

ATTITUDES AND PREFERENCES OF CONSUMERS/PURCHASERS TOWARD
DIFFERENT TYPES OF TABLE EGGS

by

Masoumeh Bejaei

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE

in

The Faculty of Graduate Studies

(Animal Science)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

December 2009

© Masoumeh Bejaei, 2009

ABSTRACT

Besides regular (white and brown) eggs, alternative types of table eggs (e.g. free-run, free-range, organic eggs) are also being sold in the Canadian market. These alternative egg types are collectively referred to as specialty eggs. The growth rate of the specialty eggs market has been high during the last decade in British Columbia (BC). Despite this growth there is insufficient information concerning consumers/purchasers' attitudes and preferences relating to this differentiated egg market. The objectives of this research were: 1) to identify the consumers' attitudes, preferences and socio-demographic characteristics towards different types of table eggs, and 2) to determine the target market for six types of eggs and to investigate the relative importance of factors (e.g. price, environmental concerns) affecting the purchase of different types of eggs.

An online survey was the primary research tool used to gather data for this project. Potential subjects were randomly selected from a list of email addresses from BC residents and 702 completed surveys were processed.

Our results indicated that the purchase of cage-free eggs was significantly higher in BC in 2009 than a 2007 Print Measurement Bureau consumer survey. Respondents with a higher educational level and higher income consumed more free-range eggs and less white regular eggs than respondents with a lower educational level. Respondents who were more concerned about local production and bird welfare purchased more free-run, free-range and organic eggs, whereas for purchasers of regular eggs, price was more important. Size of the household influenced the type of purchased eggs. Respondents from bigger households purchased proportionally more white regular eggs. Respondents who used fewer alternative egg types recognized the nutritional value of white regular eggs being as high as the free-run, free-range and organic eggs.

Respondents who purchased different types of eggs have different priorities. The results indicated that there are potential benefits to be gained from a marketing mix plan designed to develop the market share of different types of eggs in the future.

TABLE OF CONTENTS

ABSTRACT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	vii
LIST OF FIGURES	viii
ACKNOWLEDGEMENTS.....	x
DEDICATION.....	xi
CO-AUTHORSHIP STATEMENT.....	xii
1 INTRODUCTION.....	1
1.1 Egg Industry	1
1.2 Problem Statement and Objectives.....	3
1.3 Organization of the Thesis	5
1.4 References.....	6
2 LITERATURE REVIEW	8
2.1 Egg Industry in Canada and British Columbia	8
2.1.1 Undifferentiated egg market.....	10
2.1.2 Differentiated egg market.....	15
2.2 Results of Previous Specialty Egg Surveys	32
2.2.1 Survey of Albertans’ attitudes and willingness to pay for specialty eggs....	32
2.2.2 Print Measurement Bureau 2008 Survey	33
2.3 British Columbians Demographic Characteristics	34
2.3.1 Gender	34
2.3.2 Age.....	35
2.3.3 Household size.....	35

2.3.4	Education.....	36
2.3.5	Total household income	37
2.4	Survey methods	37
2.4.1	Door-to-door personal interview	38
2.4.2	Mall intercept personal interview	38
2.4.3	Telephone interview.....	39
2.4.4	Mail survey	39
2.4.5	Internet survey	39
2.5	Summary.....	40
2.6	References.....	42
3	ATTITUDES AND PREFERENCES OF CONSUMERS TOWARD DIFFERENT TYPES OF TABLE EGGS AVAILABLE IN BRITISH COLUMBIA, CANADA	47
3.1	Introduction.....	47
3.2	Materials and Methods	48
3.3	Results.....	50
3.3.1	Survey sample size.....	50
3.3.2	Socio-demographic characteristics and their influences on egg type selection.....	51
3.3.3	Table egg consumption	55
3.3.4	Factors affecting consumption of table eggs.....	57
3.3.5	Non-consumers.....	61
3.4	Discussion	62
3.5	Conclusion	66
3.6	References.....	67
4	PURCHASERS' PREFERENCE TOWARD SIX TYPES OF TABLE EGGS IN BRITISH COLUMBIA, CANADA.....	70

4.1	Introduction	70
4.2	Materials and Methods	71
4.3	Results.....	73
4.3.1	Survey response rate	73
4.3.2	Respondents' socio-demographic characteristics and the types of eggs they purchased.....	74
4.3.3	Table egg purchase	77
4.3.4	Package size.....	79
4.3.5	Egg size	80
4.3.6	Shell color.....	80
4.3.7	The importance of eleven factors	81
4.3.8	Where did you buy your eggs?.....	84
4.4	Discussion	84
4.5	Conclusion	87
4.6	References.....	89
5	GENERAL DISCUSSION AND CONCLUSION	92
5.1	General Discussion.....	92
5.2	Recommendations	94
5.3	Strengths of Our Research	94
5.4	Limitations of Our Research.....	95
5.5	Future Research.....	95
5.6	References.....	96
	APPENDICES	97
	APPENDIX I: An Observation from Four Grocery Stores in Vancouver.....	97
	APPENDIX II: Methodology.....	100

II.1 Selection of online survey method	100
II.2 Survey population and method of selecting subjects.....	102
II.3 Invitation E-mail.....	102
II.4 Online questionnaire	102
II.5 Ethics principles	106
II.6 Implementing the survey.....	106
II.7 Data analysis	107
II.8 References	108
APPENDIX III: Invitation E-mail.....	110
APPENDIX IV: Online Questionnaire	113
APPENDIX V: Behavioural Research Ethics Board Certificate of Approval.....	134

LIST OF TABLES

Table 3.1 Socio-demographic characteristics of the survey respondents:	52
Table 3.2 Correlation of demographic characteristics	54
Table 3.3 Frequency of selection of each type of eggs and the mean consumption of eggs by respondents who selected a special type of egg.....	56
Table 3.4 Distribution of frequency of consumption of table eggs	57
Table 3.5 Distribution of frequency of preparation methods of table eggs.....	57
Table 3.6 Reasons for preferring eggs with darker yolk	58
Table 3.7 Respondents' familiarity with different types of eggs.....	59
Table 3.8 Respondents' perception about the nutritional values of different types of eggs	60
Table 3.9 Frequency (%) of factors that egg users considered important for selecting a special type of egg	61
Table 4.1 Socio-demographic characteristics of the survey respondents.....	76
Table 4.2 Frequencies of selection of egg types and the mean purchase of eggs.....	78
Table 4.3 Correlations between numbers of purchased eggs	79
Table 4.4 The frequency (%) of selection of each carton size for a special type of egg.	80
Table 4.5 Percent of purchasers who purchased different egg sizes in the last 30 days.	80
Table 4.6 Purchasers' preferences regarding shell color of table eggs.	80
Table 4.7 The importance of eleven factors in the number of purchased eggs from each type. ...	81
Table 4.8 The importance of eleven factors in egg purchase decision making for purchasers of different types of eggs.	83
Table 4.9 The stores that purchasers purchased their eggs in the last 30 days.....	84
Table I.1 Prices of different kind of eggs in four grocery stores, Vancouver, April 2009	98

LIST OF FIGURES

Figure 2.1 Annual table egg production in Canada and British Columbia.	11
Figure 2.2 Annual values of table egg production in Canada and BC	11
Figure 2.3 Annual farm price of table eggs in Canada and British Columbia.	12
Figure 2.4 <i>Per capita</i> consumption of eggs in Canada	13
Figure 2.5 Average monthly retail prices for eggs in Canada	14
Figure 2.6 Annual production of processed eggs	15
Figure 2.7 AC Nielsen Canada retail sale data from 2002 till 2006.	22
Figure 2.8 Percent of annual consumer spending in Canada (AC Nielsen retail sale data).	22
Figure 2.9 Consumer spending in specialty eggs from 2005 to 2007.	23
Figure 2.10 Calculated from consumer spending data for the 52 weeks (Agri-Food Trade Service, 2008).	24
Figure 2.11 Percent change in consumer spending for specialty eggs in Canada from 2005 to 2006.	24
Figure 2.12 Retail sales market track (dollar volume) of brown regular and specialty eggs in Canada.	26
Figure 2.13 Retail sales market track (dollar volume) of brown regular and specialty eggs in BC	26
Figure 2.14 Calculated from AC Nielsen market track, dollar volume of different types of table eggs in Canada and British Columbia.	28
Figure 2.15 Calculated from AC Nielsen market track, unit volume of different types of table eggs in Canada and British Columbia	30

Figure 2.16 Calculated from AC Nielsen market track dollar and unit volume data (2008) for table egg types in Canada.....	31
Figure 2.17 Calculated from AC Nielsen market track dollar and unit volume data (2008) for table egg types in BC.	31
Figure 2.18 Calculated population distribution in BC for residents 20 yrs. or older according to 2006 census statistics	35
Figure 2.19 Number of persons in private households in BC according to 2006 census data.	36
Figure 2.20 Calculated educational levels of BC residents 25 yrs. or older according to 2006 census data.....	36
Figure 2.21 Calculated household annual income distribution of private households in BC 2005	37
Figure 3.1 Outline of the survey questionnaire	49
Figure 4.1 Survey questionnaire outline	72
Figure I.1 Retail prices for different types of large size eggs per dozen in four grocery stores....	97
Figure II.1 Online interactive survey design	101

ACKNOWLEDGEMENTS

I am extremely grateful to my supervisor, Dr. Kimberly M. Cheng, for his supervision, guidance and encouragement throughout my study and research at the University of British Columbia.

I am deeply grateful to Kelleen Wiseman who wrote the grant application for my thesis research and provided helpful advice for my research design. I would like to thank my supervisory committee, Drs. James Vercammen, Sanghoon Lee and especially Eunice C.Y. Li-Chan for their advice, helpful comments and thoughtful reviews on my research project. In addition I would like thank Drs. Gwen Chapman and Marina von Keyserlingk for serving on my thesis defense committee.

I specially want to thank my survey participants for taking the time to fill out the questionnaire; without their cooperation, this study would not have been possible.

I wish to thank Stewart and Carol Paulson for valuable inputs and Dr. Darin Bennett for the support and encouragement. I also would like to acknowledge the support of my friends from UBC Animal Science program Jennifer Arthur, Fariba Izadi, Xinrui Li, Jianan Liu and Deepa Meno during this project.

I would like to extend my deepest gratitude to my family for their help, support, and encouragement throughout the entire study.

I would like to thank Jayne Flinn Burton from The AC Nielsen Company in Canada for sharing the egg retail sale data and Sharron Murray from The Print Measurement Bureau for permitting access to their database via UBC library. Financial support for this research was provided from the BC Ministry of Agriculture and Land, administered by the Special Birds Research Committee.

Masoumeh Bejaei

December 2009

DEDICATION

For my husband, Masoud Habashi, who offered me unconditional love and support throughout the course of the thesis.

CO-AUTHORSHIP STATEMENT

Masoumeh Bejaei, graduate student, designed the research and questionnaire, conducted the survey, gathered the data, analyzed the data, interpreted the results and prepared the manuscript.

Dr. Kimberly Cheng supervised development of work and helped in design of the research program, design of the questionnaire and the manuscript preparation. Ms. Wiseman helped in design of the research and questionnaire.

1 INTRODUCTION

1.1 Egg Industry

The egg industry in Canada is one of the important contributors to the economy of the country and is run under a supply management system. Production of eggs sold for consumption in Canada and British Columbia (BC) in 2008 was about 506.42 and 54.83 million dozen eggs respectively (Statistics Canada, 2009c). Revenue receipt of egg farmers who produced eggs for consumption in Canada and BC were 594.98 and 74.13 million dollars in 2008, respectively (Statistics Canada, 2009c). *Per capita* egg availability (before adjustment for losses) declined from 22.97 dozen per year in 1960 to 14.42 dozen per year in 1995 in Canada, and has stabilized at the range of 14.5 to 15.9 dozen per person per year since 1996 (Statistics Canada, 2009b). Sim & Sunwoo (2000) reported that cholesterol content of a regular egg was one of the factors that contributed to the egg consumption decline for more than 30 years.

Karipidis et al. (2005) explained that food markets split into niche markets in developed countries to answer the changes in demands of the variety of consumers with different socioeconomic levels or different preferences regarding product attributes. The egg market in Canada transformed from an undifferentiated market to a highly differentiated one in the recent years (Goddard et al., 2007). Yet almost all published data related to eggs in Canada have considered table eggs as an undifferentiated product. Besides regular (white and brown) eggs, alternative types of table eggs (free-run, free-range, organic, and nutrient enhanced) (See Chapter 2, Section 2.1.2.1 for definitions) are also being sold in the Canadian market. These alternative egg types are collectively referred to as specialty eggs in my research.

The retail sale of specialty eggs has doubled in five years in Canada, from 10.3% of total egg retail sales in 2002 to 20.7% in 2006 (*The Nielsen Company, 2007*). Consumer spending for specialty eggs in Canada increased from \$94.4 million at the end of 2005 to \$120 million at the end of 2007 (Agri-Food Trade Service, 2008). The AC Nielsen retail sales data (dollar volume) showed that the market share of white and brown regular eggs were 76% and 7.2% of the Canadian egg market, respectively in the 52-weeks ending August 2008. At the same time the dollar volume market share of omega-3 enhanced, free-range, organic, free-run eggs were 13.3%, 2%, 0.9%, 0.8%, respectively in the Canadian egg market.

The retail sale data for 52-weeks ending August 2008 (AC Nielson, unpublished data) indicated that the BC egg market was different than the Canadian egg market. Total specialty eggs market share (dollar volume) in BC was higher than specialty eggs market share in Canada (22.9% vs. 16.8%).

The market share of specialty eggs might be greater than the above mentioned percentages because a part of the purchasers buy their specialty eggs from health food stores while those data are not included in retail sale data (Clark, 2007).

The specialty eggs sale increased 63% in US from 2001 to 2005 and its growth rate has been in double digits during the last decade. US specialty eggs market was almost 10% of US national egg market share in 2007. Almost 5% of US egg market share was from cage free eggs at the same time (Clark, 2007). Market share of the specialty eggs was not the same for different regions in US; for example it was higher for New York City metropolitan market (almost 30%) than rural area in Pennsylvania (7 to 8%) (Clark, 2008).

The production of caged eggs in UK was 54.1% at the second quarter of 2009. The production of specialty eggs in UK is more than Canada and US. Free-range, organic and free-run eggs were 37.6%, 4.2% and 4.1% of total egg production, respectively at the same time (ThePoultrySite, 2009). The production of free-range eggs in second quarter of 2009 was higher than the same period in 2008 in UK (37.6% vs. 31.7%).

1.2 Problem Statement and Objectives

Few studies have been done on consumers/purchasers' attitudes and preferences toward specialty eggs in Canada (e.g. Goddard et al., 2007) and there are only a few published reports or papers on this topic because differentiated egg markets have only been developed in a few countries during the last decade. There is a need for a market research on specialty eggs in British Columbia to determine the consumers/purchasers' attitudes, preferences and demographics toward specialty eggs in BC. Kennedy (2000) also suggested that research by some credible organizations, advertising, promotion, nutrition education and labeling would be needed for the egg industry to reposition eggs as part of a healthy diet.

Knowledge about consumers will help the egg industry to develop a marketing plan for the differentiated egg market by producing egg products according to consumer preferences. There was no published information about BC specialty egg consumers' characteristics, as well as their preferences for different types of eggs. The results will capture information for producers and egg industry to increase their profit and facilitate their planning in the future. The objectives of my thesis research were:

1. Determining the consumers' attitudes, preferences and socio-demographic characteristics regarding the consumption of table eggs.
2. Identifying the target market (socio-demographic characteristics) for the six types of table eggs in BC and determining the importance of eleven factors affecting the purchase of different egg types. The influence of product attributes (e.g. shell color, package size and egg size) in customers' purchase of eggs was also investigated in our research.

The BC Egg Marketing Board and egg farmers could establish new regulations according to the results of my research via identifying the target market trend of different types of eggs and demands in egg market. They will be able to maintain or increase their market share if they act according to the current consumers demands. The results could facilitate their planning process in the future.

Consumers/purchasers will benefit from the results of my research because the results will broadcast their demands to the producers and law makers. Therefore they will have the products that they would like to see in the market.

The retail sector could find out the socio-demographics of the purchasers and establish new marketing mix for eggs and related products. Knowledge about the priorities of the consumers in selecting eggs will increase the focus of their advertisement and successfulness of their marketing mix.

The total Canadian egg industry could benefit from my research results because it could provide a market research method for egg industry and they can investigate the influence of the changes in British Columbia egg market in the Canadian egg industry.

1.3 Organization of the Thesis

The second chapter includes the literature review and statistics regarding the production and the market for total eggs and specialty eggs in Canada and British Columbia, and defines the justification and the objectives of this study. Following the literature review, Chapters 3 and 4 contains two research papers that address the two objectives of the thesis. General conclusions and recommendations of this research can be found in Chapter 5.

1.4 References

AGRI-FOOD TRADE SERVICE (2008) Retail sales in Canadian grocery stores, consumer spending for the 52 weeks. *Agriculture and Agri-Food Canada*,

<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170951696766&lang=eng>

CLARK, E. (2007) Boom continues for specialty eggs. Retrieved Sep/24, 2009

from <http://www.wattpoultry.com/eggindustryinsider/view.aspx?id=7310>

CLARK, E. (2008) Value-added commands larger presence and premiums in market. Retrieved

Sep/24, 2009 from <http://www.wattpoultry.com/EggIndustry/Article.aspx?id=18434>

GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A.

(2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (07-03)

published by *Department of Rural Economy, University of Alberta*

<http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>

KARIPIDIS, P., TSAKIRIDOU, E., TABAKIS, N. and MATTAS, K. (2005) Hedonic

analysis of retail egg prices. *Journal of Food Distribution Research* **36(3)** 68-73

KENNEDY, A. (2000) Producer's perspective on egg consumption: how does the market react?

In: SIM, J.S., NAKAI, S. & GUENTER, W. (ed.) *Egg Nutrition and Biotechnology*, 113-118 (Wallingford, CABI Publishing).

SIM, J.S. and SUNWOO, H.H. (2000) Designer eggs: nutritional and functional significance.

Proceedings of the 2000 Poultry Symposium and Egg Processing Workshop, *UC Davis, University of California*. <http://animalscience.ucdavis.edu/Avian/sim.pdf>

STATISTICS CANADA. (2009a) Farm cash receipts (dollars). *E-STAT, CANSIM, Table 002-*

0001, Restricted data. http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

STATISTICS CANADA. (2009b) Food available by major groups in Canada, annual 1960 to 2008, Eggs (dozens per year). *E-STAT, CANSIM, Table 002-0019*, Restricted data.
<http://estat.statcan.ca/cgi-win/CNSMCGI.EXE>

STATISTICS CANADA. (2009c) Poultry and egg statistics. *Statistics Canada, Agriculture Division, Livestock Section, Catalogue no. 23-015-X*, Restricted data.

THE NIELSEN COMPANY. (2007) Retail sales in Canadian grocery stores. *Agriculture and Agri-Food Canada*, <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170860293780&lang=eng>

THEPOULTRYSITE. (2009) UK egg statistics - Second quarter 2009. Retrieved Sep/24, 2009 from <http://www.thepoultrysite.com/poultrynews/18293/uk-egg-statistics-second-quarter-2009>

2 LITERATURE REVIEW

Most of the published reports about egg production and market in Canada pool all table eggs without any regard for the differentiation in the egg market and the presence of specialty eggs in the market. For the purpose of my research, detailed information about the trends in the egg markets in general and changes in the specialty eggs markets in particular has been gathered from different databases. In the first section of this chapter, I reviewed recent reports on the table egg industry in Canada and BC. In the next section, I reviewed literature on a differentiated egg market and the production and marketing of specialty eggs. In the last section, I reviewed results of previous specialty egg surveys.

2.1 Egg Industry in Canada and British Columbia

All registered egg farmers in Canada work under the supply management system. According to the supply management regulations producers should get a quota from the egg marketing board in their province. Eleven egg marketing boards in Canada are run under the Egg Farmers of Canada (EFC) organization. The B.C. egg marketing board, established in 1967, was the first one in Canada. The reason for creating this organization was to stabilize the market for producers via controlling supply according to a demand and pricing system (British Columbia Egg Marketing Board, 2008).

The main types of quota, according to the ‘B.C. Egg Marketing Board Standing Order’ section 1 and 2 (British Columbia Egg Marketing Board, 2006), are as follows:

Licence Issuance - No person shall keep or maintain for the purposes of egg production or grow or produce for marketing, pack, store, transport or market the regulated product within

British Columbia unless he is qualified for and applies to and does obtain from the Board annually, one or more appropriate licences.'

'Size Exemption - A person who keeps or maintains ninety-nine (99) layers or less shall be exempt from the requirement of obtaining a licence and registering as a Registered Producer.'

'Small Lot Authorizations - The Board has established a Small Lot Authorization program to a maximum of 10,000 layers. A person who wishes to keep or maintain more than ninety-nine (99) layers but three hundred and ninety-nine (399) layers or less, must apply annually to the Board to be exempt from: the requirement of obtaining a licence, registering as a Registered Producer and paying marketing licence fees if they do not market their eggs through a Federally Registered grading station.'

'Regular Layer Quota means quota used to produce any egg other than a "Specialty Egg.'

'Specialty Layer Quota means the number of layers which may at any time be kept or maintained for the purposes of producing Specialty Eggs as determined or varied from time to time by resolution of the Board.'

'Specialty Egg means organic, free run, free range eggs and any other new innovative organic, free run or free range eggs, produced by holders of Specialty Layer Quota.'

'There must be third party certification i.e. through the Agri-Food Choice and Quality Act (AFCQA) and/or nationally or internationally recognized standards or other standard acceptable to the BC Egg Marketing Board.'

2.1.1 Undifferentiated egg market

2.1.1.1 Table egg production

The number of registered egg producers was 1,032 in Canada and 132 in BC in 2008 (Egg Farmers of Canada, 2008b). BC had 12.46% of farm cash receipt of eggs produced for consumption in Canada in the same year (Statistics Canada, 2009c). Average monthly number of layers was about 26 millions layers in Canada and 3.2 million layers in BC (Statistics Canada, 2009f). Average number of eggs per 100 layers per day for Canada (74.4%) was higher than the value for BC (68%) in 2008 (Statistics Canada, 2009f).

The US is the second largest egg producer in the world. For the sake of comparison, similar statistics from the US, an unregulated market, are as follows:

There are 205 egg producing companies in US with layers of 75,000 or more and they have 95% of US laying hens. Twelve egg producing companies with 5 million layers are active in US. The table egg farmers in US produced 6,403 million dozens in 2008; they had 281 million laying-hens in the same year. Egg production rate was 73.4% per 100 layers in August 2009 (United Egg Producers, 2009; USDA, World Agricultural Outlook Board, 2009).

The following three figures compare Canada and BC table egg productions, their values and prices. BC's share was 10.83% of produced eggs for consumption in Canada (Fig. 2.1). There was a reduction in egg production in BC in 2004 because of the avian flu outbreak in this province.

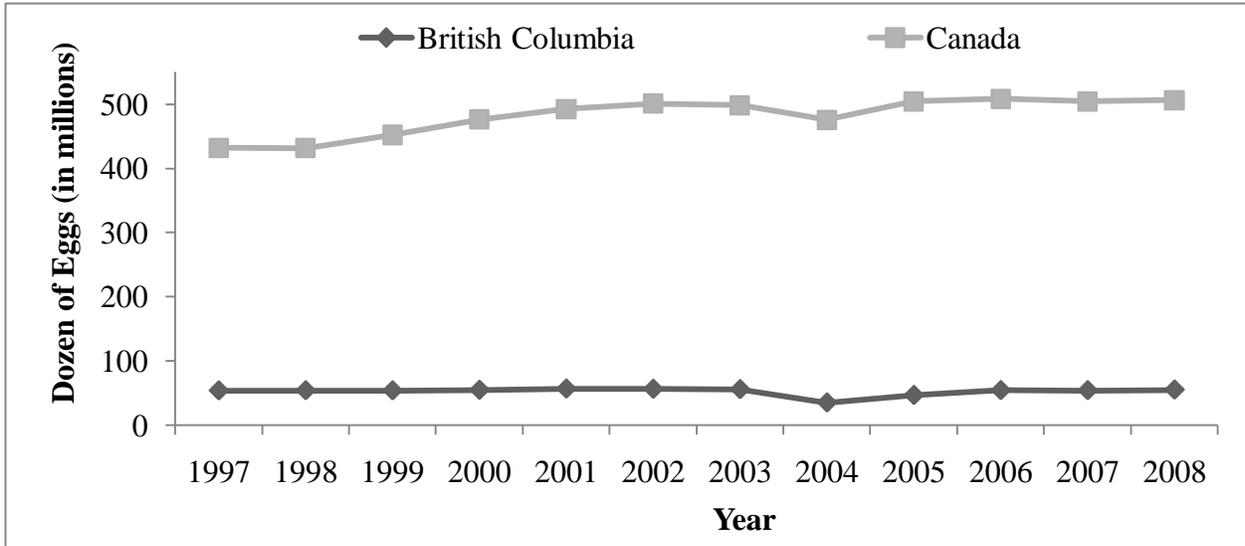


Figure 2.1 Annual table egg production in Canada and British Columbia (Statistics Canada, 2009f). The annual production data has been calculated from monthly values.

Annual value of produced table eggs in BC was 11.85% from total value of table eggs in Canada in 2008 (Fig. 2.2). The value of the eggs increased during the last three years in Canada. The production was stable during last four years; the reason for this increase in the value of the eggs sold for consumption might be the increase in the farm price of eggs (Fig. 2.3).

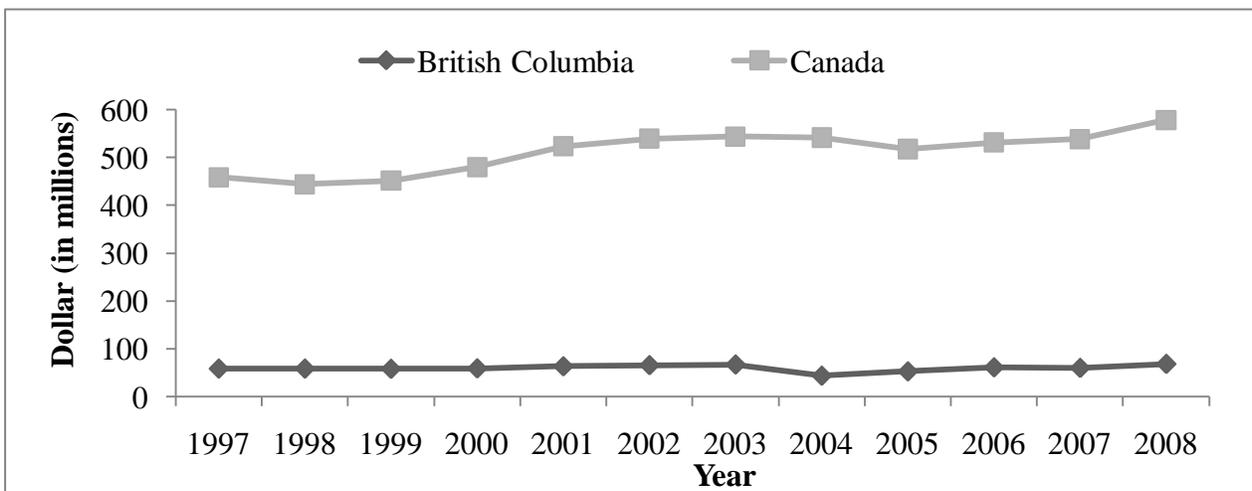


Figure 2.2 Annual values of table egg production in Canada and BC (Statistics Canada, 2009f). The annual values have been calculated from monthly data.

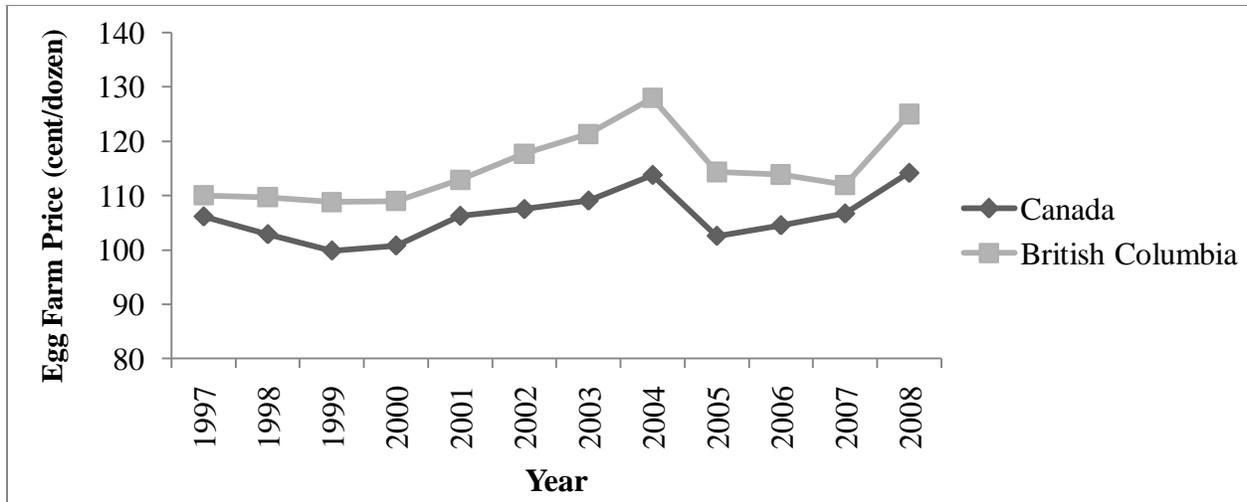


Figure 2.3 Annual farm price of table eggs in Canada and British Columbia (Statistics Canada, 2009f). The annual farm price has been calculated from monthly egg prices.

2.1.1.2 Table egg consumption rates

Per capita consumption of table eggs dramatically declined from 22.97 dozen in 1960 to 14.42 dozen in 1995 and has been in a constant range of 14.5 to 15.9 dozen per person since 1996 (Statistics Canada, 2009d). The net supply of table eggs was 486.18 million dozen in Canada and the Canadian population was 33.5 million at the same time. Therefore *per capita* consumption of table eggs was 14.6 dozen per person in 2008 (Statistics Canada, 2009d) (Fig. 2.4).

Kennedy (2000) explained that the consumption of eggs declined because consumers became more concerned about a link between dietary cholesterol and heart disease. He mentioned that a *Salmonella* epidemic in UK in the late 1980s created a serious threat to the egg industry. Another threat was the increasing consumers' preference for novel and ready to eat foods for breakfast. Hailu & Goddard (2004) indicated that health information and nutritional concerns influenced the demand for eggs for many years. In the late 70's the demand declined

because of the cholesterol concerns of consumers (cholesterol phobia), as well as the result of a change in the lifestyle of consumers and the availability of variety of food products for the higher income families (Fearne & Lavelle, 1996). The demand increased in the mid 1990's mainly because of the popularization of the Atkins diet and the development of functional (specialty) eggs. Sim & Sunwoo (2000) reported that the cholesterol content of a regular egg was one of the factors in the decline of consumption of eggs for more than 30 years. They mentioned that the production of designer eggs (a type of specialty eggs) increased the *per capita* consumption of eggs in the late 1990s.

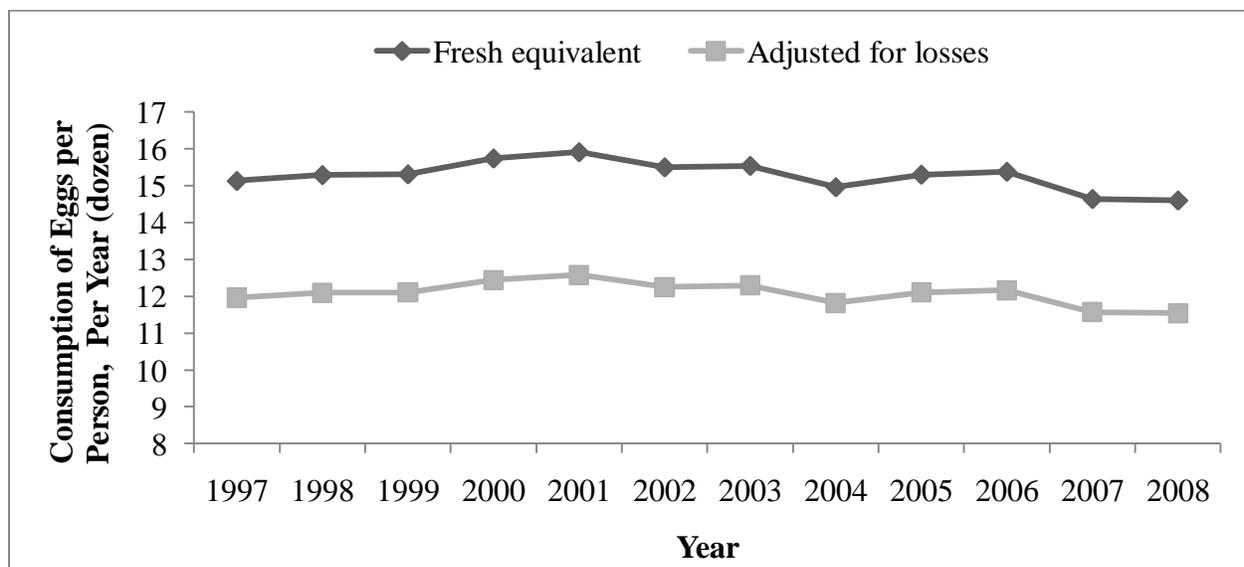


Figure 2.4 *Per capita* consumption of eggs in Canada (Statistics Canada, 2009d), the consumption of eggs became stable during the recent years.

Winhorst (2008) predicted a small increase (4.7%) in the egg production in the United States and Canada till 2015. He predicted that the *per capita* consumption of eggs in Canada will increase from 11.3 kg in 2005 to 14 kg in 2015; in the same time US egg consumption will

increase slightly from 15.4 kg to 15.8 kg. The base for his projections was the socioeconomic data, population increase, age of the population, urbanization level and projected gross income development for each country.

2.1.1.3 Trend in monthly retail egg prices in Canada

Average monthly retail prices per dozen of egg in Canada (Fig. 2.5) increased since 1997 (Statistics Canada, 2009b). These statistics considered eggs as a single product (table eggs) without considering different types of eggs that were already in the market. Canadian farm product price index (FPPI) for eggs increased from 100 in 1997 to 107.9 in 2008; whereas the ‘total livestock and animal product’ and ‘all farm products’ price indexes were 103.7 and 120.7 in 2008 (Statistics Canada, 2009h) , respectively.

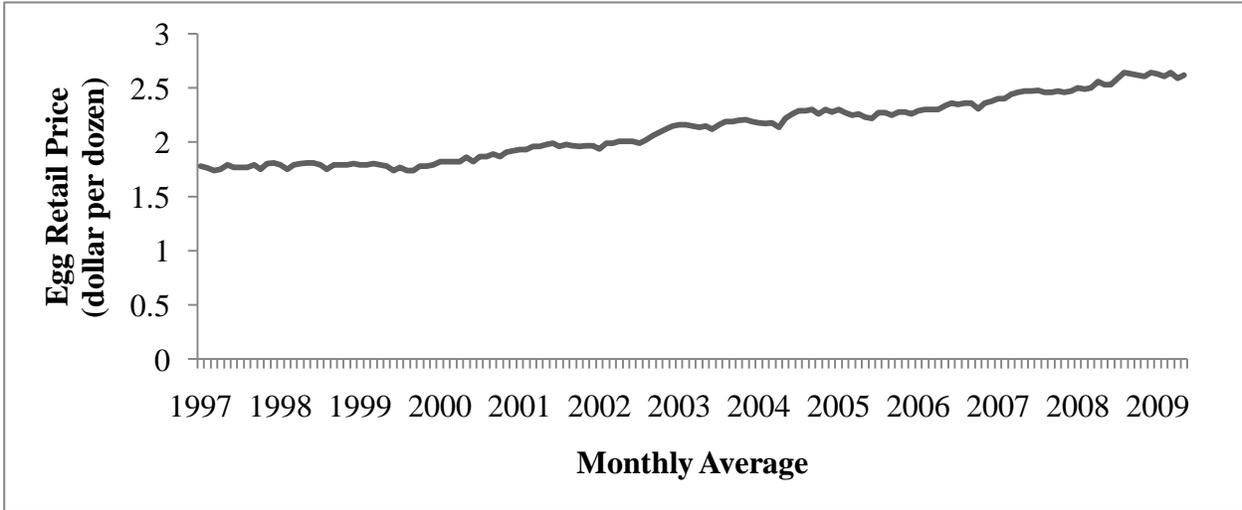


Figure 2.5 Average monthly retail prices for eggs in Canada (Statistics Canada, 2009b) increased from \$1.78 in January 1997 to \$2.62 in May 2009.

2.1.1.4 Processed eggs production

Total breaker eggs production decreased in Canada since 2002 (Fig. 2.6).

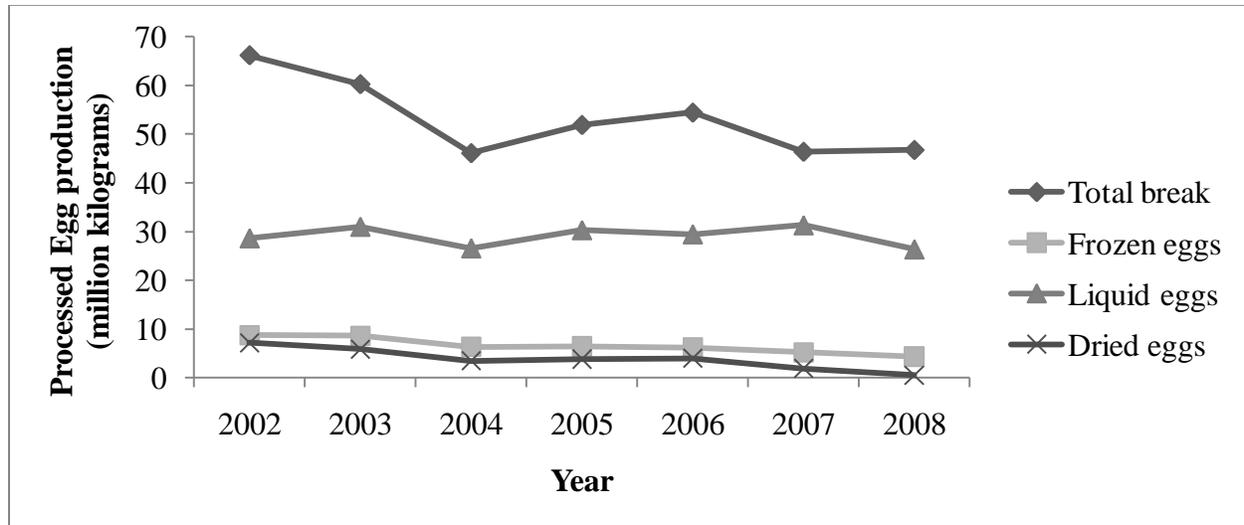


Figure 2.6 Annual production of processed eggs (Statistics Canada, 2009g)

'Total break is the actual liquid weight of shell eggs broken and processed, plus additives, by category. This figure is a total of domestic and imported shell eggs broken to be prepared as frozen or liquid egg product, or converted to dried egg product. It does not include imported liquid product which is converted to dried' (Statistics Canada, 2009g).

2.1.2 Differentiated egg market

Karipidis et al. (2005) explained that food markets split into niche markets in developed countries to answer the changes in demands of variety of consumers with different socioeconomic levels or different preferences regarding product attributes. The egg market in developed countries transformed from an undifferentiated market to a highly differentiated one in recent years; for example, 100 types of specialty eggs were available in the US market in 2007 (Clark, 2008).

Sim & Sunwoo (2000) commented that it would be easier to improve the nutritional quality of eggs than to decrease the cholesterol content of eggs. This improvement in the quality of eggs has repositioned eggs as a healthy food product in the market. Cherian et al. (2002) indicated that in Canada, specialty eggs were sold as table eggs rather than processed egg products, and that would be a good opportunity for producing and marketing of specialty eggs (nutrient enhanced eggs) because of the consumers' concern about relationship between their diet and their health.

2.1.2.1 Definition of classic and specialty table eggs

With reference to the Egg Farmers of Canada classification (Egg Farmers of Canada, 2008a), shell chicken eggs (unprocessed table eggs) have been categorized for the purpose of my research as:

- Classic eggs: white regular eggs and brown regular eggs
- Specialty eggs: free-run eggs, free-range eggs, organic eggs, nutrient enhanced eggs (omega-3/vitamin enhanced) and vegetarian eggs

The following are the definitions of different categories of table eggs according to the Egg Farmers of Canada (2008a):

White regular eggs: These are white eggs produced by white-feathered chicken hens kept in laying cages. White regular eggs will be considered as a control group in my research for comparison with other types of eggs because purchasers do not pay any premium for these eggs and these eggs have been available in the market for many years.

Brown regular eggs: These are brown eggs produced by brown-feathered chicken hens kept in laying cages. The nutritional value of the brown eggs has been shown to be similar to that of white regular eggs (Jacob & Miles, 2008). Brown eggs are more expensive than white regular eggs because of the higher feed requirement of slightly larger brown egg layers. These eggs have been available in the market for many years too.

Free-run eggs: These eggs are produced from chicken hens that are kept in indoor floor pens. These hens do not have access to the outdoors. The shell color of these eggs can be either white or brown. The nutritional value of free-run eggs is the same as white regular eggs (Egg Farmers of Canada, 2008a). The only difference is the housing system which is considered to have higher animal welfare standards. These eggs are more expensive than white regular eggs because of the higher costs of their production and housing system (Jacob & Miles, 2008).

Free-range eggs: These eggs are produced from chicken hens that have access to nesting boxes, floor pens, perches and outdoor spaces. In Canada the hens in free-range housing system have access outdoor when the weather conditions permit (Egg Farmers of Canada, 2008a). The shell color of these eggs could be either white or brown. The nutritional value of free-range eggs is the same as white regular eggs (Egg Farmers of Canada, 2008a) and the only difference is the housing system which is considered to have higher animal welfare standards. These eggs are more expensive than white regular eggs because of the higher costs of their production system.

Organic eggs: These eggs are produced by chicken hens that are fed a diet of certified organic grains and raised according to the guidelines issued by valid certifying agencies. According to the British Columbia Egg Marketing Board definition, organic eggs in BC have to be certified by one of the following certifying agencies: the Certified Organic Associations of

British Columbia (COABC) or OCPP/Pro-Cert Canada (BC Egg Marketing Board, 2008). The shell color of these eggs could be either white or brown. The nutritional value of the organic eggs is the same as white regular eggs (Egg Farmers of Canada, 2008a). They are the most expensive eggs in the market because of the cost of the organic feed, the cage-free housing system (required by certifying agencies in Canada) and higher animal welfare standards in their production.

Omega-3 enhanced eggs: These eggs are produced by chicken hens that are fed a diet that includes omega-3 polyunsaturated fatty acids from PUFA sources like flaxseed or fish oils (Sim & Sunwoo, 2000). As a result of this diet, the hens produce eggs that contain 0.3 grams or more of omega-3 polyunsaturated fatty acids per large egg (Egg Farmers of Canada, 2007). The layers can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown.

Vitamin enhanced eggs: These eggs are produced by chicken hens fed a nutritionally-enhanced diet containing higher levels of certain nutrients (e.g., vitamin E, folate, vitamin B6 and vitamin B12). As a result of this diet, the hens produce eggs with a higher level of these nutrients. The chicken hens can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown.

‘Vegetarian feed only’ eggs: These eggs are produced by chicken hens that are fed a diet containing ingredients of plant origin only (no animal by products in the feed). The chicken hens can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown. There is no nutritional difference between these eggs and white regular eggs (Egg Farmers of Canada, 2008a) but the price is higher.

2.1.2.2 Advantages of differentiation in the egg market

There are different kinds of specialty eggs and they have some common advantages and some particular advantages. The following statements explain some of the advantages of differentiation in the egg market:

- Differentiation in the egg market will provide more choice options for the purchasers with different priorities and concerns.
- Specialty eggs have very good market potential and there is a high demand for specialty eggs in general. Production of designer eggs (a type of nutrient enhanced eggs) increased the *per capita* consumption of eggs (Sim & Sunwoo, 2000).
- Nutritionally enhanced designer eggs could be a good choice for nutrition-health conscious consumers. For example one large designer egg contains 600 mg of omega-3 PUFA, 6 mg tocopherols, balanced ratios of PUFA/SAFA (Saturated fatty acids) (1:1) and omega-6/omega-3 (1:1). Omega-3 fatty acids are essential ingredients for human body and they protect consumers against cardiovascular disease and a few types of cancer (Lewis et al. 2000).
- The omega-3 enhanced eggs could be used in baby foods because they have a similar composition of fatty acids as that of human breast milk. Most infant foods lack omega-3 poly unsaturated fatty acid, Docosahexaenoic acid and Amino Acids. Although eggs can be considered as potential allergens for some (Canadian Food Inspection Agency, 2009), this nutritionally enhanced eggs could be useful in producing infant foods (Sim & Sunwoo, 2000).
- Hens kept in a cage-free housing system will increase egg consumption for those purchasers who are concerned about animal welfare standards.

- Layers have less foot injuries in the cage-free housing system (Duncan, 2001).

2.1.2.3 Disadvantages of differentiation in the egg market

- The egg production in cage free housing systems is more expensive because of lower hen density in alternative housing systems and higher housing and labor cost (Anderson, 2009). As a result specialty eggs are more expensive than white regular eggs.
- The influence of animal welfare regulations in California (bigger cages or cage-free housing systems), which are going to be fully implemented in 2015, is forcing the producers of eggs from regular caged layers to sell their eggs as breakers or going out of business (Babcock et al., 2002). According to the new regulations only the graders will have the opportunity to sell their eggs in grocery stores and the breakers have to sell their eggs only to the processing facilities. In this case the graders will gain more profit because they will be able to supply table egg market with higher prices. The supply for grocery stores will be steady while the demand could increase in some occasions (e.g. Easter) and the breaker producers could not sell their eggs in grocery stores; therefore the price of the eggs will increase.
- Risk of predators and diseases is higher in free-range housing system.
- It is more difficult to control the environment in the free-range housing systems; for example climate change could influence the production.
- Not all producers register with the Egg marketing board. Small scale producers (less than 99 layers per a farm) also play a significant role in the specialty egg market but this portion of market cannot be tracked and there is no quality control over this portion of production.

- Most of the specialty egg products are being sold in organic and health food stores which are also not tracked by retail sale tracking companies.
- High differentiation in the egg market could confuse the purchasers (Goddard et al., 2007).

2.1.2.4 Specialty egg market in Canada

Most of the available statistics about eggs was related to the total table eggs production without differentiating the types of eggs. The only governmental data related to specialty eggs is from Agriculture and Agri-Food Canada (AAFC) database. This database considered total table eggs in two groups; one group as the regular eggs and the other one specialty eggs without mentioning the types of specialty eggs.

There were two types of data regarding specialty eggs in the AAFC data base; the first group of statistics was related to the retail sale of specialty eggs in Canada from 2002 till 2006 (The AC Nielsen Company, 2007) and the second group of data was from consumer spending statistics (from 2005 till 2007).

2.1.2.4.1 AC Nielsen data from Agriculture and Agri-Food Canada database

AC Nielsen data indicated that retail sales of specialty eggs increased from 10.3% of total table egg market at the end of 2002 to 20.7% in 2006 (Fig. 2.7). Regular unprocessed table eggs lost their market at the same time. The regular table egg market had 89.7% of the market in 2002 and but its market share was reduced to 79.3% in 2006 (Fig. 2.8). According to this data the

percent change in retail sale of specialty eggs was much higher than the percent change in retail sale of regular table eggs (The Nielsen Company, 2007).

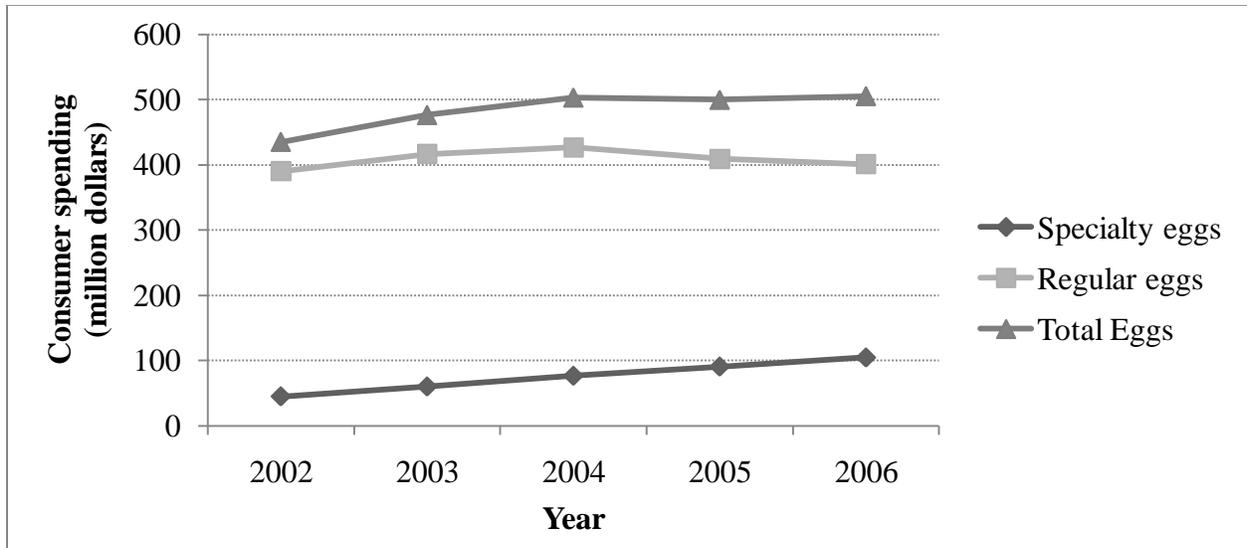


Figure 2.7 AC Nielsen Canada retail sale data (The Nielsen Company, 2007), retail sale of specialty eggs increased from 44.7 to 104.7 from 2002 till 2006.

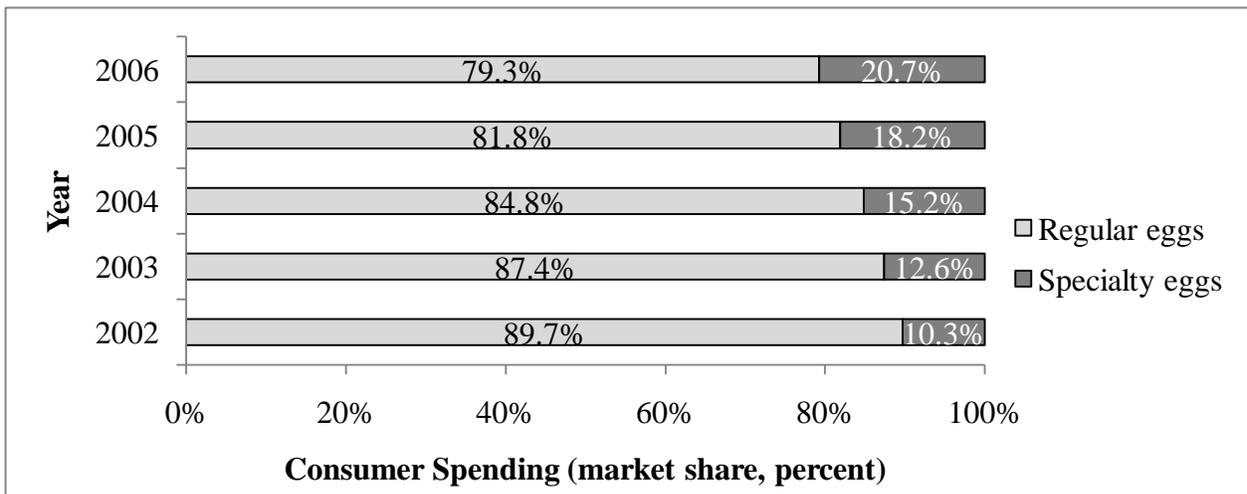


Figure 2.8 Percent of annual consumer spending in Canada calculated from AC Nielsen retail sale data (The Nielsen Company, 2007). The retail sale of specialty eggs doubled during the five years (10.3% of retail sale in 2002 became 20.7% of retail sale in 2006).

2.1.2.4.2 Agriculture and Agri-Food Canada in ‘Food Distribution Statistics’

Consumer spending for specialty eggs (without identifying the types of specialty eggs) increased from 94.4 million dollars at the end of 2005 to 109.7 million dollars at the end of 2006 and then to 120 million dollars at the end of 2007 (Fig. 2.9).

The Agriculture and Agri-Food Canada statistics indicated that retail sale of regular unprocessed table eggs was less than 80% of total retail sale of eggs in 2006 and less than 79% in 2007 (Fig. 2.10).

Regular eggs sale showed slight decrease (-1) in 2006 (versus 2005) but their annual sale increased 4% in 2007 (Fig. 2.11). The growth rate of the sale of specialty eggs was higher than regular eggs. Also there was a 5% increase in the total Canadian egg market in 2007 versus 2006 (Agri-Food Trade Service, 2008).

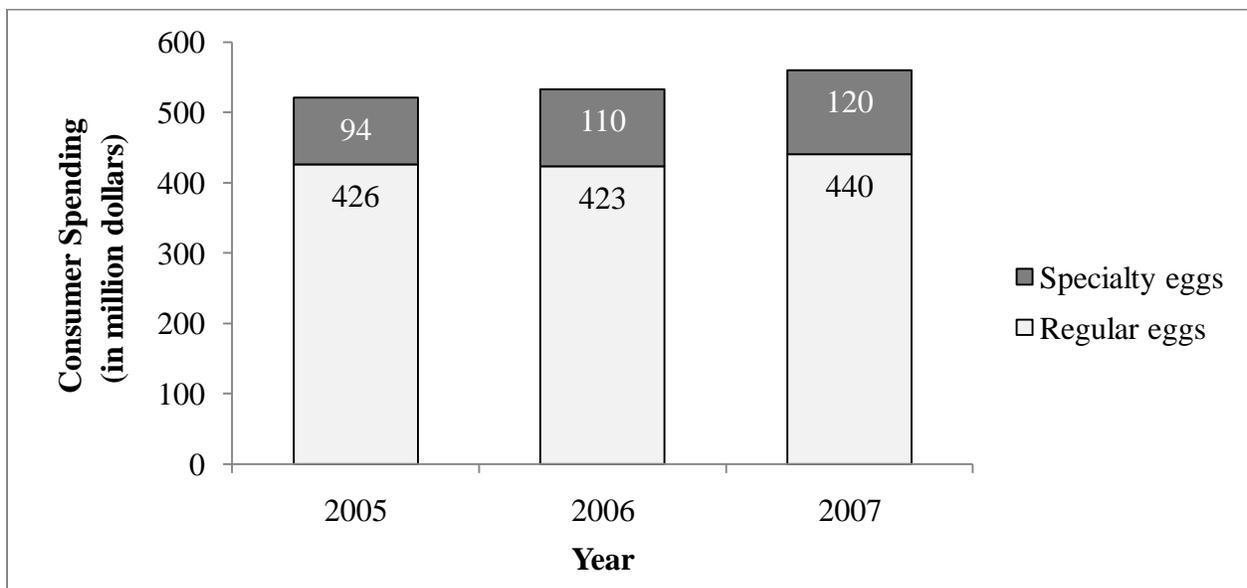


Figure 2.9 Consumer spending in specialty eggs from 2005 to 2007 (Agri-Food Trade Service, 2008).

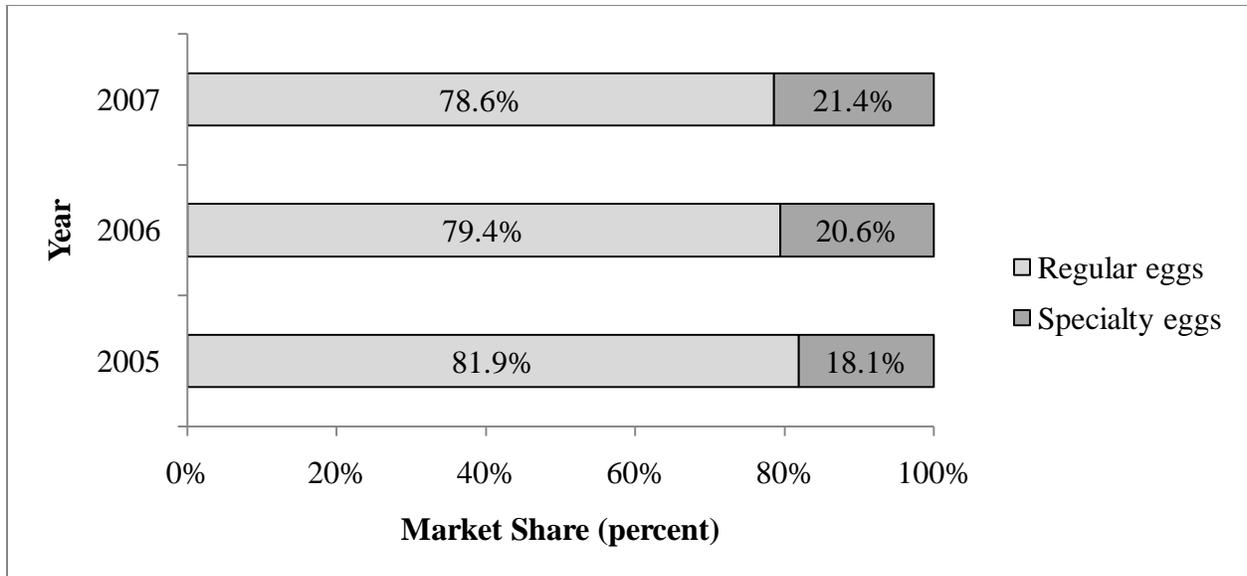


Figure 2.10 Calculated from consumer spending data for the 52 weeks (Agri-Food Trade Service, 2008), the market of specialty eggs increased from 18.1% to 21.4% from 2005 till 2007.

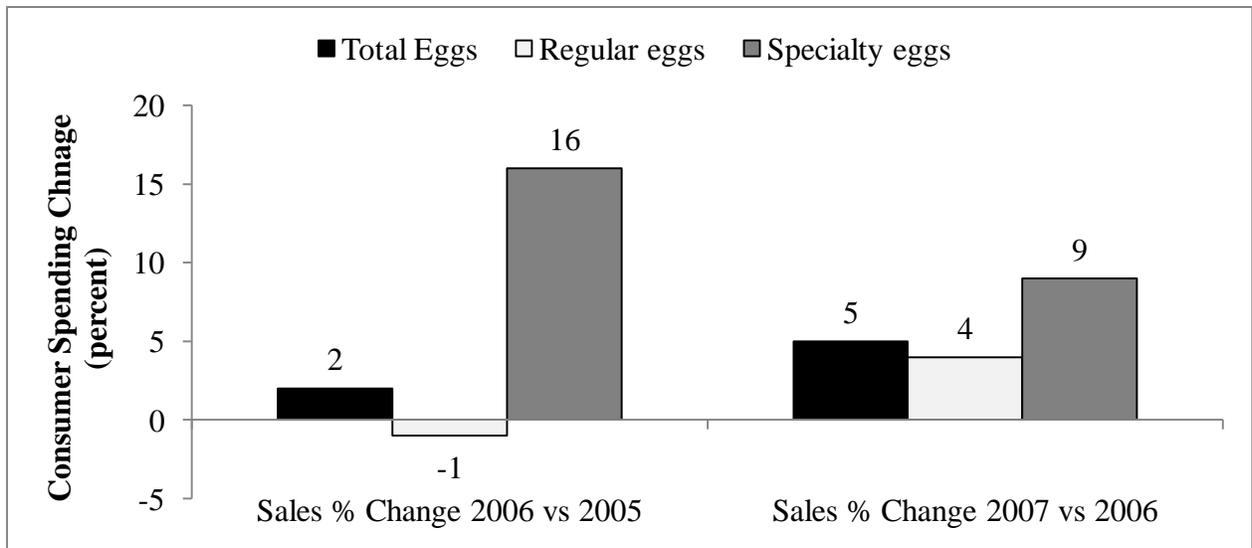


Figure 2.11 Percent change in consumer spending for specialty eggs in Canada (Agri-Food Trade Service, 2008), the market growth of specialty eggs was higher during 2005 and 2006.

2.1.2.4.3 AC Nielsen Canada: dollar volume market track data

The A.C. Nielsen Company market track (retail sale) data includes scanning data of the sale dollars and sale volume of a product via in-store scanners. Nielsen data is useful to determine that part of the market share of a product that is being sold at the big chain stores. This data does not cover local stores or stores smaller than \$150 million in sales per year (Broomhall, 2008). Therefore Nielsen market track data does not show the total market share of a product; furthermore it is from a part of the market that belongs to the major chain stores. AC Nielsen market track data with differentiation regarding the type of specialty eggs could help us determine the market share of different types of eggs.

The AC Nielsen market track data that I had access to was the dollar volume, dollar volume percent change, unit volume and units volume percent change for two 52 week ending August 2007 and 2008. The third 52 weeks ending August 2006 has been calculated via access to the percent changes of the data related to 52 weeks ending August 2007. The market tracks of the following kinds of eggs were included in AC Nielsen Canada market track data from all tracked channels: white regular, brown regular, free-run, free-range, organic, omega-3 enhanced eggs.

The size of specialty egg retail sale was smaller than regular eggs but its growth rate was faster than regular eggs. Market track data indicated that the retail sale of eggs increased in Canada from 2006 till 2008, with retail sale of white regular eggs of \$412 million in 2006 and \$450 million in 2008. Figure 2.12 shows the increase in retail sale of specialty egg types in Canada in the last three years.

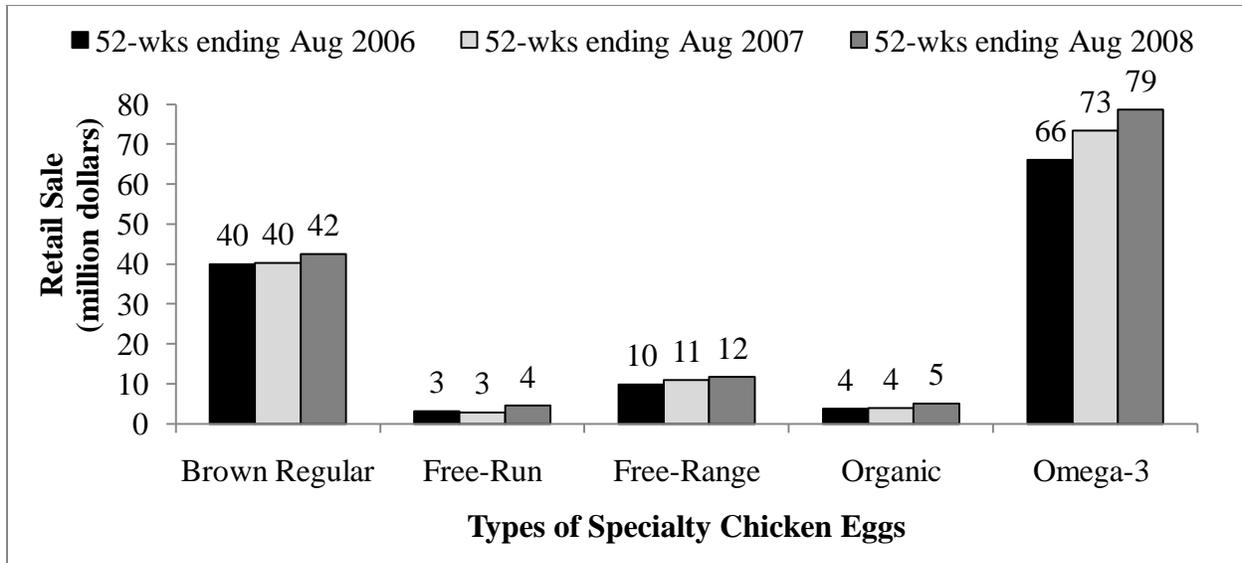


Figure 2.12 Retail sales market track (dollar volume) of brown regular and specialty eggs in Canada (The Nielsen Company, 2008).

The retail sale of white regular eggs was \$54 million in British Columbia in 2006 (The AC Nielsen 2008) and it declined by one percent in 2007 data (\$53.6 million). However there was an increase of 7% in 2008 (\$57.6 million). Figure 2.13 shows the increase in retail sale of specialty egg types in British Columbia in the last three years.

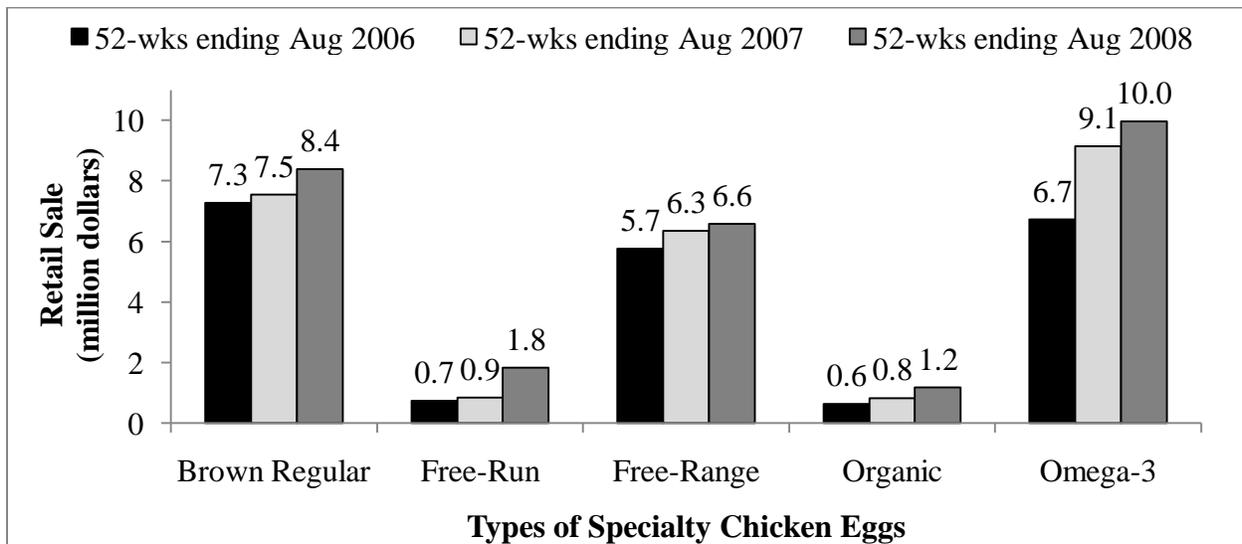
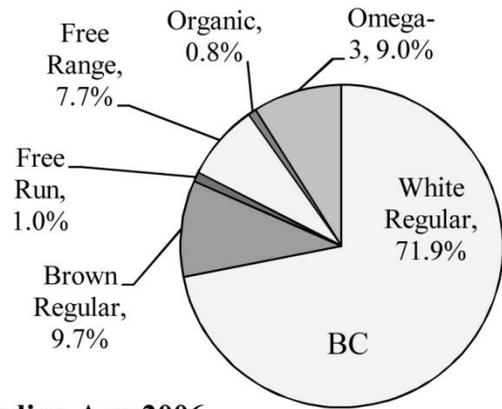
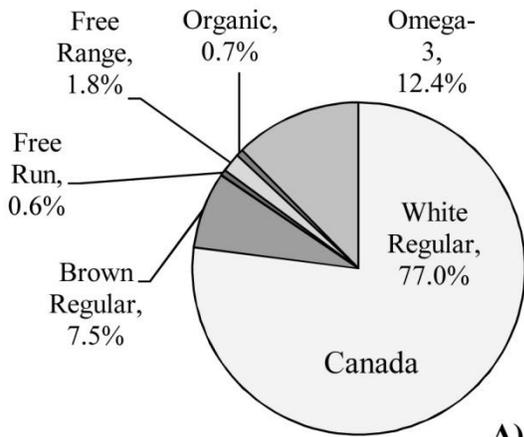


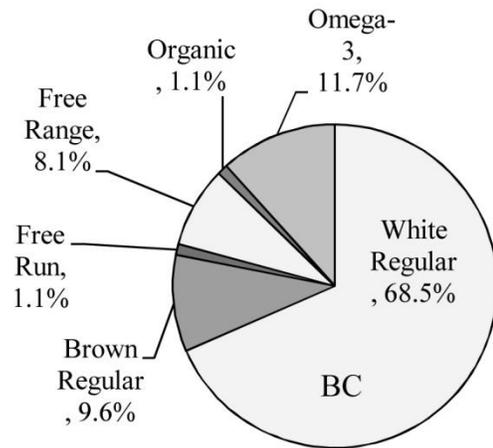
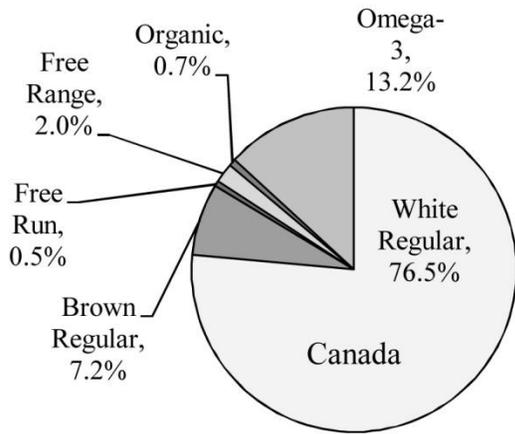
Figure 2.13 Retail sales market track (dollar volume) of brown regular and specialty eggs in BC (The Nielsen Company, 2008).

According to AC Nielsen market track (dollar volume) data in 52-weeks ending August 2008 (Figure 2.14):

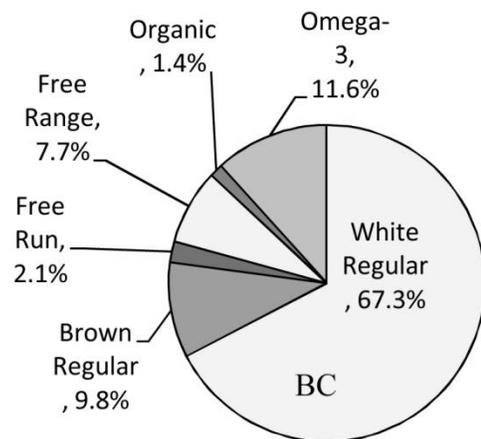
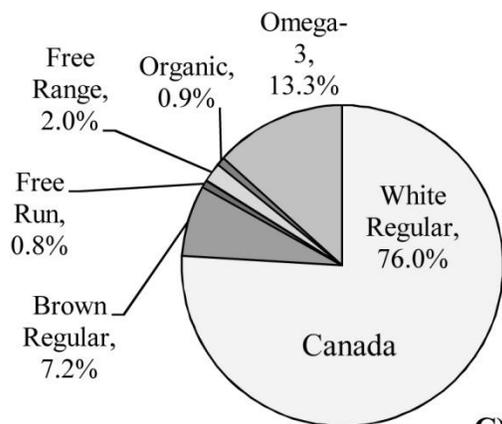
- Retail sales (million dollars) of white regular eggs in Canada was 76% of total retail egg sales and was higher than that in BC (67%).
- Brown regular eggs were more popular in BC than Canada (9.81% vs. 7.2%).
- The percentage retail sale of specialty eggs (free-run, free-range, organic and omega-3 enhanced eggs) in BC was higher than Canada (22.9% vs. 16.8%).
- Free-range eggs were sold in BC almost four times more than their sale in Canada (7.7% vs. 2%).
- Free-run eggs were sold more in BC than Canada (2.14% vs. 0.8%).
- Organic eggs sale was 50% more in BC than Canada (1.37% vs. 0.9%).
- The percentage retail sale of omega-3 eggs in Canada was higher than BC (13.3% vs. 11.65%).



A) 52-wks ending Aug 2006



B) 52-wks ending Aug 2007



C) 52-wks ending Aug 2008

Figure 2.14 Calculated from AC Nielsen market track, dollar volume of different types of table eggs in Canada and British Columbia (The Nielsen Company, 2008).

2.1.2.4.4 AC Nielson Canada: unit volume market track data

About 450 million dozen white regular eggs were sold in the retail sector in Canada during the 52-weeks ending August 2008; in the same time 57.55 million dozen of white regular eggs were sold in British Columbia. Omega-3 eggs were sold more than the other types of specialty eggs in Canada (24 million dozen) and British Columbia (2.7 million dozen).

Specialty eggs were 13.1% of retail sale in Canada in 52-weeks ending August 2008; this percentage of unit volume generated 16.8% of total table egg retail sale dollar volume in Canada. Unit volume of specialty eggs in BC was 16.6% of total BC retail sale unit volume and it generated 22.9% of total retail dollar volume of table eggs in BC. The unit volume of specialty eggs was lower than the dollar volume of this type of eggs because specialty eggs were more expensive than regular eggs and they made more money for a unit volume.

Figure 2.15 shows the retail sale unit volume of table eggs in Canada and BC. In comparison, Figure 2.14 shows the dollar volume to demonstrate the influence of price differences between regular and specialty eggs in their market share.

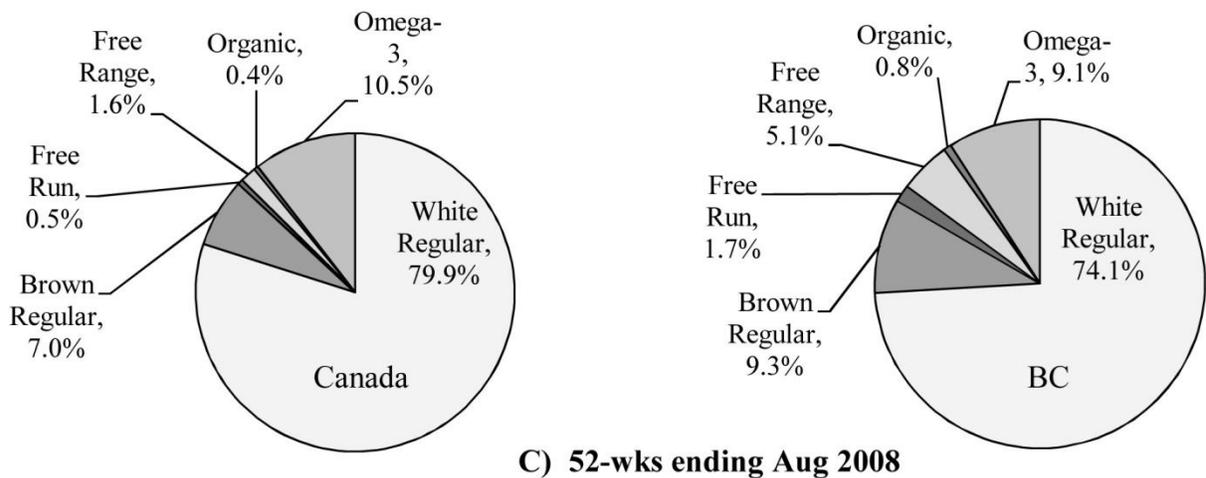
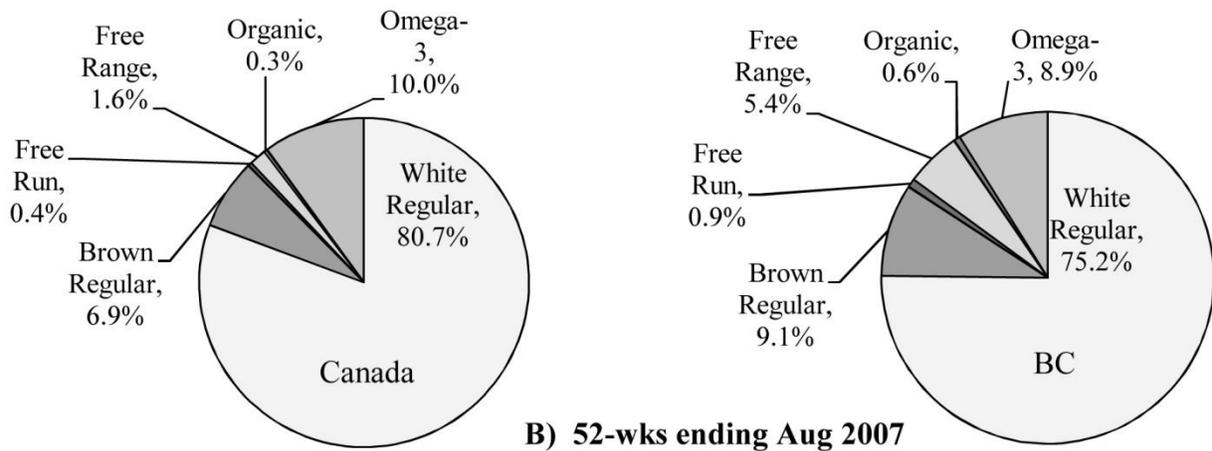
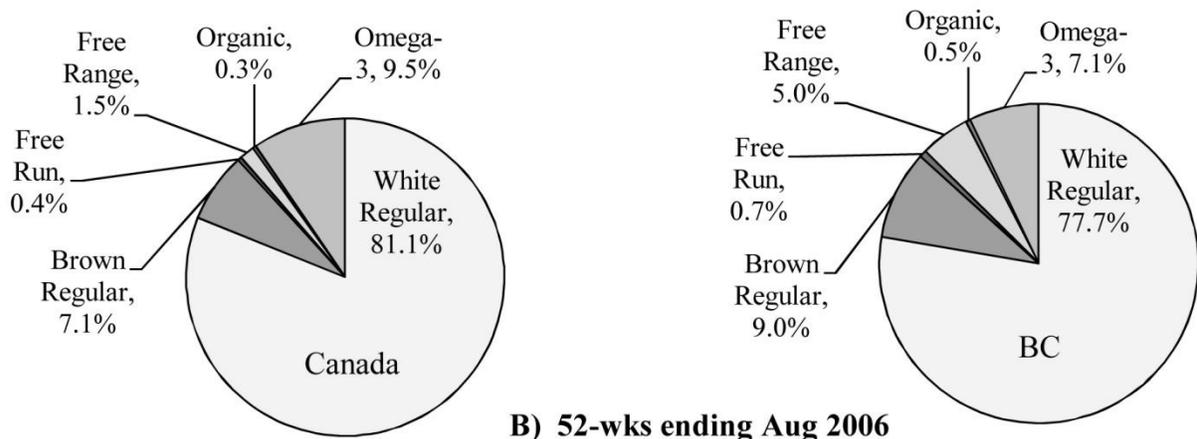


Figure 2.15 Calculated from AC Nielsen market track, unit volume of different types of table eggs in Canada and British Columbia (The Nielsen Company, 2008).

2.1.2.4.5 Retail prices of egg types

Annual retail prices for different types of eggs were calculated by dividing the dozen of sold eggs (unit volume) to their retail sale dollar value (The Nielsen Company, 2008). The price of eggs in BC was not the same as that for Canada, but specialty eggs are more expensive than regular eggs both in BC and in Canada (Fig. 2.16 and Fig. 2.17, also see Appendix I).



Figure 2.16 Calculated from AC Nielsen market track dollar and unit volume data (2008) for table egg types in Canada.



Figure 2.17 Calculated from AC Nielsen market track dollar and unit volume data (2008) for table egg types in BC.

2.2 Results of Previous Specialty Egg Surveys

2.2.1 Survey of Albertans' attitudes and willingness to pay for specialty eggs

Goddard et al. (2007) conducted two surveys about the consumer attitudes and willingness to pay for specialty eggs in Alberta. The first research was a grocery store interview in 2005 (about white regular, omega-3 and vitamin enhanced eggs) and an online survey in 2006 (about brown regular, organic, free-run and vegetarian eggs).

The results of Goddard et al.'s research indicated that the consumption of white regular eggs was higher than specialty eggs but there was a niche market for specialty eggs as well. There was no free-range type of egg in their survey because of the weather conditions in winter in Alberta which precludes the production of free-range eggs. Consumers were willing to pay a higher premium for free-run and organic eggs. Nutrient enhanced eggs were more desirable for elderly people and health conscious respondents. The results indicated that consumers were confused about the health benefits of free-run and organic eggs.

The results (Goddard et al., 2007) demonstrated that the price was the key factor in making decisions to buy eggs and the comparative prices of different types of eggs was important in the purchase of eggs. In the households with children at home or older age of household heads, they saw an increase in the consumers concern about price. Households with higher grocery store expenditures purchased more specialty eggs.

Goddard et al. (2005) also did statistical analysis on the AC Nielsen Homescan data (2002 to 2004) for Alberta and Ontario purchasers. According to their results Albertans consumed 91% regular eggs (white & brown), 3% premium eggs (These eggs are selected from the eggs produced by young hens at the peak of their laying cycle. Premium eggs have stronger

shells and thicker whites (Egg Farmers of Canada (2008a)), 2% omega-3 eggs, 2% free-range eggs, 1% organic eggs and 1% vitamin enhanced eggs. Ontarians consumed 81% regular eggs (white, brown), 11% omega-3 eggs, 4% premium eggs, 2% vitamin enhanced/vegetarian eggs, 1% free-range and 1% organic eggs.

The results of Goddard et al. (2007)'s statistical analysis on AC Nielsen Homescan data indicated that higher income households spend more money on grocery shopping and purchased more specialty eggs but the increase in size of the household and also the age of the household head decreased the purchase of specialty eggs.

2.2.2 Print Measurement Bureau 2008 Survey

TNS Canadian Facts (a marketing and social research organization) did a survey from Oct. 2006 to Sep. 2007 and the results have been published in PMB 2008 database (Print Measurement Bureau, 2008). A few questions in their survey were related to specialty eggs and the respondents' demographic information. Eggs and egg products were divided into 5 categories: white regular eggs, brown regular eggs, omega-3 eggs, other specialty eggs and liquid egg products.

The percent of respondents who selected white regular eggs was 57%, brown regular eggs 20%, omega-3 eggs 20%, other specialty eggs 4% and liquid egg products 3% of total sample size in Canada. Detailed data from the PMB survey were not available to conduct statistical significance analysis.

From the indices used by PMB, the following conclusions can be drawn:

- Female respondents used more ‘other specialty eggs’ and ‘processed eggs’ than the expected value in general population.
- Younger respondents (less than 18 yrs. old) used less specialty eggs than expected value.
- The respondents with bachelor or higher degree used more omega-3 and other specialty eggs than expected value.
- The respondents with income above 75 thousand dollars used more omega-3 and other specialty eggs than expected value.
- Single person families used more specialty eggs than expected value.
- Presence of a child under 18 at home increased the usage of ‘other specialty eggs’ and decreased the purchase of brown regular eggs.
- BC used more brown eggs and ‘other specialty eggs’ and less white and omega-3 eggs than other provinces in Canada.
- Vancouver used more specialty eggs but less white regular eggs than other cities in Canada.
- Metropolitan areas used more ‘other specialty eggs’ and small communities used more of white and brown regular eggs than expected value.

2.3 British Columbians Demographic Characteristics

The data about the socio-demographic characteristics of BC residents was included in this section as a reference for the characteristics of our survey respondents.

2.3.1 Gender

British Columbia population statistics indicated that number of males per 100 females in this province was 98.4 in 2008 (BC STATS, 2009).

2.3.2 Age

The median age of the residents was 40.5 yrs. in BC in 2008 (BC STATS, 2009). The population distribution in BC calculated for the residents 20 yrs. or older (Fig. 2.18).

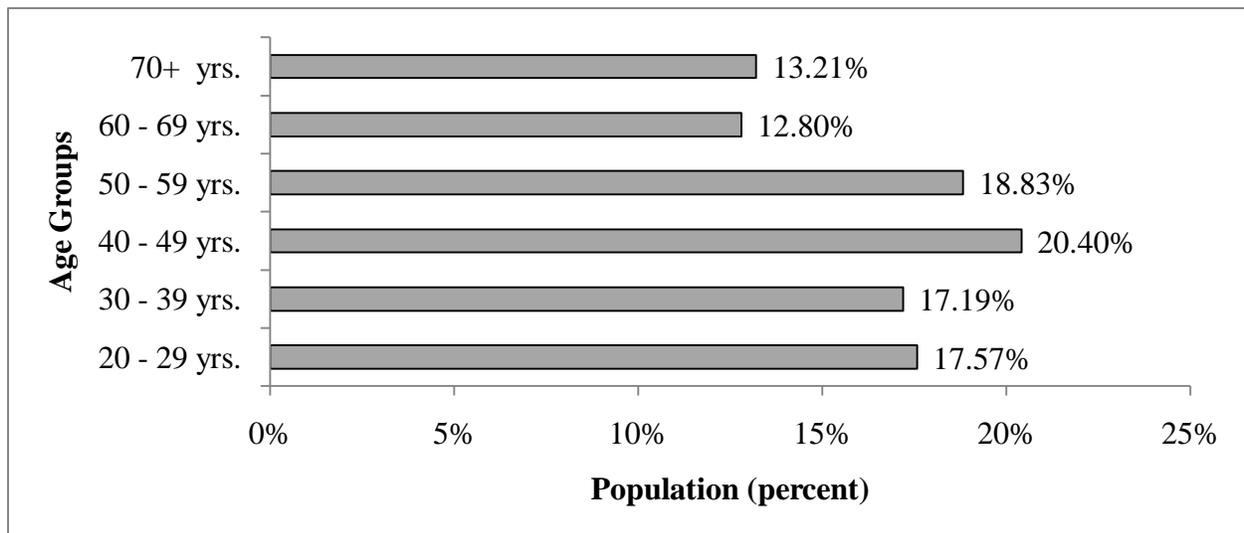


Figure 2.18 Calculated population distribution in BC for residents 20 yrs. or older according to 2006 census statistics (BC STATS, 2009).

2.3.3 Household size

The average household size in Canada and BC was 2.5 according to the 2006 census (Statistics Canada, 2008). Families with household size of three or more persons comprised 38% of BC population according to 2006 census statistics (Fig. 2.19).

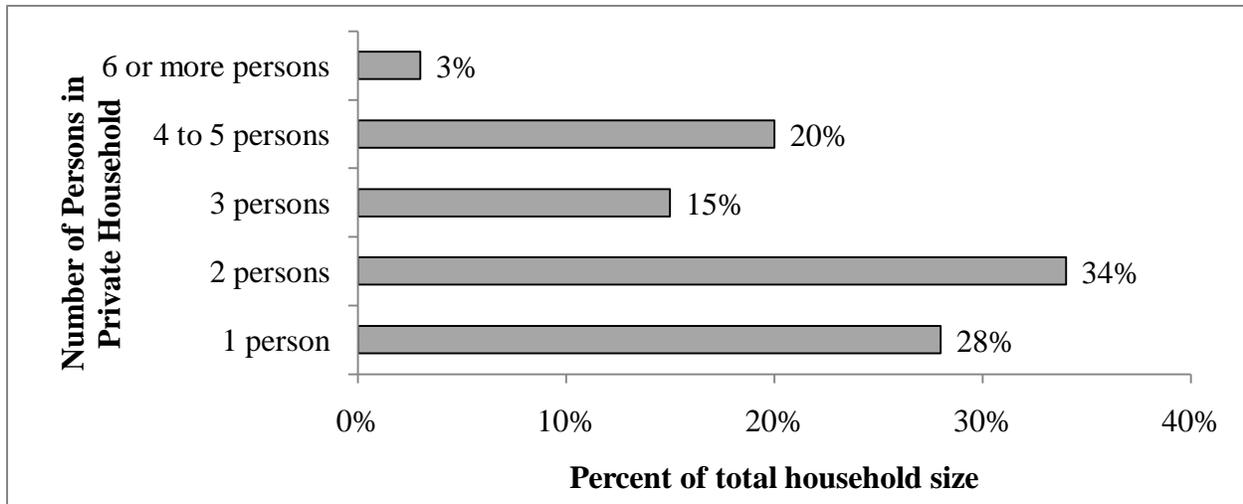


Figure 2.19 Number of persons in private households in BC according to 2006 census data (Statistics Canada, 2009a).

2.3.4 Education

27.1% of BC population had some university education or higher degrees (Fig. 2.20).

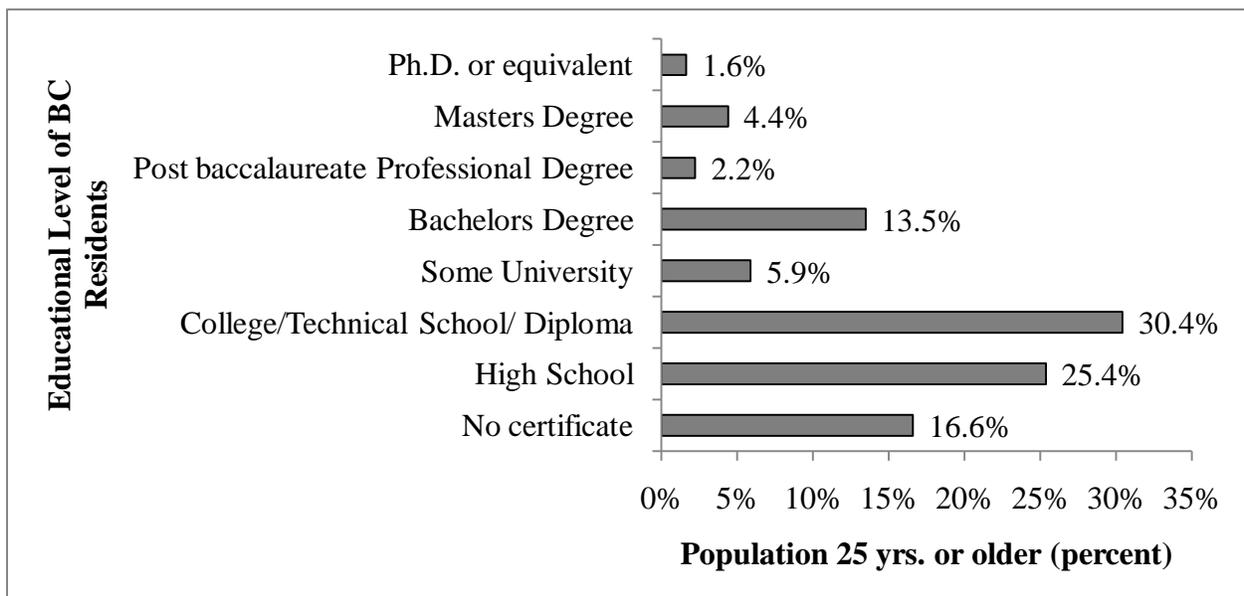


Figure 2.20 Calculated educational levels of BC residents 25 yrs. or older according to 2006 census data (Statistics Canada, 2009a).

2.3.5 Total household income

29% of BC households had more than \$80,000 annual income in 2005 (Fig. 2.21).

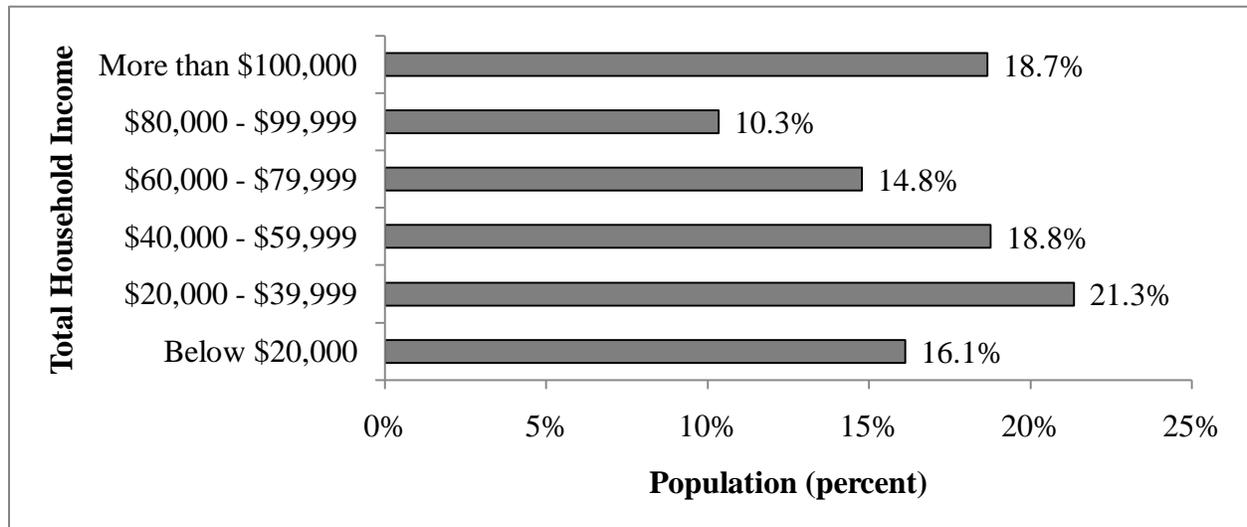


Figure 2.21 Calculated household annual income distribution of private households in BC 2005 (Statistics Canada, 2009a).

2.4 Survey methods

Different primary research methods were investigated and their pros and cons were considered to select an appropriate method for this research. The following research about market analysis of animal products was conducted via different survey methods:

Value Chain Management Centre (2009) studied meat consumption in Canada by using an online survey method. Vukasoviča (2009) used the personal interview method to gather information about consumer perceptions of poultry meat in Slovenia. Bernard et al. (2005) did a consumer attitude research via mail survey. Goddard et al. (2007) used grocery store interviews and online surveys to do market research about specialty eggs in Alberta.

The advantages and disadvantages of different survey methods are defined according to Zikmund (2003).

2.4.1 Door-to-door personal interview

Since the interviewer is able to describe the questions to respondents, the respondents' misunderstanding and their anonymity will be low. The influence of the interviewer could be high in this method. The questionnaire could be long and versatile. Respondents' cooperation is very good and most of the questions will be answered because of the presence of the interviewer. Data could be collected from a limited area with moderate speed of data collection. This method has the highest cost among survey methods.

2.4.2 Mall intercept personal interview

The interviewer can explain and clarify the questions if the respondents do not understand a question; therefore the misinterpretation of the respondents and their anonymity will be low. The influence of the interviewer could be high in this method. The questionnaire could be moderate in length and extremely versatile. Respondents' cooperation is moderate to low. Mall intercept interview could only be conducted in urban area therefore there is a bias because of eliminating the residents of the rural areas from data collection process. The speed of data collection is fast and the cost is moderate to high for this method.

2.4.3 Telephone interview

The respondents' cooperation is good and their misunderstanding level in this method is average. The degree of influence of the interviewer is moderate. The anonymity of the respondents is moderate. The questionnaire could be moderate in length and versatility. Respondents' cooperation is moderate. Telephone interview could be conducted very quickly and in a broad area. The supervision of the interviewers is high and the follow-up is fast and easy. The cost of this method is low to moderate.

2.4.4 Mail survey

Respondents' cooperation in a mail survey depends on the design quality of the questionnaire. The questionnaire should be in the standardized format and highly focused. The length of the questionnaire depends on the incentives of the survey. Data could be collected from a broad area but the speed of data collection is low and the interviewers do not have any control on the return of the mail survey. Respondents will leave blank the questions that they do not want to answer or they do not understand. The influence of the interviewer is low because s/he is not there. The follow-up is easy but it takes time.

2.4.5 Internet survey

The data collection speed is very fast and the data could be gathered immediately from a very broad area (worldwide). The questionnaire could be extremely versatile. Respondents' cooperation depends on the design of the questionnaire, the software and incentive of the survey.

The interviewer could make some questions mandatory and the software will not allow the respondents to leave those questions blank; therefore the non-response rate for questions will be low with special software. The questionnaire could be interactive and the respondents will receive the questions based on their responses to the previous questions.

The absence of the interviewer eliminates the interviewer influence bias but it could increase the misunderstanding of the respondents for some questions which need more explanation. Follow-up will be easy if the email addresses of the respondents are accessible but otherwise it will be difficult.

2.5 Summary

The retail sale market track data showed that there is a new trend in table egg market in Canada. The egg market transferred from an undifferentiated market to a differentiated one and the retail sale growth rates of specialty eggs was higher than retail sale growth rate of regular eggs. The total table egg retail sale has increased since 2002 (available data) and higher growth rate of specialty eggs seems the main reason for market growth rate of total table eggs.

BC has a greater specialty egg market than Canadian average, whereas there was no published data about the consumers' attitudes and preferences toward specialty eggs in BC. A market research was therefore necessary to investigate the prevalence of purchase/consumption of different types of eggs in BC, to examine the reasons for selecting a special type of egg and to identify the socio-demographics characteristics of purchasers of each egg type.

The data about the socio-demographic characteristics of BC residents was used to investigate the representativeness of my survey sample compared to BC population. The results of the other egg consumer surveys in Canada were used to compare the results of my survey to investigate the change in the market of specialty eggs. Information about different types of survey methods made it possible to compare the survey methods and select the best method for my research.

2.6 References

AGRI-FOOD TRADE SERVICE (2008) Retail sales in Canadian grocery stores, consumer spending for the 52 weeks. *Agriculture and Agri-Food Canada*,

<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170951696766&lang=eng>

BABCOCK, B.A., MIRANOWSKI, J. and CARBONE, R. (2002) An initial analysis of adoption of animal welfare guidelines on the U.S. egg industry. Briefing Paper, Food and Agricultural Policy Research Institute (FAPRI), Staff Reports, *Center for Agricultural and Rural Development, Iowa State University*, **02-BP 37** <http://purl.umn.edu/32047>

BC EGG MARKETING BOARD (2008) General FAQs, simply like eggs. Retrieved 09/28, 2009 from <http://www.bcegg.com/files/faq-general.php>

BC STATS (2009) British Columbia populations projections 2009 to 2036. *BCStats*, **Table 1** http://www.bcstats.gov.bc.ca/DATA/pop/pop/project/BCtab_Proj0901.pdf

BERNARD, J.C., PAN, X. and SIROLI, R. (2005) Consumer attitudes toward genetic modification and other possible production attributes for chicken. *Journal of Food Distribution Research* **36(2)** 1-11

BRITISH COLUMBIA EGG MARKETING BOARD (2006) B.C. Egg Marketing Board Standing Order.1 and 2. Retrieved August/26, 2009 from http://www.bcegg.com/pdf/BCEMBISO_Section1.pdf and http://www.bcegg.com/pdf/BCEMBISO_Section2.pdf

BRITISH COLUMBIA EGG MARKETING BOARD (2008) Egg industry in British Columbia. Retrieved August/21, 2009 from <http://www.bcegg.com/files/egg-industry.php>

BROOMHALL, J. (2008). *MarketTrack overview*. Canada, *The Nielsen Company*, Personal communication, *received at November 2008*.

- CANADIAN FOOD INSPECTION AGENCY.** (2009) Canadian Food Inspection Agency.
Canadian Food Inspection Agency, Retrieved 11/18, 2009
from <http://www.inspection.gc.ca/english/fssa/labeti/allerg/eggoeue.shtml>.
- CHERIAN, G., HOLSONBAKE, T.B. and GOEGER, M.P.** (2002) Fatty acid composition and egg components of specialty eggs. *Poultry Science* **81(1)** 30-33
- CLARK, E.** (2008) Value-added commands larger presence and premiums in market.
WattAgNet News. Retrieved Sep/24, 2009
from <http://www.wattpoultry.com/EggIndustry/Article.aspx?id=18434>
- EGG FARMERS OF CANADA** (2007) Nutrition labelling regulation (an overview of how they apply to eggs). *Egg Farmers of Canada, Health Canada, eggs.ca*,
<http://www.eggs.ca/Files/Resource/NutritionalLabellingRegulationsforEggs.pdf>
- EGG FARMERS OF CANADA** (2008a) Eggs...so many choices. *Egg Farmers of Canada (CEMA)*, Retrieved 12/01, 2008 from <http://eggs.ca/Resources/pdf/en/egg-choices-e.pdf>
- EGG FARMERS OF CANADA** (2008b) Annual Report 2008. *Egg Farmers of Canada*,
http://www.eggs.ca/Files/Resource/1527E_EggFarmersofCanadaAnnualReport2008.pdf
- FEARNE, A. and LAVELLE, D.** (1996) Segmenting the UK egg market: results of a survey of consumer attitudes and perceptions. *British Food Journal* **98(1)** 7-12
- GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A.**
(2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (07-03)
published by *Department of Rural Economy, University of Alberta*
<http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>
- GODDARD, E., HAILU, G., EMUNU, J., DOLL, G., HILL, A., FERENGE, S. and SCHULTZ, T.** (2005) Egg demand in Canada. *Presented for the Coop Symposium, Canada*. 1-32
http://www.coop.re.ualberta.ca/symposium_2005/Presentations/egoddard2.pdf

- HAILU, G. and GODDARD, E.** (2004) Nutrition and health: structural analysis of egg consumption in Canada. Annual meeting (1-4 August 2004), *American Agricultural Economics Association, Denver, CO, USA*. 1-26 <http://purl.umn.edu/19968>
- JACOB, J. and MILES, R.** (2008) Designer and specialty eggs., *Technical Report PS-51 University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS)* <http://edis.ifas.ufl.edu/PS048>
- KARIPIDIS, P., TSAKIRIDOU, E., TABAKIS, N. and MATTAS, K.** (2005) Hedonic analysis of retail egg prices. *Journal of Food Distribution Research* **36(3)** 68-73
- KENNEDY, A.** (2000) Producer's perspective on egg consumption: how does the market react? In: SIM, J.S., NAKAI, S. & GUENTER, W. (ed.) *Egg Nutrition and Biotechnology*, 113-118 (Wallingford, CABI Publishing).
- LEWIS, N.M., SEBURG, S. and FLANAGAN, N.L.** (2000) Enriched eggs as a source of N-3 polyunsaturated fatty acids for humans. *Poultry Science* **79(7)** 971-974
- PRINT MEASUREMENT BUREAU** (2008) Kinds of eggs used in the household in past 30 days. *Print Measurement Bureau, PMB, Table 27*, Restricted data, http://www.pmb.ca/public/e/product_data/reports_online_gateway.shtml;
- SIM, J.S. and SUNWOO, H.H.** (2000) Designer eggs: nutritional and functional significance. Proceedings of the 2000 Poultry Symposium and Egg Processing Workshop, *UC Davis, University of California*. <http://animalscience.ucdavis.edu/Avian/sim.pdf>
- STATISTICS CANADA** (2008) Average household size for Canada, provinces and territories, 2006, 2001 and 1996 censuses. *Statistics Canada*, Restricted data, http://www12.statcan.ca/english/census06/data/trends/Table_2.cfm?TOPIC_ID=400&LINE_ID=407&T=PR&start=1&topicsub=Submit
- STATISTICS CANADA** (2009a) 2006 Census of population (provinces, Census divisions, municipalities). *E-STAT*, Restricted data, <http://estat.statcan.gc.ca/cgi-win/cnsmcgi.pgm>

STATISTICS CANADA (2009b) Average retail prices for food and other selected items, monthly (dollars). *E-STAT, CANSIM, Table 326-0012*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

STATISTICS CANADA (2009c) Farm cash receipts (dollars). *E-STAT, CANSIM, Table 002-0001*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

STATISTICS CANADA (2009d) Food available by major groups in Canada, annual 1960 to 2008, eggs (dozens per year). *E-STAT, CANSIM, Table 002-0019*, Restricted data, <http://estat.statcan.ca/cgi-win/CNSMCGLEXE>

STATISTICS CANADA (2009e) Poultry and egg statistics. *Statistics Canada, Agriculture Division, Livestock Section, Catalogue no. 23-015-X*, Restricted data.

STATISTICS CANADA (2009f) Production and disposition of eggs, monthly (layers unless otherwise noted). *E-STAT, CANSIM, Table 003-0022*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

STATISTICS CANADA (2009g) Report of processed eggs production in Canada, annual (kilograms). *E-STAT, CANSIM, Table 003-0079*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

STATISTICS CANADA (2009h) Farm product price index (FPPI), annual (index, 1997=100). *E-STAT, CANSIM, Table 002-0022*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

THE NIELSEN COMPANY (2007) Retail sales in Canadian grocery stores. *Agriculture and Agri-Food Canada*, <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170860293780&lang=eng>

THE NIELSEN COMPANY (2008) MarketTrack data received from *The Nielsen Company, Canada*, received at October 2008. Restricted data.

UNITED EGG PRODUCERS (2009) Egg industry fact sheet. Retrieved 05, 2009 from http://www.unitedegg.org/useggindustry_generalstats.aspx

USDA, WORLD AGRICULTURAL OUTLOOK BOARD (2009) Eggs and egg products: Supply and disappearance and per capita disappearance. Retrieved 8/25, 2009 from <http://www.ers.usda.gov/publications/ldp/LDPTables.htm>

VALUE CHAIN MANAGEMENT CENTRE (2009) Consumer Data for Farmers & the agri-food industry, Condensed Chicken Report on National Purchasing Panel Data. *George Morris Centre*, Retrieved 10/01, 2009 from <http://www.vcmtools.ca/pdf/Chicken%20report%20final.pdf>

VUKASOVIČA, T. (2009) Consumer perception of poultry meat and the importance of country of origin in a purchase making process. *World's Poultry Science Journal* **65(Mar)** 65-65-74

WINHORST, H.W. (2008) A projection of the regional development of egg production until 2015. *World's Poultry Science Journal* **64(September)** 356-376

ZIKMUND, W.G. (2003) Advantages and disadvantages of typical survey methods. In: (edition 8) *Exploring Marketing Research*, 240, (Thomson, South-Western).

3 ATTITUDES AND PREFERENCES OF CONSUMERS TOWARD DIFFERENT TYPES OF TABLE EGGS AVAILABLE IN BRITISH COLUMBIA, CANADA¹

3.1 Introduction

In Canada, *per capita* egg availability (before adjustment for losses) declined from 22.97 dozen in 1960 to 14.42 dozen in 1995. Since then the availability has been stable or slowly increasing and it was 14.60 dozen per person in 2008 (Statistics Canada, 2009c). Because in Canada poultry and egg production is regulated by the quota system, availability directly reflects consumption. Consumption of eggs declined because of consumer lifestyle changes and increased concern about dietary cholesterol and heart disease (Kennedy, 2000). It was also because of the increased availability of novel and ready-to-eat foods, particularly for higher income families (Fearne & Lavelle, 1996a). Table egg demand increased during the mid 1990's because of the popularization of the Atkins diet and because of the availability of specialty eggs (Hailu & Goddard, 2004).

As a result, the egg market in Canada transformed from an undifferentiated market to a differentiated one during the last decade. Yet, most of the published statistics have considered table eggs as an undifferentiated product. According to market track data provided by AC Nielsen, the retail sale of specialty eggs has increased more than white regular eggs since 2002. The retail sale (in unit value) of specialty eggs in the province of British Columbia (BC) was greater than the average in Canada (16.6% vs. 13.1% respectively) in the 52-weeks ending August 2008 (The Nielsen Company, 2008). While specialty eggs have a growing niche market

¹ A version of this chapter will be submitted for publication. Bejaei, M., Cheng, K.M. and Wiseman, K. Attitudes and Preferences of Consumers toward Different Types of Table Eggs Available in British Columbia, Canada.

in Canada, few studies have been done on consumers' attitudes and preferences toward specialty eggs.

Regular chicken eggs refer to two types of eggs: white regular and brown regular eggs that are produced from white and brown feathered hens kept in cages. Four types of specialty eggs refer to: free-run eggs (from hens kept in indoor floor pens), free-range eggs (from hens that have access to outdoor spaces), organic eggs (from hens that are fed a diet of certified organic grains and raised under the guidelines issued by certifying agencies), and nutrient enhanced eggs (from hens that are fed a nutritionally-enhanced diet containing higher levels of certain nutrients such as omega-3 polyunsaturated fatty acids, vitamins or minerals).

The purpose of our research was to determine the consumers' attitudes, preferences and socio-demographic characteristics regarding the consumption of table eggs. The results will facilitate the production and market planning process of the egg industry and enable them to develop a proper strategy to deal with the differentiated egg market in BC.

3.2 Materials and Methods

An online survey (Zikmund, 2003) was selected as the primary survey method to facilitate the interactive nature of the questionnaire (see Appendix II for more information on methodology of the research). Questions the respondents received may be dependent on the type of response they gave to the previous question (see Fig. 3.1).

The questionnaire was designed according to Dillman's (2007) guidelines and a pre-test was conducted with university students to refine the protocol. An invitation email was sent to randomly selected e-mail addresses and receivers were asked to click on the start survey link if

they were BC residents 19 years old or older (see Appendix III for invitation email and Appendix IV for questionnaire). Confidentiality of the respondents was guaranteed and the research was conducted according to the University of British Columbia Behavioural Research Ethics Board regulations (see Appendix V). The survey was launched in June 2009 and opened for 20 days.

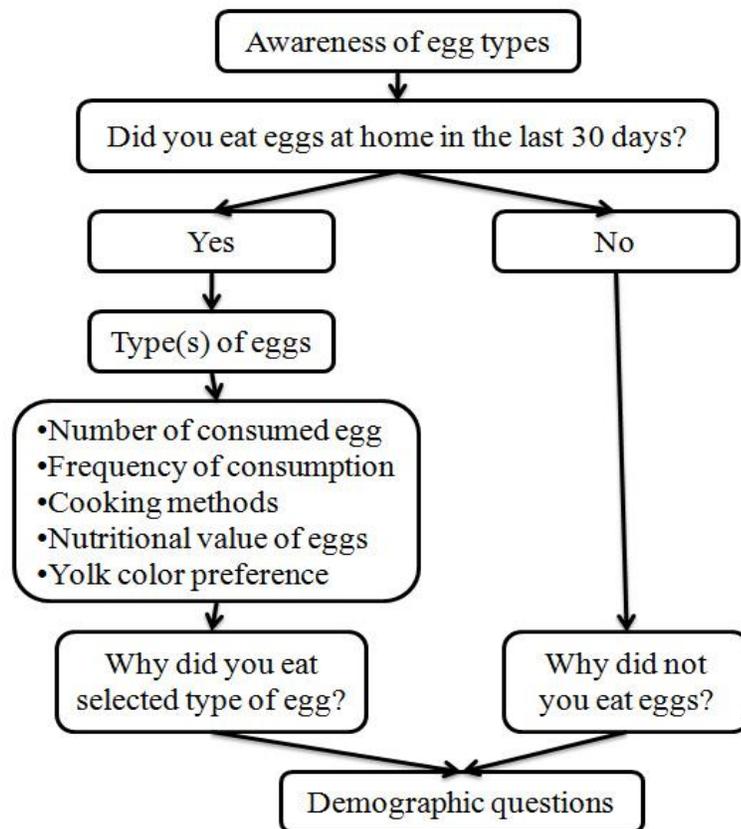


Figure 3.1 Outline of the survey questionnaire. The full survey questionnaire is available at <https://circle.ubc.ca/>.

PASW Statistics 17 (SPSS) software was used to analyze the survey data. Significance level for all assumptions was set as $P < .05$. According to the scale of measurement for each question and the assumptions of statistical tests, following tests were applied to the responses:

ANOVA (a parametric test of whether the means of more than two groups are equal), Point-biserial correlation (to measure the strength of the relationship between two variables when one of variables is a dichotomous variable), Pearson's correlation coefficient (to measure the strength of the relationship between two variables that data are interval or ratio level), Chi-square test (whether two categorical variables within a contingency table are associated), Wilcoxon Signed-rank test (a non-parametric test that looks for difference between two related samples or repeated measure on a single sample), Kruskal-Wallis test (a non-parametric test that looks for difference among more than two independent groups), Friedman's ANOVA (a non-parametric test that looks for difference among more than two related groups), Bonferroni correction (to control Type I error rate when there are multiple significance tests), Hochberg's GT2 post hoc test (is used when the sample size is different in a parametric test but the population has a homogenous variance), Game-Howell post hoc test (is used when we are not sure about the homogeneity of the variance of the population) (Field, 2005).

3.3 Results

3.3.1 Survey sample size

Out of the 1027 invitation e-mails that were sent out, 813 (79.2%) responded, and 702 respondents (68.36%) completed and returned the survey questionnaire.

3.3.2 Socio-demographic characteristics and their influences on egg type selection

3.3.2.1 Sex

Males represented 43.9% of the respondents and they consumed more brown regular eggs than female respondents (Point-biserial Correlation, $r_{pb}=-.08$, $p<.05$). British Columbia population statistics indicated that ratio of the population of male to the population female in this province was 98.4 in 2008 (BC STATS, 2009).

3.3.2.2 Age

The research was designed for respondents who are 19 years old or older (See Table 3.1). Older consumers consumed more brown regular eggs (Pearson Correlation, $r_s=.09$, $p<.05$) than younger consumers.

The majority of the participants (81.2%) were in the 40 to 69 year-olds age categories and the proportion of participants in these age groups was more than the average of the British Columbia population (older than 18) in the same age groups (53%) in 2008 (BC STATS, 2009). The percentage of the population in the age categories of 19 to 39 years old (16.2%) and 70 years old or older (2.7%) were less than the BC population statistics for these age categories of 19 to 39 years old (34.76%) and 70 years old or more (13.2%) (BC STATS, 2009).

3.3.2.3 Size of household

The average family size for the respondents of this research was 2.61 ± 0.1 . This value is very close to BC household size which was 2.5 in Census 2006 (Statistics Canada, 2008a).

Respondents from bigger households consumed more white regular eggs ($r_s=.12$, $P<.01$) than those from smaller households. Respondents from households with a teenage family member (age of 15-19 year-olds) consumed significantly less ($r_{pb}=-.08$, $p<.05$) organic eggs than those with no teenage members. Consumption of free-range eggs was significantly higher for those respondents who had a family member at the age of 60 years old or older ($r_{pb}=.08$; $P<.05$) but it was significantly less for those who had family members between 40-59 years old ($r_{pb}=-.08$; $P<.05$).

Table 3.1 Socio-demographic characteristics of the survey respondents:

Socio-demographic characteristics	Categories	Distribution in sample (%)
Age of participants	20-29 yrs. old	3.6
	30-39 yrs. old	12.6
	40-49 yrs. old	27.5
	50-59 yrs. old	36.9
	60-69 yrs. old	16.7
	70+ yrs. old	2.7
Household size	One person	21.1
	Two persons	34.8
	Three persons	19.1
	Four persons	16.3
	Five persons or more	8.7
Educational level	High School	10.3
	College/Technical School/ Diploma	19.0
	Some University	10.4
	Bachelors and post Bachelor degree	27.1
	Masters degree	17.8
	Ph.D. or equivalent	15.4
Annual household income	Below \$40,000	9.4
	\$40,000 - \$59,999	16.1
	\$60,000 - \$79,999	15.8
	\$80,000 - \$99,999	19.1
	More than \$100,000	39.7
Community size	Rural area or small town	14
	Medium sized town in rural area	6.9
	Suburban area surrounding cities	19.9
	Medium sized city	18.7
	Large sized city	40.6

3.3.2.4 Size of community

Respondents were asked about their community size. Six types of communities (Table 3.1) were provided for the respondents to choose. Results showed that the participants of the survey came from various types of communities in BC.

In 2006 (Statistics Canada, 2009d), 85% of British Columbia residents were living in urban areas and 15% in rural areas. The distribution of the survey respondents in urban and rural areas was reflective of the BC population distribution. Respondents from larger communities consumed significantly less brown eggs ($r_s = -.08$, $p < .05$) than those from smaller communities.

3.3.2.5 Total annual household income level – (See Table 3.1)

More respondents in this survey came from households with higher income than the average reported by Statistics Canada for BC residents in 2005. The income level of BC residents in 2009 has not been published yet, though it is anticipated to be higher than in 2005 because the price index (CPI) increased during four years from 106.7 in May 2005 to 114.7 in May 2009 (2002=100) (Statistics Canada, 2009b).

Higher income respondents consumed less white regular eggs ($r_s = -.14$, $p < .05$) but more free-range eggs ($r_s = .11$, $p < .05$) than lower income respondents.

3.3.2.6 Educational level – (See Table 3.1)

Participants in this survey were more educated than the average for adult BC residents (Statistics Canada, 2009a). As the educational level of the respondents increased, their

consumption of white regular eggs significantly decreased ($r_s=-.22$, $p<.05$) and the consumption of free-run ($r_s=.09$, $p<.05$), free-range ($r_s=.16$, $p<.05$) and organic eggs ($r_s=.12$, $p<.05$) significantly increased.

3.3.2.7 Correlation of demographic characteristics - (See Table 3.2)

Male respondents had a significantly ($P<.01$) higher educational level ($r_{pb}=.19$), were significantly ($P<.01$) older ($r_{pb}=.12$) and had significantly ($P<.01$) higher annual total household income ($r_{pb}=.19$) than female respondents. Respondents from larger communities had a significantly ($P<.01$) higher educational level ($r_s=.26$) and income ($r_s=.14$) than those from smaller communities. Higher income respondents had significantly ($P<.01$) higher educational levels ($r_s=.4$) than lower income respondents.

Table 3.2 Correlation of demographic characteristics

	Sex of respondent ¹	Age of respondent	Household size	Size of community	Income of household	Education of respondent
Sex of respondent	1					
Age of respondent	.12**	1				
Household size	.06	-.15**	1			
Size of community	.03	-.11*	-.05	1		
Household income	.19**	.07	.22**	.14**	1	
Education of respondent	.19**	.08*	-.02	.26**	.40**	1

¹Females participated more than males in our survey, therefore they considered they coded as 0 and male were coded as 1.

Significance levels: * $p<.05$ and ** $p<.01$

3.3.3 Table egg consumption

Results indicated that the majority of the respondents (94.4%) consumed eggs at home in the last 30 days.

3.3.3.1 Preferences

Since there was an upward bias in the educational level of the participants of this survey, adjustment of the frequency data with relationship to this factor was necessary. According to the results of our survey there was a high correlation between educational level and income of the respondents. Therefore adjustment for educational level would adjust the results for both factors. Data were weighted (post-stratification weight is used to compensate the influence of over-representativeness or under-representativeness of respondents in these characteristics in the survey; Johnson, 2008) for the respondents' educational level and the educational level of the BC population (Statistics Canada, 2009a) to generalize the results of the survey to BC population. Frequency distribution was calculated for each egg type after weighting the data for education (Table 3.3). Respondents were allowed to select as many types of eggs as they have consumed at home in the last 30 days.

The consumers of white regular eggs are likely to also consume brown regular eggs ($r_s=.13$, $p<.01$), but less likely to consume free-range ($r_s=-.37$, $p<.01$), organic ($r_s=-.13$, $p<.01$) and nutrient enhanced eggs ($r_s=-.12$, $p<.01$). The respondents who consumed more brown regular eggs are less likely to like organic eggs ($r_s=-.12$, $p<.01$). Consumers of free-run eggs are likely to also consume free-range ($r_s=.09$, $p<.05$) and organic eggs ($r_s=.12$, $p<.01$) but less likely to consume nutrient enhanced eggs ($r_s=-.11$, $p<.01$). The consumption of free-range eggs was

positively correlated to the consumption of organic eggs ($r_s=.25$, $p<.01$) but negatively correlated to the consumption of nutrient enhanced eggs ($r_s=-.11$, $p<.01$). Organic egg consumers are less likely to also consume nutrient enhanced eggs ($r_s=-.09$, $p<.05$).

Table 3.3 Frequency of selection of each type of eggs and the mean consumption of eggs by respondents who selected a special type of egg

Types of eggs	% Preference ¹	Consumption ²
		Mean \pm 95% Confidence Interval
White regular	55.1 a	9.83 \pm 0.88 a
Free-range	32.9 b	9.56 \pm 0.94 ab
Brown regular	23.2 c	7.39 \pm 0.86 b
Nutrient enhanced	22.4 c	8.55 \pm 0.92 ab
Organic	11.9 d	8.46 \pm 0.97 ab
Free-run	7.6 e	8.24 \pm 1.52 ab

¹ Percent of respondents who consumed that type of egg at home in the last 30 days; percent followed by different letters are significantly different by Wilcoxon Signed Ranks test at $p<.0033$ (Bonferroni correction).

² “Mean \pm 95% Confidence Interval”; Number of eggs consumed at home in the last 30 days by the respondents who selected that type of eggs. One-way ANOVA was used and mean followed by different letters are significantly ($P<.05$) different by the Hochberg’s GT2 post hoc tests.

3.3.3.2 Frequency of egg consumption

The results of the one-way ANOVA test indicated that consumers of white regular eggs consumed significantly ($F_{(5,1095)} = 2.930$, $P<.05$, Table 3.3) more eggs than consumers of brown regular eggs but there was no difference among consumers of other types of eggs. Also, results of the Kruskal-Wallis test indicated that there was not a significant difference between the

frequencies of consumption for the consumers of different types of eggs (Mdn = 2) (Also see Table 3.4).

Table 3.4 Distribution of frequency of consumption of table eggs

Consumption	Special occasion	1 – 2 times/week	3 – 5 times/week	6 or more times/ week
Proportion (%)*	14.7	63.5	17.3	4.7

* Percent of respondents who consumed eggs in the last 30 days

3.3.4 Factors affecting consumption of table eggs

3.3.4.1 Methods of preparation – (Table 3.5)

Results of Chi-Square tests indicated that there were no significant relationship between a preparation method and the type of eggs that consumers consumed.

Table 3.5 Distribution of frequency of preparation methods of table eggs

Cooking methods	Boil	fried	omelet	scramble	Mixed with other ingredients
Proportion (%)	20.7	16.1	17.3	18.3	10.1

3.3.4.2 Yolk color

A majority of the respondents (67.3%) indicated that they prefer darker yolk color, while 18.8% were not sure which yolk color they prefer and 13.9% did not like darker yolk color ($\chi^2(2)=345.95, p<.01$).

There was a significant relationship between the preference of darker yolk color and the type of eggs that consumers used. White regular egg consumers preferred lighter yolk color ($\chi^2(2)=41.19$, $p<.001$), but consumers of brown regular eggs preferred darker yolk color ($\chi^2(2)=9.53$, $p<.01$). The respondents who consumed free-range eggs preferred darker yolk color ($\chi^2(2)=35.78$, $p<.001$). Organic egg consumers did not like lighter yolk color ($\chi^2(2)=7.78$, $p<.05$).

The reasons given by respondents who preferred darker yolk color for their preference is shown in Table 3.6. Results of Friedman’s test indicated that there is a significant difference between the selected reasons for preference of darker yolk color ($\chi^2(7)=420.93$, $p<.01$).

Table 3.6 Reasons for preferring eggs with darker yolk

Why?	Better taste	Visual appeal	Hens better fed	better nutrition	Better health	More fresh	Local product	Better welfare
Proportion*	43.7 a	35.9 b	28.3 b	20.9 c	18.9 c	17.9 c	12.8 d	10.5 d

*Percent of respondents. Each respondent was allowed to select up to 4 options. The significance levels are determined by Wilcoxon Signed Ranks test at $p<.002$ (Bonferroni correction).

3.3.4.3 Familiarity with the product

Respondents were asked to rate their awareness about different types of eggs via a five point Likert scale (1=‘never heard of it’ to 5=‘know a lot about it’). The awareness of respondents of different types of eggs is shown in Table 3.7. Nutrient enhanced eggs divided into two groups in this question: omega-3 enhanced and vitamin enhanced eggs to assess the respondents’ awareness by more detail.

Respondents were significantly (Friedman; $\chi^2(6)=1781.49$, $P<.01$) more familiar with white regular eggs than other types of eggs. Consumers who were more familiar with specialty eggs consumed less white regular eggs and more free-range and organic eggs.

Table 3.7 Respondents' familiarity with different types of eggs

Types of eggs	White regular	Brown regular	Free-range	Organic	Free-run	Omega 3 enhanced	Vitamin enhanced
Familiarity*	4.32±0.06 a	4.23±0.06 b	3.99±0.07 c	3.65±0.08 d	3.47±0.1 e	3.47±0.09 e	2.1±0.1 f

* "Mean ± 95% Confidence Interval" in a five point Likert scale (1='never heard of it' to 5='know a lot about it'). Significance levels calculated via Wilcoxon Signed Ranks test at $p<.0024$ (Bonferroni correction).

3.3.4.4 Nutritional value

Consumers' opinions regarding the nutritional values of different kinds of eggs were assessed via a five point Likert scale question (1=very poor and 5=excellent). Respondents were asked to compare their selection with white regular eggs. Those who selected white regular eggs received only the white regular egg option. The nutritional values of the 6 types of eggs, as perceived by the consumers, were not the same (Kruskal-Wallis Test, $\chi^2(5)=322.48$, $p<.001$, Table 3.8).

Respondents ranked the nutritional value of white regular eggs significantly ($\chi^2(25)=406.17$; $P<.001$) lower than its expected value, and the nutritional values of free-run, free-range, organic and nutrient enhanced eggs higher than their expected values. As expected, respondents who ranked the nutritional value of white regular eggs as high consumed

significantly more white regular eggs ($r_s=.29$) but less free-run ($r_s=-.12$), free-range ($r_s=-.27$) and organic eggs ($r_s=-.19$) (all at $p<.01$).

Table 3.8 Respondents' perception about the nutritional values of different types of eggs (five point Likert scale; 1=very poor and 5=excellent)

Types of eggs	Median	Mean \pm 95% Confidence Interval
Nutrient enhanced eggs	5	4.49 \pm 0.09 a
Organic eggs	5	4.47 \pm 0.12 a
Free-range eggs	4	4.37 \pm 0.08 a
Free-run eggs	4	4.23 \pm 0.15 a
Brown regular eggs	4	3.89 \pm 0.13 b
White regular eggs	3	3.36 \pm 0.08 c

Means followed by different letters are significantly different by the Games-Howell post hoc test at $p<.05$.

3.3.4.5 Reasons for making selection

Respondents were asked the reasons why they selected a particular type of egg for consumption. For example if a respondent indicated that he/she ate brown regular eggs at home in the last 30 days, he/she was asked to identify his/her reasons (up to four reasons) for his/her selection (Table 3.9).

Table 3.9 Frequency (%) of factors that egg users considered important for selecting a special type of egg (they were able to select 4 options).

Proportion (%)	Taste	Healthy choice	Animal Welfare	Environmental concerns	Price	Ease of preparation	Nutritional Value
White regular	53.7	40.9	22.6	14.3	80.8	18.6	38.4
Brown regular	63.7	49.4	31.0	20.2	69.0	15.5	49.4
Free-run	74.6	62.0	71.8	32.4	28.2	4.2	57.7
Free-range	66.3	62.8	76.8	44.6	28.4	2.8	53.7
Organic	65.1	68.3	78.6	52.4	21.4	0.8	59.5
Nutrient enhanced	60.7	75.0	31.0	17.3	48.2	7.1	71.4

Respondents selected white regular eggs mostly ($\chi^2(25)=464.39$, $p<.001$) because of their lower price. They selected brown regular eggs both because of lower price and taste. Nutrient enhanced eggs were chosen because of their nutritional value and were considered a healthy choice. Free-range, free-run and organic eggs were chosen because of better animal welfare, better taste, and a healthy choice.

3.3.5 Non-consumers

The respondents who did not eat eggs at home in the last 30 days (5.6% of respondents) were asked about their reasons for not eating eggs at home. Their selected reasons were the taste of eggs (31%), health concerns (26%), having eggs at the restaurant (21%), animal welfare concerns (18%), environmental concerns (8%) and allergy towards egg (8%).

3.4 Discussion

Our on-line survey netted 702 usable responses. This sample size is considered adequate to provide trustworthy information (Zikmund, 2003). While with most on-line survey there is an inborn bias of respondents being younger and more educated with higher income, this bias is becoming much lower in magnitude with the popularization of electronic and digital communication devices (Statistics Canada, 2007; 2008b; 2008c). Furthermore, our data have been adjusted to minimize this kind of bias.

Our most important finding with this survey was that consumers' preference for free-range and organic eggs was much higher than previous surveys had indicated. In the PMB 2007 BC survey (Print Measurement Bureau, 2008), less than 8% of respondents used free-range, free-run and organic eggs combined, but our survey indicated 32.9% of respondents consumed free-range eggs and 11.9% consumed organic eggs. This could be due to the different ways of conducting the survey but it is more likely that during the two years between the surveys, there has been a significant increase in the consumers' awareness and concern about animal welfare, environmental and health issues. For example, two billion free-range eggs were sold in UK in the 52 weeks ending 6 September 09 (40% of total UK retail egg sale) and it showed a 25% increase since 2006 (British Lion Eggs, 2009); chain restaurants such as Unilever and McDonalds changed their purchase of regular eggs (from caged hens) to "cage-free" eggs in some branches because of consumers' demand for products produced via higher animal welfare standards (WorldPoultry.net, 2008). Our contention can also be supported by our survey findings that:

Respondents with higher educational levels consumed more free-run, free-range and organic eggs. Higher income respondents also consumed more free-range eggs than lower income respondents. It has been well established that as the education and income levels of the

consumers increase, their knowledge about nutrition becomes more sophisticated, and their food preferences also change accordingly (Drewnowski & Hann, 1999).

In the 52-weeks ending August 2006, the average cost of a dozen free-range and organic eggs in BC was \$4.09 and \$4.94, respectively. In 52-weeks ending August 2008, the average cost was \$4.45 and \$5.22, respectively (The Nielsen Company, 2008). Also an observation from four retail stores in Vancouver for the purpose of our research indicated that the average cost of free-range and organic eggs was \$5.19 and \$5.06 in April 2009, respectively. The cost of these eggs has not decreased but the consumption has increased drastically because price is not the main factor for the selection of free-range and organic eggs and the consumers of these eggs are more concerned about bird welfare.

In spite of the higher cost of free-range and organic eggs, AC Nielsen retail sales data (2008) indicated that BC customers purchased more specialty eggs than the Canadian average and the rate for specialty eggs consumption was growing faster than for white regular eggs. Also PMB data (2008) indicated that BC consumption of specialty eggs was higher than the Canadian average.

Consumers of free-run eggs were likely to also consume free-range ($r_s=.09$) and organic eggs ($r_s=.12$) and the consumption of free-range eggs was positively correlated to the consumption of organic eggs ($r_s=.25$). This is because they all have the same priority (animal welfare standards and environmental concerns) for their selection.

Our survey also brought out several issues:

Perception and preferences: Consumers' misconceptions influenced the egg types that they selected. Most consumers believe that free-run, free-range and organic eggs have higher

nutritional value than regular eggs. This may be a consumers' misconception because there has been no evidence that cage-free eggs have different nutritional value from regular eggs (Goddard et al., 2007; Egg Farmers of Canada, 2008). This perception influenced the consumption of different types of eggs. Consumers who rated the nutritional value of white regular eggs as high (score 4 or 5 in a five point Likert scale) consumed more white regular eggs and less free-run, free-range and organic eggs. The result demonstrates that it is necessary to educate consumers about the nutritional value of eggs to help them to make an educated choice.

According to consumers' opinion brown regular eggs have higher nutritional value than white regular eggs. However, there is no evidence that white and brown regular eggs have different nutritional value (Goddard et al., 2007; Egg Farmers of Canada, 2008).

Selling a new product to "old" purchasers is not as easy as selling an old product to "new" purchasers (Smith, 2001). Regular eggs have been in the market for decades and older people should be more interested in the purchase of these eggs. Since older people are more health conscious (Drewnowski & Hann, 1999) but with lower income, and they may not differentiate brown-shell eggs from organic or free-range eggs, they may prefer the brown regular eggs over the more expensive organic or free-range eggs. Egg producers should inform consumers about the similar characteristics of white and brown regular eggs.

Consumers indicated that darker yolk color results in better taste, whereas results of a blind taste test indicated that consumers were not able to distinguish any significant difference in the taste of eggs from different eggs and yolk colors (Fearne & Lavelle, 1996b).

Consumers indicated that brown regular and specialty eggs are tastier than white regular eggs. Fearne & Lavelle (1996b) reported that consumers considered eggs from free-run and free-

range eggs tastier than battery eggs when they had labels on their package but in a blind test consumers were not able to make a distinction between the tastes of different egg types. Therefore the labels are carriers of various marketing messages and indirectly they can stimulate the satisfaction of taste which is an incentive in egg consumption.

Familiarity with different types of eggs varied among the respondents, and familiarity may affect preference (Smith, 2000). For example a few respondents indicated that white eggs are “factory” eggs and brown eggs are more “natural” eggs even though these eggs are produced the same way. This result demonstrates again the importance to educate consumers about different egg types that resulted from different housing systems or variety in the feed ingredients for hens.

Costs: This is not a new issue. White eggs are still the cheapest eggs compared to the other types of eggs in the survey, and they were preferred by lower income, larger family size consumers. Brown eggs are the next cheapest and they were preferred by lower income, older people (same results from PMB, 2008). If organic and free-range eggs were cheaper, more regular egg consumers may shift to the consumption of free-range and organic eggs because the concern about the animal welfare issues is growing and the only barrier for some consumers in choosing these eggs is the price. Fearne & Lavelle (1996b) reported similar results. As well, Goddard et al. (2007) mentioned that price was the important factor in purchasing different types of eggs. If specialty egg producers want to corner a bigger share of the market, they will need to cut costs to make specialty eggs more affordable to the consumers.

3.5 Conclusion

In conclusion, the results of our research indicated major changes in consumers' attitudes and preferences since the PMB consumer survey in 2007. Almost a third of the consumers used free-range eggs at home in a month. Our findings that consumers' concern about nutrition and animal welfare standards is growing can be supported by the retail sales data (AC Nielsen) that the market growth of specialty eggs is faster than white regular eggs.

More consumers may use free-range or free-run eggs if the price of those eggs becomes less expensive (more competitive with regular eggs). Considering the growing market of free-range eggs it seems necessary to develop a research plan to investigate the sustainability of different production systems in the Canadian egg industry.

Future research is necessary to design an educational program to increase the consumers' awareness about different egg types, egg production systems and the nutritional value of eggs. Our results indicated that consumption of eggs will increase via increasing the awareness of consumers about eggs and the high nutritional value of eggs.

Our findings indicated consumers did not act according to the same priorities when they were selecting different types of eggs. Price was the main factor in selection of regular eggs; bird welfare, environmental concerns and having access to healthy food were main factors in the selection of free-run, free-range & organic eggs; and nutritional value and having access to healthy food were main factors in consumption of nutrient enhanced eggs. According to these results egg producers could design a marketing mix plan to develop their market share in the future. The availability of different egg types in the market also helps the consumers to access the high quality food products that they demand.

3.6 References

BC STATS (2009) British Columbia populations projections 2009 to 2036. *BCStats*, **Table 1**

http://www.bcstats.gov.bc.ca/DATA/pop/pop/project/BCtab_Proj0901.pdf

BRITISH LION EGGS (2009) Two billion free range eggs to be sold in 2009 (52 weeks ending 6 September 09). Retrieved 10/17, 2009

from http://www.britegg.co.uk/press_releases/view/131.

DREWNOWSKI, A. and HANN, C. (1999) Food preferences and reported frequencies of food consumption as predictors of current diet in young women. *The American Journal of Clinical Nutrition* **70(1)** 28-36

DUNCAN, I.J.H. (2001) The pros and cons of cages. *World's Poultry Science Journal*, **57**, 381-390.

EGG FARMERS OF CANADA (2008) Eggs...so many choices. *Egg Farmers of Canada (CEMA)*, Retrieved 12/01, 2008 from <http://eggs.ca/Resources/pdf/en/egg-choices-e.pdf>

FEARNE, A. and LAVELLE, D. (1996a) Segmenting the UK egg market: results of a survey of consumer attitudes and perceptions. *British Food Journal* **98(1)** 7-12

FEARNE, A. and LAVELLE, D. (1996b) Perceptions of food “quality” and the power of marketing communication: results of consumer research on a branded-egg concept. *Journal of Product & Brand Management* **5(2)** 29-42

FIELD, A. (2005) *Discovering statistics using SPSS*. (Second), (SAGE Publications, London).

GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A. (2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (**07-03**)

published by *Department of Rural Economy, University of Alberta*

<http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>

- HAILU, G. and GODDARD, E.** (2004) Nutrition and health: structural analysis of egg consumption in Canada. Annual meeting (1-4 August 2004), *American Agricultural Economics Association, Denver, CO, USA*. 1-26 <http://purl.umn.edu/19968>
- JOHNSON, D.R.** (2008) Using weights in the analysis of survey data, Department of Sociology, Population Research Institute, The Pennsylvania State University, *2008-2009 Demographics Methods Focus, Featured Speaker*, (November 2008). Retrieved 11/18 from <http://help.pop.psu.edu/help-by-statistical-method/weighting/Introduction%20to%20survey%20weights%20pri%20version.ppt/>
- KENNEDY, A.** (2000) Producer's perspective on egg consumption: how does the market react? In: SIM, J.S., NAKAI, S. & GUENTER, W. (ed.) *Egg Nutrition and Biotechnology*, 113-118 (Wallingford, CABI Publishing).
- PRINT MEASUREMENT BUREAU** (2008) Kinds of eggs used in the household in past 30 days. *Print Measurement Bureau, PMB, Table 27*, Restricted data, http://www.pmb.ca/public/e/product_data/reports_online_gateway.shtml
- SMITH, W.C.** (2001) New product development- building the future. *Textile North America (TTNA) Symposium*, Industrial Textile Associates, Retrieved 10/17, 2009 from <http://www.intexa.com/downloads/npd.pdf>.
- STATISTICS CANADA** (2007) Canadian Internet use survey, Internet use, by location of access, sex and age group, every 2 years (percent). *E-STAT, CANSIM, Table 358-0124*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm
- STATISTICS CANADA** (2008a) Average household size for Canada, provinces and territories, 2006, 2001 and 1996 censuses. *Statistics Canada*, Restricted data, http://www12.statcan.ca/english/census06/data/trends/Table_2.cfm?TOPIC_ID=400&LINE_ID=407&T=PR&start=1&topicsub=Submit

- STATISTICS CANADA** (2008b) Canadian Internet use survey, Internet use, by location of access and income quartile, every 2 years (percent). *E-STAT, CANSIM, Table 358-0126*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm
- STATISTICS CANADA** (2008c) Canadian Internet use survey, Internet use, by location of access and level of education, every 2 years (percent). *E-STAT, CANSIM, Table 358-0125*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm
- STATISTICS CANADA** (2009a) 2006 Census of population (provinces, Census divisions, municipalities). *E-STAT*, <http://estat.statcan.gc.ca/cgi-win/cnsmcgi.pgm>
- STATISTICS CANADA** (2009b) Consumer price index (CPI), 2005 basket, monthly (2002=100). *E-STAT, CANSIM, Table 326-0020*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm
- STATISTICS CANADA** (2009c) Food available by major groups in Canada, annual 1960 to 2008, eggs (dozens per year). *E-STAT, CANSIM, Table 002-0019*, Restricted data, <http://estat.statcan.ca/cgi-win/CNSMCGI.EXE>
- STATISTICS CANADA** (2009d) Population urban and rural, by province and territory (British Columbia). *Statistics Canada, 2006 Census* <http://www40.statcan.gc.ca/l01/cst01/demo62k-eng.htm>
- THE NIELSEN COMPANY** (2008) MarketTrack data received from *The Nielsen Company, Canada*, received at October 2008. Restricted data.
- WORLDPOULTRY.NET** (2008) Unilever and McDonalds change to free-range eggs. *WorldPoultry.Net*
- ZIKMUND, W.G.** (2003) Advantages and disadvantages of typical survey methods. In: (edition 8) *Exploring Marketing Research*, 240, (Thomson, South-Western).

4 PURCHASERS' PREFERENCE TOWARD SIX TYPES OF TABLE EGGS IN BRITISH COLUMBIA, CANADA¹

4.1 Introduction

The egg industry in Canada is one of the important contributors to the economics of the country and it runs under the supply management system. Production of eggs sold for consumption in Canada and British Columbia (BC) were about 506.42 and 54.83 million dozen eggs, respectively in 2008 (Statistics Canada, 2009c).

Almost all published statistics related to eggs in Canada has considered table eggs as an undifferentiated product, but the egg market in Canada has transformed from an undifferentiated to a differentiated one in the last decade. AC Nielsen data (2007) indicated that retail sales of specialty eggs had a higher market growth rate than white regular eggs in Canada and it increased from CAD\$44.7 million in 2002 to CAD\$104.7 million in 2006. The percentage retail sales of specialty eggs (free-run, free-range, organic and omega-3 enhanced eggs) in BC was higher than the Canadian average (22.9% vs. 16.8%) according to 52-weeks ending August 2008 statistics (The Nielsen Company, 2008).

The six types of table eggs include two types of regular eggs (white and brown regular eggs from caged hens) and four types of specialty eggs (free-run, free-range, organic and nutrient enhanced eggs) (Egg Farmers of Canada, 2008). Free-run eggs are from un-caged hens kept in indoor floor spaces. Free-range eggs are from un-caged hens that have access to outdoor spaces. Organic eggs are from un-caged hens that are fed certified organic diet and raised under the

¹ A version of this chapter will be submitted for publication. Bejaei, M., Cheng, K.M. and Wiseman, K. Purchasers' Preference toward Six Types of Table Eggs in British Columbia, Canada.

certifying agencies' guidelines. Nutrient-enhanced eggs are from caged hens that are fed a nutritionally enhanced diet.

The purpose of our research was to identify the target market (socio-demographic characteristics) for the six types of table eggs in BC and to determine the importance of eleven factors (used by other surveyors of egg consumption (e.g. Goddard et al., 2007; Fearne and Lavelle, 1996)) affecting the purchase of different egg types. The influence of product attributes (e.g. shell color, package size and egg size) in purchasers' purchase of eggs was also investigated in our research.

The information obtained by our research will not only help identify the target market of the six egg types, but will also facilitate planning and policy development according to the demand changes in the market. Retailers will benefit from the results by having access to information about the target market, the importance of different factors in making a decision to purchase a food product, and by developing their marketing and advertising strategies accordingly.

4.2 Materials and Methods

The method of our primary research was an online survey (Zikmund, 2003). The questionnaire was designed for an online interactive survey to be able to gather more in depth information about the purchasers of different egg types. Respondents received alternative questions that depended on their responses to previous questions. Figure 4.1 shows the outline of the survey questionnaire.

Dillman (2007) ‘Mail and Internet Survey’ guidelines were used to develop the questionnaire. The questionnaire was modified according to the results of the pre-test survey from university students. An invitation email was sent out to randomly selected email addresses (see Appendix III). The respondents were asked to start the survey by clicking on a link in the invitation email if they were BC residents during the last 30 days and were older than 18 years of age. The survey was conducted in June 2009 according to the regulations of UBC Behavioural Research Ethics Board (see Appendix V).

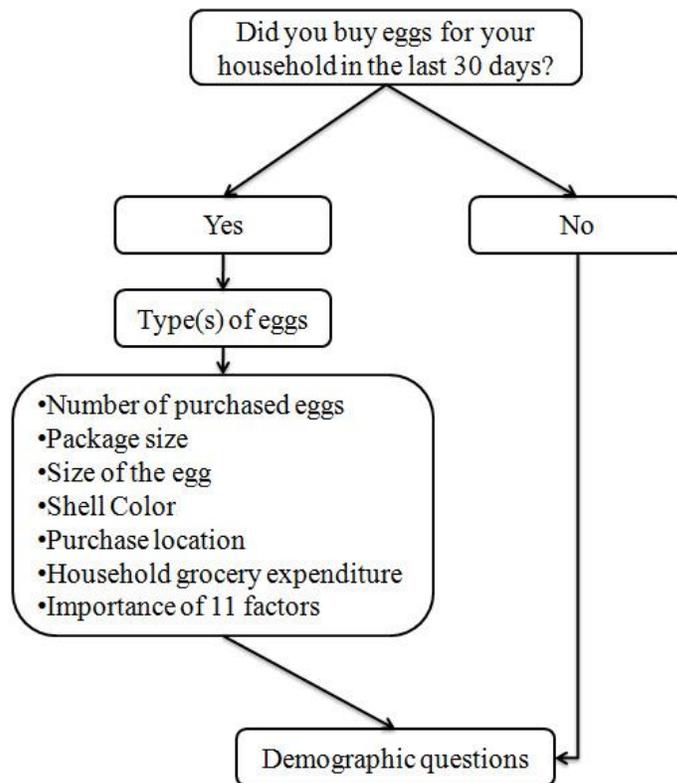


Figure 4.1 Survey questionnaire outline; the full questionnaire is available at the University of British Columbia's digital archive for research and teaching materials (<https://circle.ubc.ca/>).

PASW Statistics 17 (SPSS) software was used to analyze the survey data. Significance level for all assumptions was set as $P < .05$. According to the scale of measurement for each question and the assumptions of statistical tests, following tests were applied to the questions:

Point-biserial correlation (to measure the strength of the relationship between two variables when one of variables is a dichotomous variable), Spearman Correlation Coefficient (a non-parametric statistics which measure the strength of the relationship between two variable that the data violated parametric assumptions), Chi-square test (whether two categorical variables within a contingency table are associated), Wilcoxon Signed-rank test (a non-parametric test that looks for difference between two related samples or repeated measure on a single sample), Mann-Whitney U tests (a non-parametric test between two independent samples that looks for difference), Kruskal-Wallis test (a non-parametric test that looks for difference among more than two independent groups), Friedman's ANOVA (a non-parametric test that looks for difference among more than two related groups), Bonferroni correction (to control Type I error rate when there are multiple significance tests) (Field, 2005).

4.3 Results

4.3.1 Survey response rate

Invitation emails were sent to 1027 randomly selected email addresses and 813 participants (79.2%) started the survey. From those who started the survey, 702 participants (86.35%) completed it.

4.3.2 Respondents' socio-demographic characteristics and the types of eggs they purchased

The results of respondents' socio-demographic characteristics, their responsibility for grocery shopping and their grocery expenditure data are summarized in Table 4.1.

4.3.2.1 Sex

Female participants represented 56.1% of the respondents. The sex ratio of the BC population was 98:100 (male to female) in 2008 (BC STATS, 2009) which was higher than our survey.

4.3.2.2 Age – (see Table 4.1)

Proportion of participants at the age of 19-39 in our survey was less than the BC population proportion, but proportion of respondents at the age of 40 to 69 was more than the proportion of BC residents in the same category.

An increase in the age of the respondents had a negative small influence on their purchase of organic eggs (Spearman Correlation, $r_s = -.09$, $p < .05$).

4.3.2.3 Size of household – (see Table 4.1)

The average household size of the respondents was 2.61 ± 0.1 which was close to the BC average (Statistics Canada, 2008a). Respondents from larger households purchased more white regular ($r_s = .18$, $p < .001$), brown regular ($r_s = .07$, $p < .05$) and nutrient enhanced eggs ($r_s = .08$,

$p < .05$). The price was an important factor for the respondents who were from larger households ($r_s = .09$, $p < .05$).

4.3.2.4 Presence of at least one family member at the selected age categories

Respondents from households with children between the age of 5-14 years old purchased more white regular eggs (Point-biserial Correlation, $r_{pb} = .09$, $p < .05$) proportional to other egg types. Those from households with a larger number of teenagers (age 15-19 years old) also purchased more white regular ($r_{pb} = .09$, $p < .05$) and brown regular eggs ($r_{pb} = .07$, $p < .05$) proportional to other egg types. As well, respondents from households with larger number of adults (age 20-39 years old) purchased more white regular eggs ($r_{pb} = .12$, $p < .01$). On the other hand, respondents from households with older family members (age 40-59 years old) purchased more white regular ($r_{pb} = .12$, $p < .01$) and nutrient enhanced eggs ($r_{pb} = .08$, $p < .05$). In the last category, respondents from households with old family members (60 years and older) purchased less organic ($r_{pb} = -.08$, $p < .05$) and less nutrient enhanced eggs ($r_{pb} = -.08$, $p < .05$).

4.3.2.5 Size of community – (see Table 4.1)

Respondents selected their community size according to their personal knowledge about their own community. The distribution of respondents in rural and urban area was similar to the distribution of BC residents in rural and urban area (Statistics Canada, 2009b).

Respondents from larger communities purchased fewer brown regular eggs ($r_s = -.08$, $p < .05$) but more organic eggs ($r_s = .10$, $p < .01$). Larger community residents had higher education ($r_s = .26$) and income ($r_s = .14$, $p < .001$).

Table 4.1 Socio-demographic characteristics of the survey respondents:

Socio-demographic characteristics	Categories	Distribution in sample (%)
Sex ratio	Number of males per 100 females	78.25
Responsible for grocery shopping	Myself	48.4
	Other household member	7.9
	Myself and other household member	43.6
Age of participants	20-29 yrs. old	3.6
	30-39 yrs. old	12.6
	40-49 yrs. old	27.5
	50-59 yrs. old	36.9
	60-69 yrs. old	16.7
	70+ yrs. old	2.7
Household size	One person	21.1
	Two persons	34.8
	Three persons	19.1
	Four persons	16.3
	Five persons or more	8.7
Presence of at least one family member at the selected age categories	4 yrs. or younger	7.1
	5 – 14 yrs.	19.1
	15 – 19 yrs.	18.5
	20 – 39 yrs.	34.2
	40 – 59 yrs.	68.8
	60+ yrs.	29.5
Educational level	High School	10.3
	College/Technical School/ Diploma	19.0
	Some University	10.4
	Bachelors and post Bachelor degree	27.1
	Masters degree	17.8
	Ph.D. or equivalent	15.4
Annual household income	Below \$40,000	9.4
	\$40,000 - \$59,999	16.1
	\$60,000 - \$79,999	15.8
	\$80,000 - \$99,999	19.1
	More than \$100,000	39.7
Community size	Rural area or small town	14
	Medium sized town in rural area	6.9
	Suburban area surrounding cities	19.9
	Medium sized city	18.7
	Large sized city	40.6
Grocery expenditure of household per week	Less than \$100	18.2
	\$100 - \$200	54.4
	\$201 - \$300	21.0
	Over \$301	6.4

4.3.2.6 Educational level – (see Table 4.1)

Educational level of survey respondents was higher than average BC residents (Statistics Canada, 2009a). Respondents with higher educational level purchased less white regular eggs ($r_s = -.12$, $p < .01$) but more free-run ($r_s = .08$, $p < .05$), free-range ($r_s = .13$, $p < .001$) and organic eggs ($r_s = .15$, $p < .001$).

4.3.2.7 Total annual household income – (see Table 4.1)

Household income level of the survey respondents was higher than BC residents (Statistics Canada, 2009a). Respondent with higher income purchased less white regular eggs ($r_s = -.12$, $p < .01$) and more free-range eggs ($r_s = .10$, $p < .01$). There was a positive correlation between the education and income of the respondents ($r_s = .4$, $p < .001$). Respondents with higher income and higher educational level significantly considered price as unimportant factor in determining their purchase ($r_s = -.24$, $p < .001$ and $r_s = -.24$, $p < .001$, respectively).

4.3.2.8 Household grocery expenditure – (see Table 4.1)

Respondents who spent more money on their grocery shopping purchased more free-range ($r_s = .10$, $p < .05$) and nutrient enhanced eggs ($r_s = .08$, $p < .05$).

4.3.3 Table egg purchase

Almost 90.6% of the respondents indicated that they purchased eggs for their household in the last 30 days.

4.3.3.1 Preference

The educational level and income of respondents in our survey was higher than the educational level and income of British Columbians (Statistics Canada, 2009a). Also there was a significant correlation between the education and income of participants and purchase of egg types. Consequently weighting for the educational variable was necessary so that we could generalize the frequencies of selection of different types of eggs to the BC population (Post-stratification weight is used to compensate the influence of over-representativeness or under-representativeness of respondents in these characteristics in the survey; Johnson, 2008). Because of the relationship between income and education, the frequencies were adjusted for the income variable too (Table 4.2). The respondents were able to select as many types of eggs as they purchased in the last 30 days.

Table 4.2 Frequencies of selection of egg types and the mean purchase of eggs

Types of eggs	% Preference ¹	Purchase ²
		Mean ± 95% Confidence Interval
White regular	54.8 a	22.32±1.46 a
Free-range	30.3 b	19.53±1.38 ab
Nutrient enhanced	22.8 c	19.19±1.92 ab
Brown regular	22.6 c	15.21±1.20 c
Organic	9.8 d	17.86±2.13 bc
Free-run	7.1 d	14.38±2.08 c

¹ Percent of respondents who purchase an egg type for their household in the last 30 days; percent followed by different letters are significantly different by Wilcoxon Signed Ranks test at $p < .0033$ (Bonferroni correction).

² “Mean ± 95% Confidence Interval”; Number of eggs purchased for household in the last 30 days by the respondents who selected that type of eggs. Kruskal-Wallis test was significant ($\chi^2(5)=50.2$, $p < .001$). Mean followed by different letters are significantly ($P < .0033$) different by Mann-Whitney U tests.

There was a significance difference in the preference frequencies of the purchased egg types (Friedman's test: $\chi^2(5)= 539.17, P<.001$).

The mean of purchase for each kind of eggs refers to the average of the purchased eggs amongst purchasers of each special type of eggs. Purchasers of white regular, free-range and nutrient enhanced eggs purchased more eggs in comparison to other types of eggs.

4.3.3.2 Correlation of number of purchased eggs with egg types

There were significant relationships between numbers of eggs purchased from an egg type compared to the number of purchased eggs from the other egg types (Table 4.3).

Table 4.3 Correlations between numbers of purchased eggs

	White regular	Brown regular	Free-run	Free-range	Organic	Nutrient enhanced
White regular	1					
Brown regular	.11**	1				
Free-run	-.05	.06	1			
Free-range	-.36**	-.01	.06	1		
Organic	-.30**	-.13**	.09*	.24**	1	
Nutrient enhanced	-.10*	.09*	-.11**	-.12**	-.07	1

(Significance levels: *p<.05 and **p<.01)

4.3.4 Package size

Most of the respondents (83.3%) purchased their eggs in the packages of 12 eggs in a carton (Table 4.4).

Table 4.4 The frequency (%) of selection of each carton size for a special type of egg.

Proportion (%)	White regular	Brown regular	Free-Run	Free-Range	Organic	Nutrient Enhanced
6 eggs	5.4	5.2	7.7	7.5	12.9	5.7
12 eggs	77.6	89.0	86.2	89.8	85.3	75.3
18 eggs	10.6	3.2	3.1	1.5	.9	11.4
20 eggs	.3	.6	0	0	0	0
30 eggs	4.8	1.9	0	0	0	1.9
Other carton size	1.3	0	3.1	1.1	.9	5.7

4.3.5 Egg size

There was not a significant difference among the purchasers of six egg types about their preference toward the size of the egg (Table 4.5).

Table 4.5 Percent of purchasers who purchased different egg sizes in the last 30 days.

Egg size	Small	Medium	Large	Extra Large	Jumbo
Proportion (%)	0.1	9.2	61.3	27	2.4

4.3.6 Shell color – (see Table 4.6)

Table 4.6 Purchasers' preferences regarding shell color of table eggs.

Shell color	White	Brown	Both	Either white or brown
Proportion (%)	14.0	36.2	6.6	43.1

White regular egg shoppers preferred white shell color ($\chi^2(3)=160.66$, $p<.001$) but brown regular ($\chi^2(3)=22.55$, $p<.001$), free-run ($\chi^2(3)=12.13$, $p<.01$), free-range ($\chi^2(3)=101.13$, $p<.001$) and organic egg purchasers ($\chi^2(3)=37.3$, $p<.001$) significantly preferred brown shell color rather than white shell color.

4.3.7 The importance of eleven factors

The importance of eleven factors at the purchase of eggs was investigated via a 5 point Likert-scale question. Spearman Correlation Coefficients were calculated between the number of purchased eggs and the importance of eleven factors (Table 4.7).

Table 4.7 The importance of eleven factors in the number of purchased eggs from each type (five point Likert scale; 1=not at all important and 5=very important).

Correlation	White regular	Brown regular	Free-run	Free-range	Organic	Nutrient enhanced
Brand Name	-.096*	-.008	.001	-.048	.014	.154**
Local Product	-.303**	-.042	.147**	.261**	.226**	-.085*
Shell Color	-.141**	.148**	.091*	.089*	.055	-.046
Package Material	-.150**	.045	.090*	.134**	.114**	-.049
Price	.345**	.127**	.004	-.255**	-.188**	-.010
Best Before Date	.013	-.061	.017	.028	-.059	.034
Taste	-.200**	.032	.042	.169**	.097*	.133**
Nutrient Information on Package	-.183**	-.059	-.027	.060	.037	.225**
Yolk Color	.136**	.063	.020	-.089*	-.039	.004
Size of Egg	-.216**	.118**	.077	.118**	.038	.122**
Care and Feeding of Hens	-.486**	-.137**	.105*	.401**	.352**	-.094*

Spearman Correlation significant at: *p<0.05 and **p<0.01 levels.

There was a significant positive relationship between the number of purchased white regular eggs and the importance of the price ($r_s=.34$, $p<.01$), indicating that price was more important for those purchasers who purchased more white regular eggs. There was also a positive significant relationship between care/feeding of hens and the number of purchased free-

range ($r_s=.4$, $p<.01$) or organic eggs ($r_s=.35$, $p<.01$). Care and feeding of hens was more important for the purchasers who purchased more free-range or organic eggs.

Friedman's ANOVA test was selected to compare the importance of 11 factors for total purchasers. The importance of the compared factors was significantly different ($\chi^2(10)=1586.28$, $p<.001$). Wilcoxon Ranks test was used to follow up the significance between each two factors. A Bonferroni correction was applied to reduce the chance of type I error and all effects are reported at a 0.001 level of significance ($\alpha/\text{number of comparisons}$) (Table 4.8).

Best before date (freshness) of eggs was an important factor for most purchasers. Price was more important for regular eggs purchasers than free-range and organic egg purchasers. Care/feeding of hens and having access to locally produced products were more important factors for purchasers of cage-free eggs than regular or nutrient enhanced egg purchasers.

Table 4.8 The importance of eleven factors in egg purchase decision making for purchasers of different types of eggs (five point Likert scale; 1=not at all important and 5=very important).

Mean ± 95% CI	White regular	Brown regular	Free-run	Free-range	Organic	Nutrient enhanced	Total
Best Before Date	4.16±0.13a	4.07±0.18a	4.11±0.33a	4.20±0.14a	4.07±0.22bc	4.23±0.17a	4.15±0.09a
Taste	3.55±0.15c	3.90±0.19ab	4.00±0.27a	4.05±0.14a	4.09±0.21bc	4.08±0.18ab	3.83±0.10b
Yolk Color	3.84±0.11b	3.83±0.16ab	3.78±0.24ab	3.58±0.13b	3.59±0.21cd	3.71±0.16bc	3.70±0.08bc
Local Product	3.11±0.16 d	3.44±0.21c	4.08±0.30ab	3.96±0.14a	4.18±0.20ab	3.38±0.21cd	3.53±0.11c
Care and Feeding of Hens	2.75±0.16e	3.18±0.23cd	4.02±0.27ab	4.18±0.14a	4.58±0.13a	3.31±0.22d	3.51±0.12c
Price	3.76±0.13bc	3.64± 0.18bc	3.37±0.29bc	2.96±0.16cd	2.80±0.25ef	3.35±0.19d	3.35±0.10cd
Size of Egg	2.85±0.15de	3.40±0.22c	3.44±0.32ab	3.30±0.16c	3.26±0.24de	3.41±0.20cd	3.16±0.10d
Shell Color	2.34±0.15f	2.89±0.21de	2.94±0.36cd	2.71±0.17d	2.73±0.26f	2.47±0.21e	3.57±0.11e
Package Material	2.35±0.16f	2.69± 0.24e	2.93±0.36cd	2.84±0.18d	2.90±0.26ef	2.45±0.23e	2.56±0.11e
Nutrient Information on Package	2.35±0.15f	2.50± 0.22e	2.52± 0.33de	2.76±0.18d	2.74±0.26f	3.16±0.23d	2.63±0.11e
Brand Name	1.65±0.12g	1.83± 0.21f	1.82±0.33e	1.75±0.16e	1.85±0.24g	2.14±0.23e	1.81±0.10f

Means followed by different letters within a column are significantly different by Wilcoxon Signed Ranks test using a Bonferroni correction at $p < .001$.

4.3.8 Where did you buy your eggs?

Respondents were asked to identify the store that they purchased eggs for their household in the last 30 days (Table 4.9). There was no limitation for the number of stores that they were able to select.

Table 4.9 The stores that purchasers purchased their eggs in the last 30 days.

Proportion (%)	White regular	Brown regular	Free-Run	Free-Range	Organic	Nutrient enhanced	Total
Costco	21.95	17.86	11.27	7.02	6.35	30.49	16.82
Marketplace IGA	11.59	14.29	12.68	14.74	8.73	12.80	11.95
Real Canadian Superstore	29.57	21.43	18.31	16.14	12.70	21.95	20.60
Safeway	34.45	39.29	32.39	30.18	23.02	35.98	31.13
Save-On-Foods	22.87	22.02	16.90	21.05	20.63	36.59	23.27
Thrifty Foods	7.01	9.52	12.68	6.67	6.35	6.10	7.39
Choices Market	2.13	3.57	5.63	7.72	18.25	4.88	5.35
Local grocery store	2.74	6.55	8.45	7.37	11.11	4.27	5.03
Other store	34.76	38.10	50.70	35.09	47.62	32.32	35.22
Farmer/farm gate	15.24	22.62	25.35	35.09	24.60	7.93	21.23

4.4 Discussion

The response rate of our online survey was high and 86.35% of participants (702 respondents) who started our survey completed it. The online internet survey was selected because internet penetration is high in Canada and 84.3% of Canadians were internet users in 2008 (Internet World Stats, 2009). Also results of two Canadian internet use surveys (Statistics Canada, 2007; 2008b; 2008c) indicated that the internet use of people from all age, income, education and community size groups increased from 2005 till 2007.

The most important finding of our survey was determining the key factors influencing the purchasers of one type of egg over another. Having access to the socio-demographic characteristics of the respondents and the importance of eleven factors in their purchase decision making process made it possible to identify the market segment for six types of table eggs.

- 1. White regular eggs:** The profile of a white regular egg (the largest market segment) purchaser is: From a larger household with no family member older than 60, has lower income and less education. Freshness of egg (best before date) and the price of egg are the important factors affecting his/her purchase of eggs. A white regular egg purchaser is less concerned about care/feeding of hens (animal welfare and nutrition) than the purchasers of the other egg types but will likely purchase brown regular eggs as well. He/she likely purchases eggs from major grocery chain stores like Costco, Real Canadian Superstore and Safeway.
- 2. Free-range eggs:** A purchaser of free-range eggs (second largest market segment in BC) prefers brown shell eggs and will likely also purchase organic eggs. He/she has higher education, higher income and likely spends more on food during grocery shopping. Care and feeding of hens, having access to locally produced eggs, carton and packaging material, fresh and tasty eggs are his/her main priorities in selecting eggs. The price of eggs was not important but the caging of hen was.

Almost a third of free-range egg purchasers buy their eggs directly from farm or farmers markets. This may be the reason why our estimation of proportion of free-range egg purchaser was much higher than that estimated by the AC Nielsen (2008) market track data of BC retail egg sales. Their data include only the sales in major grocery chain stores. However, this brought out an important issue. Most of the eggs

sold through farm gates or farmers' markets are ungraded and uninspected according to Shell Egg Grading Regulation (Statutes and Regulations of British Columbia, 1978 and van Dongen, 2009). There is no government inspection (size, cracks, contamination, cleanness, length and conditions of storage and handling) for ungraded eggs. In Alberta, the label "UNINSPECTED" has to be written on the container of ungraded eggs (Alberta regulations, 2008) whereas there is no such requirement in BC. Recent increase in demand for free-range eggs should encourage the egg marketing boards and food inspection agencies to investigate into the potential problems caused by unregulated eggs (e.g. bacterial contamination, undesirable storage and handling conditions, external and internal defects. (van Dongen, 2009)).

- 3. Nutrient enhanced eggs:** A typical purchaser of nutrient enhanced eggs comes from a larger household with at least a family member above the age of 40. He/she is more concerned about health and nutritional issues rather than the welfare of the hens and therefore freshness, taste, and the nutrient information on the package are important. Eggs are usually purchased at major grocery chain stores. While price is not a top concern, it would be considered before purchase. As a result, when the price of nutrient enhanced eggs is high, they may temporarily switch to brown regular eggs.
- 4. Brown regular eggs:** A typical brown regular egg purchaser comes from a large household with teen-agers in a small community. Price, taste and freshness of eggs are the important factors in his/her decision for the purchase of eggs. Brown regular egg purchasers can easily be attracted to the specialty egg market (e.g. free-run eggs) if they are made aware of the different types of specialty eggs that are available and if

the specialty eggs are less expensive (Fearne & Lavelle, 1996). A typical brown regular egg customer purchases his/her eggs from major grocery chain stores like Safeway.

- 5. Organic eggs:** A purchaser of organic eggs is younger, well educated and lives in bigger communities. He/she prefers brown shell eggs and shares the same concerns and priorities as a free-range egg purchaser and therefore will also purchase free-range and free-run eggs. Organic eggs are the most expensive eggs in the market but price is not as important as animal welfare for these purchasers. An organic egg purchaser prefers to shop in health or organic foods stores. Anderson (2009) reported that 37% of the organic eggs are being sold in independent organic grocery stores.
- 6. Free-run eggs:** Purchasers of free-run eggs (smallest segment of the market) share the same concerns with free-range and organic egg purchasers, with one exception; price to them is more important than to free-range and organic purchasers. They will be attracted to free-range or organic eggs if they become less expensive.

4.5 Conclusion

Our results confirmed that the importance of different factors was not the same for all purchasers. Regular egg purchasers considered price as an important factor and cage-free egg purchasers considered the animal welfare standards and having access to the locally produced eggs as important factors for egg purchase decision making process. The results revealed that the small-scale egg producers play an important role in free-range egg market and establishing

quality control regulations is required for this section of egg market. Results showed that there is a growing demand for specialty eggs.

Future research should focus on ways to lower production costs of specialty eggs, ways to facilitate the marketing of specialty eggs in a differentiated egg market. Efforts should be made in consumer education about the characteristics of the different types of eggs for them to make informed choices.

4.6 References

- ALBERTA REGULATIONS** (2008) Livestock And Livestock Products Act, Purchase and sale of eggs and processed egg regulation, 68/2008, Retrieved 10/26, 2009 from <http://www.canlii.org/en/ab/laws/regu/alta-reg-23-2004/latest/alta-reg-23-2004.html>.
- ANDERSON, K.E.** (2009) Overview of natural and organic egg production: Looking back to the future. *The Journal of Applied Poultry Research* **18(2)** 348-354
- BC STATS** (2009) British Columbia populations projections 2009 to 2036. *BCStats*, **Table 1** http://www.bcstats.gov.bc.ca/DATA/pop/pop/project/BCtab_Proj0901.pdf.
- DILLMAN, D.** (2007) Mail and internet surveys. (Second), John Wiley & Sons, Inc.
- EGG FARMERS OF CANADA** (2008) Eggs...so many choices. *Egg Farmers of Canada (CEMA)*, Retrieved 12/01, 2008 from <http://eggs.ca/Resources/pdf/en/egg-choices-e.pdf>.
- FEARNE, A. and LAVELLE, D.** (1996) Perceptions of food “quality” and the power of marketing communication: results of consumer research on a branded-egg concept. *Journal of Product & Brand Management* **5(2)** 29-42
- FIELD, A.** (2005) Discovering statistics using SPSS. (Second), (SAGE Publications, London).
- GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A.** (2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (**07-03**) published by *Department of Rural Economy, University of Alberta* <http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>
- INTERNET WORLD STATS** (2009) Internet usage and population growth. *Internet World Stats*, <http://www.internetworldstats.com/am/ca.htm>.
- JOHNSON, D.R.** (2008) Using weights in the analysis of survey data, Department of Sociology, Population Research Institute, The Pennsylvania State University, *2008-2009 Demographics*

Methods Focus, Featured Speaker, (November 2008). Retrieved 11/18 from <http://help.pop.psu.edu/help-by-statistical-method/weighting/Introduction%20to%20survey%20weights%20pri%20version.ppt/>

STATISTICS CANADA (2007) Canadian Internet use survey, Internet use, by location of access, sex and age group, every 2 years (percent). *E-STAT, CANSIM, Table 358-0124*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm.

STATISTICS CANADA (2008a) Average household size for Canada, provinces and territories, 2006, 2001 and 1996 censuses. *Statistics Canada*, Restricted data, http://www12.statcan.ca/english/census06/data/trends/Table_2.cfm?TOPIC_ID=400&LINE_ID=407&T=PR&start=1&topicsub=Submit.

STATISTICS CANADA (2008b) Canadian Internet use survey, Internet use, by location of access and income quartile, every 2 years (percent). *E-STAT, CANSIM, Table 358-0126*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm.

STATISTICS CANADA (2008c) Canadian Internet use survey, Internet use, by location of access and level of education, every 2 years (percent). *E-STAT, CANSIM, Table 358-0125*, Restricted data, http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm.

STATISTICS CANADA (2009a) 2006 Census of population (provinces, Census divisions, municipalities). *E-STAT*, <http://estat.statcan.gc.ca/cgi-win/cnsmcgi.pgm>.

STATISTICS CANADA (2009b) Population urban and rural, by province and territory (British Columbia). *Statistics Canada, 2006 Census* <http://www40.statcan.gc.ca/101/cst01/demo62k-eng.htm>.

STATISTICS CANADA (2009c) Poultry and egg statistics. *Statistics Canada, Agriculture Division, Livestock Section, Catalogue no. 23-015-X*, Restricted data.

STATUTES AND REGULATIONS OF BRITISH COLUMBIA (1978) Shell egg grading regulation.105, http://www.bclaws.ca/Recon/document/freeside/--%20a%20--/agricultural%20produce%20grading%20act%20%20rsbc%201996%20%20c.%2011/05_regulations/17_105_78.xml.

THE NIELSEN COMPANY (2007) Retail sales in Canadian grocery stores. *Agriculture and Agri-Food Canada*, <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170860293780&lang=eng>.

THE NIELSEN COMPANY (2008) MarketTrack data received from *The Nielsen Company, Canada*, received at October 2008. Restricted data.

VAN DONGEN, P. (2009) Egg policy draws mixed reaction. *AgriSuccess Express, Farm Credit Canada Newsletter* (March 20,2009), Retrieved 10/26, 2009 from http://www.fcc-fac.ca/newsletters/en/express/articles/20090320_e.asp.

ZIKMUND, W.G. (2003) Advantages and disadvantages of typical survey methods. In: (edition 8) *Exploring Marketing Research*, 240, (Thomson, South-Western).

5 GENERAL DISCUSSION AND CONCLUSION

5.1 General Discussion

There were only a few types of eggs in the BC table-egg market a decade ago but the egg market became a differentiated one and purchasers have access to but not necessary information about the various egg types during the last decade. The AC Nielsen retail sale data confirmed a higher growth rate for the specialty egg market than the regular egg market and indicated that BC residents purchased more cage-free eggs than the average Canadian did (The Nielsen Company, 2008; 2007). The priorities of purchasers were not the same and therefore their choices of different types of eggs were not the same.

Results of our online survey from 702 British Columbia residents indicated that the purchase of cage-free eggs was significantly higher in BC in 2009 than the previous consumer survey in BC in 2007 (Print Measurement Bureau, 2008). This could be due to the different ways of conducting the survey but it is more likely that during the two years between the surveys, there has been a significant increase in the consumers' awareness and concern about animal welfare, environmental and health issues. Almost one third of respondents of our survey indicated that they purchased or consumed free-range eggs because they were concerned about animal welfare standards and were interested to buy locally produced eggs. Most of these respondents had higher income and higher education than average income and education of BC residents. Price was not as important as animal welfare issues for these participants.

A considerable proportion of cage-free egg customers purchased their eggs directly from farmers. This result makes a concern about the quality standards of ungraded eggs marketed by small-scale farms (van Dongen, 2009).

Free-run and organic egg purchasers have the same priorities as free-range egg purchasers. However price was more important for free-run egg purchasers than organic and free-range egg purchasers. Organic egg purchasers were younger and from bigger communities. In general, cage-free egg purchasers preferred brown shell eggs with darker yolk color.

Nutrient enhanced egg purchasers were older and more concerned about the nutritional value of the eggs and they prefer to have access to a healthy food rather than higher animal welfare standards. The information on package of egg was important for the nutrient enhanced egg purchasers. Also these purchasers considered price while purchasing their eggs.

Freshness and taste of the eggs were important factors in selection of specialty eggs and brown regular eggs. Even though consumers were not able to distinguish between the caged and cage-free eggs in a blind taste test (Fearne & Lavelle, 1996), they indicated that one of their reasons for selecting cage-free eggs was better taste of those eggs. Our results demonstrated that brand name and nutritional information on package might influence on the consumers' taste perception and consequently their consumption of eggs.

Regular egg purchasers considered price as an important factor in the purchase decision making process. Most of these purchasers had bigger household size, lower income and lower educational level. Our results revealed that the respondents believe that nutritional value of white regular eggs is very low, even though white regular eggs may have the same nutritional value as brown regular, free-run and free-range eggs (Egg Farmers of Canada, 2008; Goddard et al., 2007). Our survey indicated that the consumers of white regular eggs would use more white eggs if they become aware of the high nutritional value of these eggs.

5.2 Recommendations

1. It may be necessary to educate consumers about:

- the nutritional value of eggs to help them to make an educated choice.
- Alternative housing systems and management of laying hens.

2. If specialty egg producers want to increase their market share, they need to cut costs to make specialty eggs more affordable to the consumers.

3. Purchasers' concern about animal welfare is growing and it is recommended that regular egg producers should take that into serious consideration. Free-run eggs seem to be a good option because they are cheaper than free-range and organic eggs and their purchasers have the same priorities as free-range and organic eggs.

4. Small-scale farms play a considerable role in cage-free egg market. It is recommended to establish quality control and inspection regulations for that segment of egg market.

5.3 Strengths of Our Research

- Appropriate sample size
- A well received questionnaire

5.4 Limitations of Our Research

- Higher income and education of the respondents than the average income and education of BC residents (we adjusted our data to BCSTAT data to eliminate the influence of this deviation).

5.5 Future Research

- Considering the growing market of free-range eggs it seems necessary to develop a research plan to investigate the sustainability of different production systems in Canadian egg industry.
- Future research is necessary to design an educational program to increase the consumers' awareness about different egg types, egg production systems and the nutritional value of eggs.
- New research could investigate the future trends of specialty egg markets, the influence of differentiated egg market on development of egg industry in Canada and the predicted market growth rate for free-run eggs which are cheaper and cage-free eggs.

5.6 References

- EGG FARMERS OF CANADA.** (2008) Eggs...so many choices. *Egg Farmers of Canada (CEMA)*, Retrieved 12/01, 2008 from <http://eggs.ca/Resources/pdf/en/egg-choices-e.pdf>
- FARM CREDIT CANADA and VAN DONGEN, P.** (2009) Egg policy draws mixed reaction. Retrieved 10/26, 2009 from http://www.fcc-fac.ca/newsletters/en/express/articles/20090320_e.asp.
- FEARNE, A. and LAVELLE, D.** (1996) Perceptions of food “quality” and the power of marketing communication: results of consumer research on a branded-egg concept. *Journal of Product & Brand Management* **5(2)** 29-42
- GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A.** (2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (07-03) published by *Department of Rural Economy, University of Alberta* <http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>
- PRINT MEASUREMENT BUREAU** (2008) Kinds of eggs used in the household in past 30 days. *Print Measurement Bureau, PMB, Table 27*, Restricted data, http://www.pmb.ca/public/e/product_data/reports_online_gateway.shtml;
- THE NIELSEN COMPANY** (2007) Retail sales in Canadian grocery stores. *Agriculture and Agri-Food Canada*, <http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1170860293780&lang=eng>
- THE NIELSEN COMPANY** (2008) MarketTrack data received from *The Nielsen Company, Canada*, received at October 2008. Restricted data.

APPENDICES

APPENDIX I: An Observation from Four Grocery Stores in Vancouver

Observation is a systematic data recording method from the objects or events as they are observed (Zikmund, 2003). Observation data gathering procedure had been conducted in April 2009 in Vancouver as a preliminary study for my thesis (Fig. I.8, Table I.1). Store, brand name, shell color, size of the egg, number of 38 category of eggs in the package and the type of egg of the claims on the package were gathered. The price for a special kind of eggs was different in four stores. Data collected from four grocery stores indicated that white regular eggs ($\$2.55 \pm 0.19$) are the cheapest eggs in the market. Free-range ($\$5.19 \pm 0.86$) and organic eggs ($\5.06 ± 0.52) were the most expensive eggs in the market (prices are for the large size of a dozen of eggs).

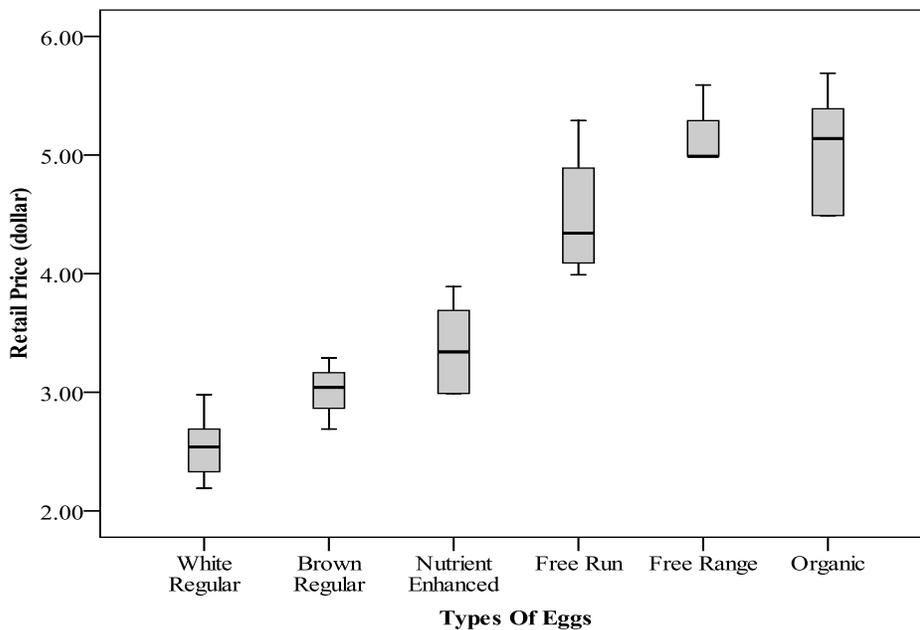


Figure I.1 Retail prices for different types of large size eggs per dozen in four grocery stores, Vancouver, April 2009; Free-range and organic eggs were the most expensive eggs in the market and white regular eggs were the least expensive ones.

Table I.1 Prices of different kind of eggs in four grocery stores, Vancouver, April 2009

Store	Brand Name	Shell Color	Size	Claim(s) on Package	# of eggs	Price (\$)
Superstore	Regular	White	Large	Regular	12	2.33
Superstore	Foremost	White	Large	Omega-3 and Vitamin Enhanced	12	2.99
Superstore	Natureegg -Omega Pro	White	Large	Omega-3 and Vitamin Enhanced	12	3.69
Superstore	President Choice	Brown	Large	Free-Run	12	4.19
Superstore	Omega 3	White	Large	Omega-3 Enhanced	12	2.99
Safeway	Regular	White	Large	Regular	12	2.39
Safeway	Country Golden Yolks	Brown	Large	Free-Run	12	5.29
Safeway	Country Golden Yolks	Brown	Medium	Free-Run	12	4.49
Safeway	Premium egg	White	N/A	Regular	12	2.69
Safeway	Regular	Brown	Extra Large	Regular	12	3.04
Safeway	Born 3	Brown	Large	Omega-3 Enhanced	12	3.89
Safeway	Regular	White	Large	Regular	18	4.2
Safeway	Regular	White	Large	Regular	20	4.92
Zellers	Nature's Best, Naturegg	White	Large	Vegetarian, Vitamin Enhanced	12	2.99
Zellers	Countryside Farm	White	Extra Large	Regular	12	2.69
Zellers	Countryside Farm	White	Large	Regular	12	2.39
Zellers	Countryside Farm	White	Medium	Regular	12	2.19
T&T	Regular	White	Large	Regular	6	1.49

Table I.1 Continued

Store	Brand Name	Shell Color	Size	Claim(s) on Package	# of eggs	Price (\$)
T&T	Maple Hill farms	Brown	Large	Certified Organic	12	4.99
T&T	Maple Hill farms	Brown	Extra Large	Vegetarian, Free-Range	12	5.59
T&T	Maple Hill farms	Brown	Large	Vegetarian, Free-Range	12	4.99
T&T	Maple Hill farms	White	Medium	Certified Organic	12	4.49
T&T	Maple Hill farms	Brown	Extra Large	Certified Organic	12	5.29
T&T	Bradner Farms	Brown	Medium	Certified Organic	12	4.49
T&T	Born 3	White	Large	Vegi, Omega3, Vitamin Enhanced	12	3.69
T&T	Gold Egg	Brown	Medium	Certified Organic, Free-Range	12	5.39
T&T	Gold Egg	Brown	Large	Certified Organic, Vegi, Free-range	12	5.69
T&T	Country Golden Yolks	Brown	Large	Free-Range	12	4.99
T&T	Liberte, Gold Egg	Brown	Large	Free-Run	12	3.99
T&T	Regular	Brown	Medium	Regular	12	2.69
T&T	Golden Valley	White	Jumbo	Regular	20	4.99
T&T	Golden Valley	Brown	Jumbo	Regular	20	4.99
T&T	Grand Maple	White	Extra Large	Regular	12	2.69
T&T	Golden Valley	Brown	Extra Large	Regular	12	3.29
T&T	Golden Valley	White	Medium	Regular	12	2.29
T&T	Golden Valley	White	Extra Large	Regular	12	2.89
T&T	Island Gold	Brown	Medium	Regular	12	4.88

APPENDIX II: Methodology

The advantage and disadvantages of different primary research methods were considered to select an appropriate method for this research. The online survey method was selected as the primary research method for this project. The subjects were selected randomly from British Columbia residents' email addresses (19 years of age or older).

II.1 Selection of online survey method

Research questions were developed according to guidelines described by Gray & Guppy (2003a). The reasons for selecting the on-line survey method were:

- High internet penetration in Canada: A Statistics Canada (2007) survey showed that 73.2% and 77.6% of population (16 years of age and older) in Canada and in British Columbia (BC), respectively, were internet users in 2007. In the same year, internet penetration in Vancouver (78.3 %) and Victoria (83 %), two main cities in BC, were even higher than the Canadian average (Statistics Canada, 2007). Internet World Stats (2009) also reported a growth in internet use in Canada in 2008. The new data shows that 84.3 % of Canadians were internet users in 2008 (Internet World Stats, 2009).
- Online survey has the highest speed of data collection (Zikmund, 2003). It is possible to complete a large and well-designed survey in less than a month via online survey.
- The cost of doing an online survey is lower than other survey methods. The cost of conducting a mail survey is higher than online survey because in a mail survey, the costs depend on the number of the initial invitation mails that have to be sent to the potential respondents. In Canada, it will cost almost two dollars per initial invitation mail because

of the printing, mailing and return stamp cost. The cost of an online survey does not depend on the number of the initial invitation emails. Furthermore, the total cost will stay low even for a big sample size.

- The kind of questions in our research demanded an interactive questionnaire. This means each group of respondents had to receive the questions related to the category that they belonged to (Fig. II.1). For example, respondents who have not eaten or purchased chicken eggs will not receive questions related to the consumption or purchase of eggs. Therefore, an internet based survey was necessary to design an interactive survey.

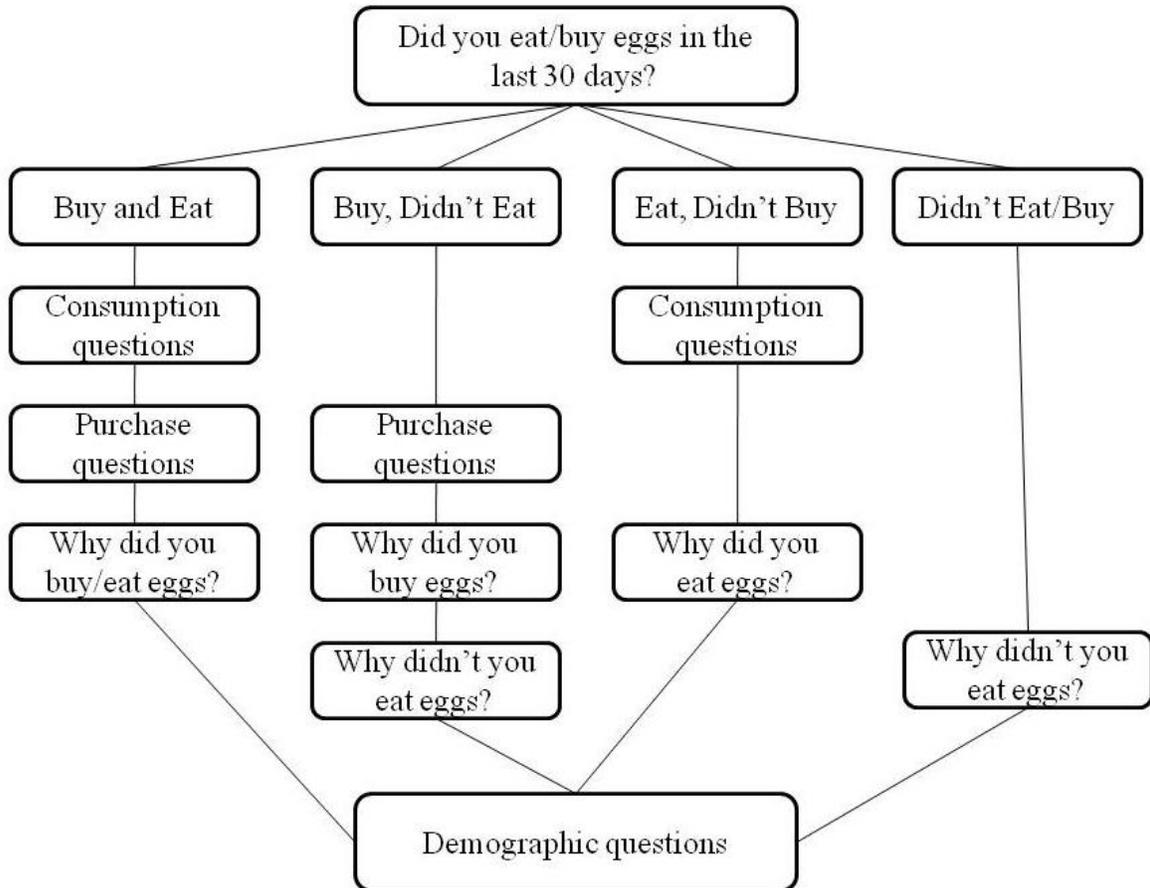


Figure II.1 Online interactive survey design; respondents were divided into 4 groups according to their responses to a question regarding their behavior about purchase (for their household) and consumption (at their home) of table eggs in the last 30 days.

II.2 Survey population and method of selecting subjects

BC residents, 19 yrs. of age or older, were the target population of my thesis research. A list of the opt-in e-mail addresses of the potential subjects was purchased from The Data Supplier Company (Zuma Marketing Inc, Beverly Hills, CA, USA) and the e-mail addresses were selected randomly from the initial list. Opt-in emails mean that the email addresses belong to the respondents who have agreed to receive emails from a third party.

II.3 Invitation E-mail

An invitation e-mail (see Appendix III) was prepared to be sent to the randomly selected e-mail addresses. The purpose of the survey, who was doing the survey, criteria for selecting subjects, the estimated length of time to complete the survey, and the guarantee of confidentiality were explained to the potential respondents.

II.4 Online questionnaire

The questionnaire (see Appendix IV for the questionnaire) was developed using many sources of reference, some of which are listed below:

- Dillman (2007) book, 'Mail and Internet Surveys', provided many details about designing clear and standard questionnaire.
- 'Successful Surveys: Research Methods and Practice' (Gray & Guppy, 2003c) was useful in developing survey and questionnaire particularly for Canadians.
- Fearne & Lavelle (1996) survey design provided the skeleton of the survey.

- Print Measurement Bureau (2008) personal and grocery shopping questionnaires were used as a guide while designing the survey questionnaire.
- The questionnaires of Goddard et al. surveys (2005 and 2006) regarding consumer attitudes and willingness to pay for specialty eggs were also referenced (Goddard et al., 2007).

II.4.1 Consumers vs. purchasers

The awareness of the respondents regarding different types of eggs was measured via a 5-point Likert scale to find out how much they know about specialty eggs. Following the first question, the definitions of main types of table eggs were provided for the respondents to avoid any bias because of misunderstanding. Then the respondents were asked whether they ate eggs at home or purchased eggs for their household in the last 30 days. Based on their answers respondents were split into four groups (Fig II.1). The respondents who ate or purchased eggs received a question to select the types of eggs that they ate/purchased in the last 30 days. The rest of the survey asked questions directly from the type(s) of eggs that participants selected at this step. If they selected two types of eggs (for example white regular and free-range eggs), they received the rest of the questions for these two types of eggs.

Those who consumed eggs at home received consumption questions. The first consumption question was about the number of eggs that they used from the selected type(s) of eggs and then the frequency of consumption of each kind of selected egg(s). There was a research hypothesis that the types of eggs that the consumers use might affect their cooking and preparation methods. So they were asked about the methods of preparation that they most commonly use. Also the color of the yolk that they prefer was asked in this questionnaire.

Those who purchased eggs answered to a question about the number of eggs that they purchased from the selected type(s) of eggs; also they answered a question about the size of carton for their purchased eggs. At the next step the importance of 11 factors in their decision making process to purchase eggs for their household was asked in a 5 point Likert scale to investigate the difference among purchasers of different types of eggs regarding the importance of these factors. Furthermore, they were asked to indicate other factors that might affect their decision. The store that they purchased their eggs from, and the expenditure on grocery food products in their household during a week were the other questions. The source of the information that the respondents usually use (when they decide to purchase a food product) was the last special question for the egg shoppers.

In this section of the survey the purchasers and consumers of eggs received some common questions about their preferences and attitudes toward eggs; for example the egg size and also their preference about the shell color. The next question was about the participants' opinion about the nutritional value of the eggs according to their personal knowledge. For this question all respondents received white regular eggs as a fixed option, and the other types of eggs that they selected at the beginning of survey (question number 3) as their variables. The reason for having the white regular eggs as the fixed option was to provide a base for the respondents to compare the nutritional value of eggs to white regular eggs (control group of this research). The last question in this section was about the important factors that the users of each type of egg considered while selecting a type of egg.

II.4.2 Past behavior

The respondents' past behavior regarding purchase and consumption of eggs in the time period of the last 30 days was examined to avoid the potential bias about their future behavior and their future willingness to purchase a product. All subsequent questions were asked pending on the respondents' past behavior. Also to make the questionnaire more clear and focused, all consumption and purchase questions were related to the respondent's personal egg consumptions at home or the respondent's egg purchase for his/her household.

The respondents who did not eat eggs in the last 30 days received a question about their reasons for not eating eggs at home. Some options were provided; a space to write other options that they might have was provided too.

II.4.3 Demographics

The last part of the survey was demographic questions to facilitate categorizing the survey respondents into various groups. Most choice options (answers) to these questions were in a range format because usually the participants do not like to provide detailed personal information for a market research (Gray & Guppy, 2003c). The questions in the demographic section were about: their gender, responsibility for grocery shopping at their household, age category, household size and family member age categories, educational level, employment status, total annual household income, their background culture, their community size and the years that they lived in Canada.

II.5 Ethics principles

UBC Behavioural Research Ethics Board regulations regarding human ethics were applied to conduct the survey. Full board review approval is displayed in Appendix V.

II.6 Implementing the survey

Online survey software from QuestionPro Company (Seattle, US) was used to conduct the online survey.

According to Dillman (2007) and Gray & Guppy (2003b), it was necessary to conduct a pretest before finalizing the questionnaire. At least 30 respondents filled out the survey. The pretest participants were faculty members, students and friends of the Faculty of Land and Food Systems (LFS). Potential software malfunctions, the clarity of the questions, typo mistakes, ease of filling out the survey and the estimated time to fill out the survey were examined and remedied. Descriptive analysis was conducted on the pretest results to make sure that the survey questions will address the research objectives of this project. The questionnaire was finalized according to the results of the pretest.

The final online survey was launched on June 10th 2009 and it was closed on June 30th 2009. The potential respondents were divided into two groups to eliminate the time bias and each group had 10 days to fill out and return the survey. A reminder invitation email was sent to those respondents who had not participated in the survey three days before the expiration date. The respondents were able to submit the survey only once because of the limitation of the survey software.

II.7 Data analysis

The software provided different formats of the results. The open ended questions were read and summarized. The results were coded and Microsoft Office Excel 2007 and PASW Statistics 17 (SPSS) software were used to analyze the data. Descriptive analysis was conducted on the results of all 28 questions. According to the scale of measurement (ratio, interval, ordinal and nominal) for each question and considering the assumptions of tests, appropriate tests were applied to the questions to find out the significant relationships and significant differences. Significance level for all assumptions in this research was $p < 0.05$ except in the cases that Bonferroni adjustment was necessary.

In addition to descriptive analysis (Frequencies, Cross-tabs, etc) the following parametric tests were used:

- Standardized test (Z)
- One-Way ANOVA
- Pearson Correlation

Non-parametric tests that were used in this research:

- Chi-Square test
- Kolmogorov-Smirnov test
- Two independent samples test (Mann-Whithney U)
- Test for several independent samples (Kruskal-Wallis H)
- Two related sample test (Wilcoxon)
- Test for several related samples (Friedman)
- Spearman Correlation

II.8 References

- BERNARD, J.C., PAN, X. and SIROLI, R.** (2005) Consumer attitudes toward genetic modification and other possible production attributes for chicken. *Journal of Food Distribution Research* **36(2)** 1-11
- DILLMAN, D.** (2007) Mail and internet surveys. (Second), (John Wiley & Sons, Inc.).
- FEARNE, A. and LAVELLE, D.** (1996) Segmenting the UK egg market: results of a survey of consumer attitudes and perceptions. *British Food Journal* **98(1)** 7-12
- GODDARD, E., BOXALL, P., EMUNU, J.P., BOYD, C., ASSELIN, A. and NEALL, A.** (2007) Consumer attitudes, willingness to pay and revealed preferences for different egg production attributes: analysis of Canadian egg consumers. Project report (07-03) published by *Department of Rural Economy, University of Alberta*
<http://www.uofaweb.ualberta.ca/re//pdfs/PR%2007-03.pdf>
- GRAY, G. and GUPPY, N.** (2003a) Developing the research question. In: VEITCH, E. (Third) *Successful Surveys: Research Methods and Practice*, 33-49, (Thomson, Nelson, Canada).
- GRAY, G. and GUPPY, N.** (2003b) Pre-testing the questionnaire. In: VEITCH, E. (Third) *Successful Surveys: Research Methods and Practice*, 128-130 (Thomson, Nelson, Canada).
- GRAY, G. and GUPPY, N.** (2003c) *Successful Surveys: Research Methods and Practice*. (Third), (Thomson, Nelson, Canada).
- INTERNET WORLD STATS** (2009) Internet usage and population growth. *Internet World Stats*, <http://www.internetworldstats.com/am/ca.htm>
- PRINT MEASUREMENT BUREAU** (2008) Kinds of eggs used in the household in past 30 days. *Print Measurement Bureau, PMB, Table 27*, Restricted data,
http://www.pmb.ca/public/e/product_data/reports_online_gateway.shtml

STATISTICS CANADA. (2007) Canadian Internet use survey, Internet use, by location of access, Canada, provinces and selected census metropolitan areas (CMAs), every 2 years (percent). *E-STAT, CANSIM, Table 358-0122*, Restricted data, Retrieved July 11, 2009 from http://estat.statcan.gc.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm

VALUE CHAIN MANAGEMENT CENTRE (2009) Consumer Data for Farmers & the agri-food industry, Condensed Chicken Report on National Purchasing Panel Data. *George Morris Centre*, Retrieved 10/01, 2009 from <http://www.vcmtools.ca/pdf/Chicken%20report%20final.pdf>

VUKASOVIČA, T. (2009) Consumer perception of poultry meat and the importance of country of origin in a purchase making process. *World's Poultry Science Journal* **65(01)** 65-65-74

ZIKMUND, W.G. (2003) Advantages and disadvantages of typical survey methods. In: (edition 8) *Exploring Marketing Research*, 240, (Thomson, South-Western).

APPENDIX III: Invitation E-mail

From: UBC LFS <eggsurvey@landfood.ubc.ca>

Subject: UBC Egg Research

The University of British Columbia

Faculty of Land and Food Systems

Dear British Columbia resident,

You are invited to participate in our survey regarding the purchase and consumption of various types of chicken eggs. The survey will take approximately 6 to 9 minutes to complete. Submit your survey by June 30, 2009. You will be entered in a draw to win one of five \$100 gift cards.

This survey is designed to collect information on the attitudes, preferences and demographics of chicken egg consumers. The data from this survey will be used as part of a Master's thesis completed within the Faculty of Land and Food Systems at **The University of British Columbia**. An electronic copy of the thesis will be available in 'cIRcle: UBC's Institutional Repository' upon completion (<https://circle.ubc.ca/>).

Please note the following:

- This survey is intended for British Columbia residents 19 years of age or older. If you are not a resident of British Columbia, or if you are under the age of 19, please disregard this request to participate in the survey.
- Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point.
- Your survey responses will be confidential and data from this research will be reported only in the aggregate and for academic research purposes only. Your information will be coded for documentation purposes only and will remain confidential.

Your participation in this survey is greatly appreciated. If you have questions at any time about the survey or the procedures, you may contact us by email at: eggssurvey@landfood.ubc.ca.

Please click on the "Start Survey" link to begin the survey.

<SURVEY_LINK>

Thank you for your participation.

Dr. Kim Cheng, Professor, Animal Science, Faculty of Land and Food Systems

Dr. James Vercauteren, Professor, Food and Resource Economics, Faculty of Land and Food Systems

Dr. Eunice C.Y. Li-Chan, Professor, Food Science, Faculty of Land and Food Systems

Dr. Sanghoon Lee, Assistant professor, Strategy and Business Economics, Sauder School of Business

Masoumeh Bejaei, M.Sc. Candidate, Animal Science, Faculty of Land and Food Systems

<SURVEY_LINK>

“This online survey company is hosted by a websurvey company located in the USA and as such is subject to U.S. laws. In particular, the US Patriot Act which allows authorities access to the records of internet service providers. This survey or questionnaire does not ask for personal identifiers or any information that may be used to identify you. The websurvey company servers record incoming IP addresses of the computer that you use to access the survey but no connection is made between your data and your computer’s IP address. If you choose to participate in the survey, you understand that your responses to the survey questions will be stored and accessed in the USA. The security and privacy policy for the websurvey company can be found at the following link: <http://www.questionpro.com/help/1-window.html>”.

<SURVEY_LINK>

University of British Columbia, Faculty of Land and Food Systems | 190C, Macmillan Building,
| Main Mall | Vancouver | British Columbia | V6T 1Z4 | Canada

APPENDIX IV: Online Questionnaire

Five \$100 gift cards! Thank you very much for your time and support. We estimate that it may take 6 to 9 minutes to complete the survey. To start the survey click on the Continue button below:

Continue

Section 1: In this section we will be asking about your awareness of various types of chicken eggs.

Rate your awareness of the following types of chicken eggs prior to this survey.

(Please rate each using the scale of 1 = Never heard of it to 5= Know all about it).

	1. Never heard of it	2	3	4	5. Know a lot about it
White Regular eggs	<input type="checkbox"/>				
Brown Regular eggs	<input type="checkbox"/>				
Free-run eggs	<input type="checkbox"/>				
Free-range eggs	<input type="checkbox"/>				
Organic eggs	<input type="checkbox"/>				
Omega-3 Enhanced eggs	<input type="checkbox"/>				
Vitamin Enhanced eggs	<input type="checkbox"/>				
Vegetarian Feed Only eggs	<input type="checkbox"/>				

These are the definitions of the types of chicken eggs mentioned in the above question.

White Regular (Classic) eggs: These eggs are produced from chicken hens that are kept in cages. White-feathered hens lay white eggs.

Brown Regular (Classic) eggs: These eggs are produced from chicken hens that are kept in cages. Brown-feathered hens lay brown eggs.

Free-run eggs: These eggs are produced from chicken hens that are allowed to roam freely in an enclosed facility (floor pens). These hens do not have access to outdoors spaces. The shell color of these eggs can be either white or brown.

Free-range eggs: These eggs are produced from chicken hens that have access to nesting boxes, floor pens, perches and outdoor spaces. The shell color of these eggs could be either white or brown.

Organic eggs: These eggs are produced by chicken hens that are fed a diet of certified organic grains and raised in accordance with guidelines issued by certifying agencies. The shell color of these eggs could be either white or brown.

Omega-3 Enhanced eggs: These eggs are produced by chicken hens that are fed a diet that includes omega-3 polyunsaturated fatty acids. As a result of this diet, the hens produce eggs that contain 0.3 grams or more of Omega-3 polyunsaturated fatty acids per large egg. The chicken hens can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown.

Vitamin Enhanced eggs: These eggs are produced by chicken hens fed a nutritionally-enhanced diet containing higher levels of certain nutrients (e.g., vitamin E, folate, vitamin B6 and vitamin B12). As a result of this diet, the hens produce eggs with a higher level of these nutrients. The chicken hens can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown.

Vegetarian Feed Only eggs: These eggs are produced by chicken hens that are fed a diet containing ingredients of plant origin only (no animal by products in feed). The chicken hens can be caged, free-run, or free-range and the shell color of these eggs could be either white or brown.

Select one of the following statements that best describes your purchase and consumption of any type of chicken eggs in the last 30 days.

(Please select one of the following).

1. I purchased eggs for my household and I ate eggs at home.
2. I purchased eggs for my household and I did not eat eggs at home.
3. I did not purchase eggs for my household and I ate eggs at home.
4. I did not purchase eggs for my household and I did not eat eggs at home.

Section 2

Select from the list below the type(s) of chicken eggs that you have purchased for your household /eaten at home in the last 30 days.

(Please select as many as apply).

1. White Regular
2. Brown Regular
3. Free-run
4. Free-range
5. Organic
6. Omega-3 Enhanced
7. Vitamin Enhanced
8. Vegetarian Feed Only
9. Omega-3 & Vitamin Enhanced
10. Vitamin Enhanced & Vegetarian
11. Omega-3, Vitamin Enhanced & Vegetarian
12. Other shell chicken eggs (please specify) _____

Section 3: In this section we will be asking about your consumption habits of selected type(s) of chicken eggs.

How many eggs did you yourself eat at home in the last 30 days of the following type(s) of chicken eggs?

(Please type the number in the provided space).

	Number of eggs
White Regular	<input type="text"/>
Brown Regular	<input type="text"/>
Free-run	<input type="text"/>
Free-range	<input type="text"/>
Organic	<input type="text"/>
Omega-3 Enhanced	<input type="text"/>
Vitamin Enhanced	<input type="text"/>
Vegetarian Feed Only	<input type="text"/>
Omega-3 & Vitamin Enhanced	<input type="text"/>
Vitamin Enhanced & Vegetarian	<input type="text"/>
Omega-3, Vitamin Enhanced & Vegetarian	<input type="text"/>
Other shell chicken eggs	<input type="text"/>

How often did you yourself eat eggs at home per week (over the last 30 days)?

(Please select your option).

	Never	Special occasions	1-2 times per week	3-5 times per week	6-7 times per week	More than 7 times per week
White Regular	<input type="checkbox"/>					
Brown Regular	<input type="checkbox"/>					
Free-run	<input type="checkbox"/>					
Free-range	<input type="checkbox"/>					
Organic	<input type="checkbox"/>					
Omega-3 Enhanced	<input type="checkbox"/>					
Vitamin Enhanced	<input type="checkbox"/>					
Vegetarian Feed Only	<input type="checkbox"/>					
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>					
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Other shell chicken eggs	<input type="checkbox"/>					

Select the form or method of preparation in which you most commonly eat your eggs. (Please select all that apply).

	Baked	Boiled	Fried	Microwave	Omelets	Raw	Scrambled	Mix with other food ingredients	Other
White Regular	<input type="checkbox"/>	<input type="checkbox"/>							
Brown Regular	<input type="checkbox"/>	<input type="checkbox"/>							
Free-run	<input type="checkbox"/>	<input type="checkbox"/>							
Free-range	<input type="checkbox"/>	<input type="checkbox"/>							
Organic	<input type="checkbox"/>	<input type="checkbox"/>							
Omega-3 Enhanced	<input type="checkbox"/>	<input type="checkbox"/>							
Vitamin Enhanced	<input type="checkbox"/>	<input type="checkbox"/>							
Vegetarian Feed Only	<input type="checkbox"/>	<input type="checkbox"/>							
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>	<input type="checkbox"/>							
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>	<input type="checkbox"/>							
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>	<input type="checkbox"/>							
Other shell chicken eggs	<input type="checkbox"/>	<input type="checkbox"/>							

When eating eggs, do you prefer a darker yolk color?

(Please select one of the following).

1. Yes
2. No
3. Not sure

Given you prefer a darker yolk color, what are your four top reasons for this preference? (Please select up to four reasons).

1. Better taste
2. Freshness
3. Healthy food
4. Hens fed better feed
5. High animal welfare standards
6. High nutritional value
7. Local product
8. Visual appeal
9. Other (please specify) _____

Section 4: In this section we will be asking about your purchase habits or preferences for selected type(s) of chicken eggs.

How many eggs did you yourself purchase for your household in the last 30 days of the following type(s) of chicken eggs?

(Please type the number in the provided space).

	Number of eggs
White Regular	<input type="checkbox"/>
Brown Regular	<input type="checkbox"/>
Free-run	<input type="checkbox"/>
Free-range	<input type="checkbox"/>
Organic	<input type="checkbox"/>
Omega-3 Enhanced	<input type="checkbox"/>
Vitamin Enhanced	<input type="checkbox"/>
Vegetarian Feed Only	<input type="checkbox"/>
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>
Other shell chicken eggs	<input type="checkbox"/>

When you purchase eggs, what size of carton do you generally purchase?

(Please select your option).

	6 eggs	12 eggs	18 eggs	20 eggs	30 eggs	Other
White Regular	<input type="checkbox"/>					
Brown Regular	<input type="checkbox"/>					
Free-run	<input type="checkbox"/>					
Free-range	<input type="checkbox"/>					
Organic	<input type="checkbox"/>					
Omega-3 Enhanced	<input type="checkbox"/>					
Vitamin Enhanced	<input type="checkbox"/>					
Vegetarian Feed Only	<input type="checkbox"/>					
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>					
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Other shell chicken eggs	<input type="checkbox"/>					

When you are in the store purchasing eggs, how important are the following product characteristics?

(Please rate each product characteristic using the scale of 1 = Not at all important to 5= Very important, or as No opinion).

	No opinion	1. Not at all important	2	3	4	5. Very important
Brand name	<input type="checkbox"/>					
Local product	<input type="checkbox"/>					
Shell color	<input type="checkbox"/>					
Package material	<input type="checkbox"/>					
Price	<input type="checkbox"/>					
'Best before' date	<input type="checkbox"/>					
Taste	<input type="checkbox"/>					
Nutrient information on package	<input type="checkbox"/>					
Size of the egg	<input type="checkbox"/>					
Yolk color	<input type="checkbox"/>					
Care and feeding of hens	<input type="checkbox"/>					

Please list any additional product characteristics that influence your purchase of eggs.

In the last 30 days, where did you buy chicken eggs of any type for your household? (Please select all that apply).

1. Costco
2. Extra Foods
3. Famous Foods
4. Marketplace IGA
5. No Frills
6. Real Canadian Superstore
7. Safeway
8. Save-On-Foods
9. Sobeys
10. Super Value
11. T&T Supermarket
12. Thrifty Foods
13. Wal-Mart
14. Zellers
15. Other (please specify) _____

On an average week, how much does your total household spend on grocery food products?

(Please select one of the following).

1. Less than \$100
2. \$100 - \$200
3. \$201 - \$300
4. \$301 - \$400
5. \$401 - \$ 500
6. Over \$500

What are the top four sources of information that you use when deciding to purchase a food product?

(Please select up to four sources).

1. Books (Nutrition, cook books)
2. Grocery store flyers
3. Email
4. Food labels
5. Magazines
6. Newspapers
7. Radio
8. TV
9. Websites
10. Word of mouth
11. Other (please specify) _____

Which size of chicken eggs do you prefer?

(Please select one of the following).

1. Peewee
2. Small
3. Medium
4. Large
5. Extra Large
6. Jumbo

Which shell color do you prefer? (Please select one of the following).

1. White
2. Brown
3. Both
4. Either white or brown
5. Other (please specify) _____

Based on your personal knowledge, please rate the nutritional value of the following type(s) of chicken eggs? (Please rate using the scale of 1= Very poor to 5= Excellent, or as No opinion).

	No opinion	1. Very poor	2	3	4	5. Excellent
White Regular	<input type="checkbox"/>					
Brown Regular	<input type="checkbox"/>					
Free-run	<input type="checkbox"/>					
Free-range	<input type="checkbox"/>					
Organic	<input type="checkbox"/>					
Omega-3 Enhanced	<input type="checkbox"/>					
Vitamin Enhanced	<input type="checkbox"/>					
Vegetarian Feed Only	<input type="checkbox"/>					
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>					
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>					
Other shell chicken eggs	<input type="checkbox"/>					

Please select up to four factors for the following type(s) of chicken eggs that you consider important when selecting a type of egg.

(Please select a maximum of four factors for each type of egg).

	Taste	Healthy choice	Animal welfare	Environmental concerns	Price	Ease of prepare	Nutritional value	Other
White Regular	<input type="checkbox"/>							
Brown Regular	<input type="checkbox"/>							
Free-run	<input type="checkbox"/>							
Free-range	<input type="checkbox"/>							
Organic	<input type="checkbox"/>							
Omega-3 Enhanced	<input type="checkbox"/>							
Vitamin Enhanced	<input type="checkbox"/>							
Vegetarian Feed Only	<input type="checkbox"/>							
Omega-3 & Vitamin Enhanced	<input type="checkbox"/>							
Vitamin Enhanced & Vegetarian	<input type="checkbox"/>							
Omega-3, Vitamin Enhanced & Vegetarian	<input type="checkbox"/>							
Other shell chicken eggs	<input type="checkbox"/>							

If you selected other in the previous question, please specify the additional factors of importance in the space below:

Section 5: In this section we will be asking why you do not eat chicken eggs at home.

Please select up to four reasons why you do not eat eggs at home.

1. Egg allergy
2. Health concerns
3. Animal welfare concerns
4. Environmental concerns
5. Nutritional value
6. Cost
7. Taste
8. Eating eggs at the restaurant
9. Difficulty with cooking eggs
10. Unavailability of eggs
11. Usage of substitute product(s) (e.g. white egg powder)
12. Other (please specify) _____

Section 6: In this section we will be asking demographics questions to allow categorizing of survey respondents.

You are:

1. Male
2. Female

Who is responsible for grocery shopping in your household?

(Please select one of the following).

1. Myself
2. Other household member
3. Myself and other household member equally
4. Someone else

Which of the following age groups do you fall into?

(Please select one of the following).

1. 19 yrs. or younger
2. 20 - 29 yrs.
3. 30 - 39 yrs.
4. 40 - 49 yrs.
5. 50 - 59 yrs.
6. 60 - 69 yrs.
7. 70+ yrs.

Including yourself, how many people live in your household in the following age categories?

(Please type the number in the provided space).

	Number of people live in your household
4 yrs. or younger	<input type="checkbox"/>
5 - 14 yrs.	<input type="checkbox"/>
15 - 19 yrs.	<input type="checkbox"/>
20 - 39 yrs.	<input type="checkbox"/>
40 - 59 yrs.	<input type="checkbox"/>
60 + yrs.	<input type="checkbox"/>

What is the highest level of education that you have attained?

(Please select one of the following).

1. Elementary School
2. High School
3. College/Technical School/ Diploma
4. Some University
5. Bachelors Degree
6. Post baccalaureate Professional Degree
7. Masters Degree
8. Ph.D. or equivalent
9. Other (please specify) _____

You are:

(Please select one of the following).

1. Full time employed
2. Part time employed
3. Self Employed
4. Full-time Homemaker
5. Student
6. Retired
7. Looking for a job
8. Other _____

Which of the following broad categories best describes your annual total household income in 2008? (Annual total house income is defined as the total earnings of all people in your household before taxes).

(Please select one of the following).

1. Below \$20,000
2. \$20,000 - \$39,999
3. \$40,000 - \$59,999
4. \$60,000 - \$79,999
5. \$80,000 - \$99,999
6. More than \$100,000

To which ethnic/cultural group do you belong?

(Please select all that apply).

1. Aboriginal
2. Arab
3. Black
4. Chinese
5. Filipino
6. Japanese
7. Korean
8. Latin American
9. South Asian (e.g. East Indian, Pakistani)
10. Southeast Asian (e.g. Indonesian, Vietnamese)
11. West Asian (e.g. Afghan, Iranian)
12. European (White or Caucasian)
13. Other (please specify) _____

Would you consider your community you reside in to be?

(Please select one of the following).

1. Rural area
2. Small town in rural area
3. Medium sized town in rural area
4. Suburban area surrounding a large to medium city
5. Medium sized city
6. Large sized city
7. Other (please specify) _____

How long have you lived in Canada? (Please select one of the following).

1. Less than one year
2. 1 to 2 years
3. More than 2 year less than 5 years
4. More than 5 year less than 10 years
5. More than 10 years

Suggestions/ comments regarding this survey:

APPENDIX V: Behavioural Research Ethics Board Certificate of Approval



The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road, Vancouver,
B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - FULL BOARD

PRINCIPAL INVESTIGATOR: Kimberly M. Cheng	INSTITUTION / DEPARTMENT: UBC/Land and Food Systems/Avian Research Centre	UBC BREB NUMBER: H09-01160
INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:		
Institution		Site
UBC		Vancouver (excludes UBC Hospital)
Other locations where the research will be conducted: This research will gather the data via an online survey from some randomly selected British Columbia residents.		
CO-INVESTIGATOR(S): Masoumeh Bejaei		
SPONSORING AGENCIES: UBC Faculty of Land and Food Systems		
PROJECT TITLE: Attitudes, Preferences and Demographics of Consumers/Customers of Specialty Eggs		
REB MEETING DATE: May 28, 2009	CERTIFICATE EXPIRY DATE: May 28, 2010	
DOCUMENTS INCLUDED IN THIS APPROVAL:		DATE APPROVED: June 5, 2009
Document Name	Version	Date
Protocol:		
Research Proposal	N/A	May 13, 2009
Questionnaire, Questionnaire Cover Letter, Tests:		
On-line Questionnaire	N/A	May 13, 2009
Letter of Initial Contact:		
Initial contact message	N/A	May 13, 2009
Other: http://www.questionpro.com/akira/TakeSurvey?id=1217395		
The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.		
<p><i>Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:</i></p> <hr/> <p>Dr. M. Judith Lynam, Chair Dr. Ken Craig, Chair Dr. Jim Rupert, Associate Chair Dr. Laurie Ford, Associate Chair Dr. Anita Ho, Associate Chair</p>		