Agri-Environmental Management
in Southern Ontario:
Enhanced Program Participation through Better Understanding
of Dairy Farmers’ Social Dynamics

by
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ABSTRACT

Agri-Environmental Management in Southern Ontario:
Enhanced Program Participation through Better Understanding of Dairy Farmers’ Social Dynamics

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This research advances agri-environmental management processes by increasing awareness of changes in farming practice due to the influence of social network dynamics. This research analyzes social network factors in three interconnected components. The first is an examination of the social structural influences on change. Theories of habitus and field in decision-making are used to understand the socio-economic factors that influence individual farmers. The second component examines the development and evolution of social innovation processes. This is achieved through studying and measuring the social factors that influence decision-making within farmer networks. The third component examines farmers’ perception of agri-environmental programming, and how a better understanding of it can lead to greater adaptive management capacity for programmers. To accomplish these objectives, this research looked at the dynamics of farmer response to participation in three agri-environmental programs in Ontario: the Environmental Farm Plan, the Rural Water Quality Program, and the Clean Water Program. A mixed-methods approach was used, including a combination of preliminary interviews, semi-structured interviews, workshops, and a survey questionnaire. The original hypothesis assumed that more socially connected farmers would also be more inclined to participate in agri-environmental programs; however, this assumption was not completely supported. One observation from the research is that knowledge and innovation in environmental farming practice is shifting from formalized, bureaucracy-centred sources of information, toward decentralized, context-specific learning through personalized social networks. Policy recommendations include understanding the detailed, place-specific requirements needed to mobilize agri-environmental innovation. These recommendations include factors such as the need for monitoring, evaluation, knowledge relevance, adaptive planning, and using a hybrid of both old and new means of extension, outreach and communication.
ACKNOWLEDGEMENTS

Initial gratitude must go to those who helped develop my graduate school research aptitude and sense of the possible while at York University. These include Roger Keil, Deborah Barndt and Rod MacRae from the Faculty of Environmental Studies. While in Mexico, at the Centre for Advanced Studies in the Social Sciences, Gabriel Torres taught me applied fieldwork skills from his attentive interviewing and workshop facilitation.

Prior to my doctoral studies, I had the opportunity to work with many people in the agricultural sector who enriched my perspective. Among the most notable are Alex Mills, a Holland Marsh organic grain farmer who always valued the practical in the theoretical and the theoretical in the practical. Wayne Roberts of the Toronto Food Policy Council provided great ideas to consider for a PhD.

While at the University of Guelph, I had the fortune to meet many people committed to agricultural sustainability. I have engaged in conversations regarding this research with Paul Smith and Darryl Finnigan at OMAFRA. Andrew Graham, at OSCIA, shared his perspective on the evolution of agri-environmental planning. As a doctoral student, I attended two sessions of the International Comparative Rural Policy Studies Summer Institute and valued the learning experience shared with fellow students and with professors Tony Fuller, Thomas Johnson, and John Bryden. On several occasions, I gained broader perspectives on rural development from Ricardo Ramirez, Karen Landman and Helen Hambly.

In the fieldwork stage, I have been exposed to people involved in all aspects of agriculture. In 2007-2008, workshops were conducted across the Greater Toronto Area with farmers to gauge their perspectives on the Greenbelt. I thank all the farmers we met
for their insights. When this thesis research began, I held meetings with Harold Cress, a dairy farmer from southwestern Ontario. He helped to open the first window into the dairy sector for me and it is much appreciated. The Eastern Ontario Water Resources Committee and South Nation Conservation welcomed my fieldwork in South Nation watershed during the summer of 2009 with a generous research grant. Ronda Boutz at South Nation Conservation has been a vital link in helping understand connections between agriculture and the goals of the Clean Water Program. At the Grand River Conservation Authority, Tracey Ryan has been fundamental to gaining deeper awareness of the context and achievements of the Rural Water Quality Program. She provided valuable suggestions for this research that significantly improved the methodology. At the Dairy Farmers of Ontario, I am grateful to Wes Lane, who has been vital to this entire research process. From its early stages, he has shown genuine interest in the project, providing recommendations to improve the objectives, helping to facilitate administration of the survey through the DFO office, and sharing valuable perspectives on dairy research in Ontario.

At the University of Guelph, notable acknowledgement goes to Hans Bakker and Patrick Parnaby in the Department of Sociology-Anthropology. From the Ontario Agricultural College, I would like to thank Ralph Martin, Robert Gordon, Stew Hilts, David Douglas, Melissa Watkins, Alan Watson, Joy Sammy, Patrick Carroll, and John Fitzgibbon. Also, the engaging spirit of the dairy farmers who were open to my many questions during my fieldwork remains one of the most valuable rewards from the past few years. To them, and to the colleagues that I met in the Grand River and South Nation watersheds, and at Alfred College, thank you.

The administration of the many elements of this research has been managed by the professionalism of the staff at the School of Environmental Design and Rural
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My greatest academic gratitude goes to my advisory committee. Tony Winson has given encouragement for the ideas in this research. David Waltner-Toews has inspired my thinking into how the world is both complex and simple. Glen Filson has been with this project from the beginning. I am grateful to him for the creative conversations we have had, and for his consistent, insightful perspectives. To Harry Cummings, who was the first to open his door to me and the idea of a doctoral project at Guelph, has shown faith and took on the project that he may never have expected to evolve the way it has. From him, I re-learned values of diligence, persistence, and pragmatism, thank you.

A few last notes for my family—to my grandmother for her wisdom, and to my mother for her dedication, hard work and persistence. To my brother, who always makes time to share something funny or a lesson learned. To Katie, with whom I have experienced so much in the past few years, I thank her for her patience, perspective, and character, and of course for the wonderful little guy that we have brought into the world together, our son Hugo. Finally, I dedicate this thesis to two people; to the memory of my father, Andras Juhasz, for his dedication to family and friends, and to my son Hugo. I hope we raise him in a world where he knows nutritious food from healthy landscapes.
Table of Contents

ABBREVIATIONS ........................................................................................................ xi

I. INTRODUCTION: BACKGROUND AND CONTEXT ........................................ 1
   Statement of Research Interest and Rationale .................................................. 1
   Research Goal, Objectives & Hypotheses ....................................................... 2
   Research Strengths and Considerations ......................................................... 3
   Overview: Outline of Chapters ................................................................... 6

II. THEORETICAL AND CONCEPTUAL FRAMEWORK ................................... 10
   Introduction .................................................................................................. 10
   CORE AREA 1: Social Structures in Social Networks .................................. 11
   Social Structure in Decision-Making Processes .......................................... 11
   Habitus ......................................................................................................... 12
   Field ............................................................................................................ 14
   Integrating habitus and field in Bourdieu’s practice theory ...................... 16
   Social Networks ......................................................................................... 17
   CORE AREA 2: Adoption and Diffusion of Innovations ............................... 21
   Theories, Concepts and Critiques of ADI ............................................... 22
   ADI Theory Applied to Sustainable Agriculture ......................................... 26
   CORE AREA 3: Adaptive Management ...................................................... 31
   Historical Context ...................................................................................... 31
   Applications in Adaptive Management ....................................................... 34
   Supply Management and Adaptive Management ........................................... 36
   Situating the Theoretical-Conceptual Framework ...................................... 38
   Conclusion .................................................................................................. 43

III. RESEARCH METHODOLOGY AND METHODS ....................................... 45
   Introduction .................................................................................................. 45
   Methodological Theory ............................................................................... 47
   The Value of Mixed Methods Research ...................................................... 51
   Integrating Mixed Methods ......................................................................... 52
   Quantitative and Qualitative Aspects Specific to this Research .................. 53
   Preliminary Fieldwork ............................................................................... 53
   Research Proposal Process ......................................................................... 54
   Fieldwork Data Sample Collection Process ............................................... 56
   Data Analysis .............................................................................................. 61
   Conclusion .................................................................................................. 66
### IV. AGRI-ENVIRONMENTAL PROGRAMS AND WATERSHEDS DESCRIPTIVE PROFILE

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watersheds Profile</td>
<td>68</td>
</tr>
<tr>
<td>Programs</td>
<td>72</td>
</tr>
<tr>
<td>Environmental Farm Plan</td>
<td>72</td>
</tr>
<tr>
<td>Grand River Conservation Authority: Rural Water Quality Program</td>
<td>80</td>
</tr>
<tr>
<td>South Nation Conservation: Clean Water Program</td>
<td>83</td>
</tr>
<tr>
<td>Conclusion</td>
<td>85</td>
</tr>
</tbody>
</table>

### V. DESCRIPTIVE PROFILE OF RESEARCH PARTICIPANTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of Survey Participants</td>
<td>87</td>
</tr>
<tr>
<td>Degree of Participation</td>
<td>87</td>
</tr>
<tr>
<td>Comparative Profile of Survey Representativeness</td>
<td>88</td>
</tr>
<tr>
<td>Education</td>
<td>90</td>
</tr>
<tr>
<td>Age</td>
<td>91</td>
</tr>
<tr>
<td>Sex</td>
<td>91</td>
</tr>
<tr>
<td>Land Managed</td>
<td>92</td>
</tr>
<tr>
<td>Herd Size</td>
<td>93</td>
</tr>
<tr>
<td>Farm Income</td>
<td>94</td>
</tr>
<tr>
<td>Location: County and Township</td>
<td>95</td>
</tr>
<tr>
<td>Generations on Farm</td>
<td>96</td>
</tr>
<tr>
<td>Farm Succession</td>
<td>97</td>
</tr>
<tr>
<td>Farm Practice</td>
<td>97</td>
</tr>
<tr>
<td>Farm Project Choice</td>
<td>98</td>
</tr>
<tr>
<td>Farm Organizations</td>
<td>99</td>
</tr>
<tr>
<td>Communication Technology Use</td>
<td>104</td>
</tr>
<tr>
<td>Conclusion</td>
<td>105</td>
</tr>
</tbody>
</table>

### VI. DATA ANALYSIS AND FINDINGS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>108</td>
</tr>
<tr>
<td>a. Socio-economic Factors</td>
<td>109</td>
</tr>
<tr>
<td>Education</td>
<td>110</td>
</tr>
<tr>
<td>Age</td>
<td>111</td>
</tr>
<tr>
<td>Land Managed</td>
<td>112</td>
</tr>
<tr>
<td>Sex</td>
<td>113</td>
</tr>
<tr>
<td>Farm Income</td>
<td>114</td>
</tr>
<tr>
<td>b. Social Influence Factors</td>
<td>116</td>
</tr>
<tr>
<td>Generations’ On-Farm</td>
<td>118</td>
</tr>
<tr>
<td>Farm Succession</td>
<td>119</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Social Knowledge Source</td>
<td>120</td>
</tr>
<tr>
<td>Immediate Social Influence</td>
<td>124</td>
</tr>
<tr>
<td>Influence of Neighbour’s Participation</td>
<td>125</td>
</tr>
<tr>
<td>Farmer Social Relationships</td>
<td>126</td>
</tr>
<tr>
<td>Social Event Attendance</td>
<td>129</td>
</tr>
<tr>
<td>Social Referencing</td>
<td>131</td>
</tr>
<tr>
<td>Farm Organization Social Networks</td>
<td>132</td>
</tr>
<tr>
<td>Communications Technology Use</td>
<td>134</td>
</tr>
<tr>
<td>c. Farmer Perception of Program Value</td>
<td>135</td>
</tr>
<tr>
<td>Program Value</td>
<td>137</td>
</tr>
<tr>
<td>Program Finance</td>
<td>139</td>
</tr>
<tr>
<td>Program Communication</td>
<td>142</td>
</tr>
<tr>
<td>Program Planning and Outreach</td>
<td>144</td>
</tr>
<tr>
<td>Regression Analysis</td>
<td>145</td>
</tr>
<tr>
<td>Summary</td>
<td>148</td>
</tr>
<tr>
<td>VII. DISCUSSION</td>
<td>154</td>
</tr>
<tr>
<td>Introduction</td>
<td>154</td>
</tr>
<tr>
<td>Contributions and Considerations for Section A:</td>
<td>154</td>
</tr>
<tr>
<td>Social Structures in Social Networks</td>
<td>154</td>
</tr>
<tr>
<td>Socio-economic Factors: Education, Farm Size, Farm Income</td>
<td>157</td>
</tr>
<tr>
<td>Social Influence Factors: Farm Continuity (Generations on-farm and Farm Succession)</td>
<td>159</td>
</tr>
<tr>
<td>Distance of Network Influence: Social Knowledge Sourcing, Immediate Knowledge Sourcing, Social Referencing</td>
<td>160</td>
</tr>
<tr>
<td>Broader Social Influence: Farmer Social Relationships, Social Event Attendance, Farm Organization Social Networks, Communication Technology Use</td>
<td>161</td>
</tr>
<tr>
<td>Program Perception: Value, Financing, Communication, Planning and Outreach</td>
<td>163</td>
</tr>
<tr>
<td>Contribution and Considerations for Section B:</td>
<td>165</td>
</tr>
<tr>
<td>Adoption and Diffusion of Innovations</td>
<td>165</td>
</tr>
<tr>
<td>Farm Scale: Farmland Managed and Farm Income</td>
<td>166</td>
</tr>
<tr>
<td>Social Dynamics: Social Knowledge Sourcing, Immediate Vicinity Social Knowledge, Social Events, Social Referencing</td>
<td>167</td>
</tr>
<tr>
<td>Program Perception: Value, Finance, Communication, Planning and Outreach</td>
<td>170</td>
</tr>
<tr>
<td>Contributions and Considerations for Section C:</td>
<td>173</td>
</tr>
<tr>
<td>Adaptive Management</td>
<td>173</td>
</tr>
<tr>
<td>Conclusion: In Context of the Theoretical Framework</td>
<td>175</td>
</tr>
<tr>
<td>VIII. CONCLUSION, RECOMMENDATIONS AND FUTURE RESEARCH</td>
<td>179</td>
</tr>
</tbody>
</table>
LIST OF TABLES

5.1: Highest levels of formal education attained by survey participants 90
5.2: Farmland Managed (Owned and Rented combined) by Research Participants – Location and Size 92
5.3: Survey respondents indicating to what degree off-farm revenues contribute to their total income 95
5.4: Percentages of conservation practices being used by survey respondents 98
5.5: Most recent and most popular on-farm projects completed by survey respondents through the EFP and the RWQP or the CWP 99
6.1: Survey responses to socioeconomic factors testing program participation 110
6.2: Survey responses to social influence factors testing program participation 118
6.3: Survey responses to social influence factors testing for program participation 127
6.4: Survey responses to farmer perception factors testing program participation 136
6.5: EFP-focused variables tested in binary regression in relation to program participation 146
6.6: RWQP-CWP focused variables tested in binary regression in relation to prog. part 147

LIST OF FIGURES & MAPS

Figure 1: Map of Southern Ontario ................................................................. xii
Figure 2: Map of Grand River watershed ....................................................... xiii
Figure 3: Map of South Nation watershed .................................................... xiv
Figure 4: Theoretical - Conceptual Framework for Understanding Program Participation ................................................................. 42
Figure 5: The Environmental Farm Plan Program Structure ............................ 75
### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAFC</td>
<td>Agriculture &amp; Agri-food Canada</td>
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<td>APF</td>
<td>Agricultural Policy Framework</td>
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<tr>
<td>ADI</td>
<td>Adoption &amp; Diffusion of Innovations</td>
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<td>COFSP</td>
<td>Canada-Ontario Farm Stewardship Program</td>
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<td>CWP</td>
<td>Clean Water Program</td>
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<td>CFFO</td>
<td>Christian Farmers Federation of Ontario</td>
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<td>CURB</td>
<td>Clean Up Rural Beaches Program</td>
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<td>DFO</td>
<td>Dairy Farmers of Ontario</td>
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<td>EBR</td>
<td>Environmental Bill of Rights</td>
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<td>EFP</td>
<td>Environmental Farm Plan</td>
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<td>GRCA</td>
<td>Grand River Conservation Authority</td>
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<tr>
<td>IIAAS</td>
<td>Institute of Applied Systems Analysis</td>
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<tr>
<td>ICRPS</td>
<td>International Comparative Rural Policy Studies</td>
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<tr>
<td>MOE</td>
<td>Ministry of Environment</td>
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<tr>
<td>MNR</td>
<td>Ministry of Natural Resources</td>
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<td>NFU</td>
<td>National Farmers’ Union</td>
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<tr>
<td>NP</td>
<td>Non-Participant</td>
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<tr>
<td>OFEC</td>
<td>Ontario Farm Environmental Coalition</td>
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<td>OSCIA</td>
<td>Ontario Soil &amp; Crop Improvement Association</td>
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<tr>
<td>OFA</td>
<td>Ontario Federation of Agriculture</td>
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<tr>
<td>OMAFRA</td>
<td>Ontario Ministry of Agriculture, Food and Rural Affairs</td>
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<td>P</td>
<td>Participant</td>
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<td>P-R</td>
<td>Prescott-Russell</td>
</tr>
<tr>
<td>RWQP</td>
<td>Rural Water Quality Program</td>
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<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
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<td>SNC</td>
<td>South Nation Conservation</td>
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<td>SNA</td>
<td>Social Network Analysis</td>
</tr>
<tr>
<td>SWEEP</td>
<td>Soil &amp; Water Environmental Enhancement Program</td>
</tr>
<tr>
<td>SP</td>
<td>Super Participant</td>
</tr>
<tr>
<td>S-D-G</td>
<td>Stormont-Dundas-Glengarry</td>
</tr>
<tr>
<td>UCFO</td>
<td>Union de Cultivateurs de Franco-Ontariens</td>
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<tr>
<td>UPA</td>
<td>Union de Producteurs de Agricoles</td>
</tr>
<tr>
<td>WA</td>
<td>Workshop Aware</td>
</tr>
</tbody>
</table>
Figure 1: Map of Southern Ontario
Figure 2: Map of Grand River watershed
Figure 3: Map of South Nation watershed
I. INTRODUCTION: BACKGROUND AND CONTEXT

Statement of Research Interest and Rationale
The early inspiration for this research grew from the author’s interest in the intersecting worlds of agriculture, food, and the natural environment. Growing up in the suburbs north of Toronto in the 1980s and early 1990s, gave exposure to the juxtaposition between how people live in the city, in the suburbs, and in the countryside. The author witnessed the conversion of farmlands in the York Region to subdivisions and saw that the result was a disconnection between the natural ecosystem and the land, and between former and new uses and users. The author also saw how farming prioritized productivity over environmental sustainability, both in the Greater Toronto Area and across Ontario.

An important question in conducting this research was how farmers make choices in their interaction with the natural environment. How do they choose among the myriad choices, messages, images, and conflicting perspectives around them? These choices are increasingly influenced by their environmental awareness and education—which they receive through various media. The author’s observation was that farmers, faced with many choices from advocates and advertisers, tend to form their habits around certain consistent choices. However, at certain times these consistent choices might be questioned, and a change in decision-making might take place. What social conditions could lead to these changes?

That perceived relationship between choices and changes in decision-making inspired this research. A central concern is how farmers decide to take specific actions; and how those actions, influenced by their social world, affect the natural environment. The focus of this research is to advance knowledge of the social factors and influences that lead to more environmentally sustainable decision-making and actions. The author
decided to research the socio-economic context, trends and conditions of farming, including how farmers adapted to changing circumstances, and why there are so many different types of responses to environmental awareness and action.

The rationale for this project is to contribute to an understanding of how socio-economic and social structures influence the processes of farmers’ decisions to participate (or not) in these programs, and by so doing, contribute to better agri-environmental policy-making and programming in Ontario, and potentially across Canada and North America.

Research Goal, Objectives & Hypotheses

Goal

To advance agri-environmental management through greater awareness of program participation as influenced and motivated by the social dynamics of farming.

Objectives

1. To analyze if specific socio-economic factors can lead to greater program participation.
   a. Hypothesis: Degrees of participation are positively related to; education, age, land managed, male gender, farm income.

2. To identify and analyze the dynamics of social influence factors that can lead to greater program participation.
   b. Hypothesis: Farmers who participated in both the Environmental Farm Plan (EFP) and either the Rural Water Quality Program (RWQP) or the Clean Water Program (CWP) (termed from here on as Super-Participants) have significantly higher degrees of social network connectivity (location,
generations on-farm, succession plan, social knowledge, immediate social neighbour influence, farmer social relations, social event frequency, social referencing, farm organization social networks, and internet use).¹

3. To analyze farmers’ perceptions of how program improvements could lead to greater participation.

c. Hypothesis: There is a positive association between farmers’ perception of program (value, financial incentives, communication quality, planning and outreach effectiveness) and their degree of participation in those programs.

Research Strengths and Considerations

Strengths

This research thesis uses a three-streamed theoretical framework to conceptualize the analyzed problems:

- The **first stream**, consisting of structures in social networks, includes the goal of understanding farmers’ decision-making in relation to their socio-economic situations.

- The **second stream** draws on the dynamics of social innovation to advance understanding of farmers’ decision-making. This research assumes that decision-making transcends the individual’s socioeconomic profile, and that particular outcomes are based on collective social forces both within and beyond an individual’s social network.

¹ Greater context on the meaning of social network connectivity is outlined in the theoretical chapter (chapter 2) under Core Area 1: Social structures in Social Networks, and Core Area 2: Adoption and Diffusion of Innovations. In addition, the methodological chapter (chapter 3) describes how the naturalistic-constructivist process of theory development for this study built on the concept of ‘social network connectivity’.
• The **third stream** considers how programs that focus on improving the natural environment can adapt to the changing social dynamics of the farming community.

An added emphasis of this research is that its goal and objectives are policy focused. The project is structured to emphasize the need for change in environmental management, governance, and applied practice.

This study involved several stages of fieldwork that concentrated on gathering data and materials: preliminary meetings and interviews with farmers across Southern Ontario took place before the formal fieldwork began. This allowed ideas to be tested, and the research focus to be clarified. Once fieldwork began, in-person interviews were conducted to add nuance to the research perspective.\(^2\) Four evening workshops were conducted with farm practitioners over a period of several months, and the survey questionnaire was developed with the input of specialists from the University of Guelph, OMAFRA (Ontario Ministry of Agriculture, Food and Rural Affairs), the DFO (Dairy Farmers of Ontario) and OSCIA (Ontario Soil and Crop Improvement Association). The results of the field data, both qualitative and quantitative, were then analyzed with the input of the authors’ thesis advisory committee.

It is important to note the context in which this research methodology was developed. The author had previously conducted a one-year research project that included workshops with Greater Toronto Area farmers in the Greenbelt region of south central Ontario. This allowed for the development of valuable facilitation skills. During doctoral studies at the University of Guelph, the author attended two International

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\(^2\) Figures 2 & 3 on pages xiii and xiv are maps of the Grand River and South Nation watersheds respectively. Stars are included over the map as a general visual indicator of spatial coverage in interviews and are not GPS specific locations of the interviews.
Comparative Rural Policy Summer Institute seminars, and one Canadian Practitioners of EcoHealth seminar. These intensive training courses built social networks, and applied social-research skills needed for this research. Finally, the data-analysis methodology was advanced from the author’s experience conducting research on several associated projects, including communication strategies for the Ontario Soil and Crop Improvement Association, scanning environmental technologies for the Dairy Farmers of Ontario, and compiling dairy sustainability indicators for Agriculture & Agri-Food Canada. These factors all added to the context of the research process.

Considerations

This research focuses on dairy farmers. The dairy sector in Ontario (and in all of Canada) is under a supply management system, making it atypical among other agricultural commodity farms—an important point to consider in the findings. Because supply management gives farmers some income stability, the on-farm capacities of this group are unique. If other groups had been included in the research—livestock farmers, grain farmers, or vegetable and fruit farmers—the results would likely not have been comparable. Another important point is that dairy farmers produce feedstock for their animals, and must manage large quantities of manure; as a result, this group has one of the most interactive relationships with agro-ecosystems. This was a major motivator for the research focus.

The geographical context of the research is the province of Ontario, which is unique in Canada for specific attributes of jurisdiction, culture, law, social context, geography, climate, and ecosystems. The analysis is also confined to three specific agri-environmental programs: the Environmental Farm Plan, the Rural Water Quality Program, and the Clean Water Program, which operate in the same context as many
other agri-environmental programs in Ontario and Canada. All these programs focus on environmental sustainability; the first focuses on environmental education within a whole farm system outlook and the others on water quality issues. This narrows the scope of the research somewhat, since the programs do not deal with other major environmental issues directly such as biodiversity or climate change.

This research is focused on the environmental impact of agriculture and is not focused on dairy food production directly. The research also acknowledges that while the focus of the analysis is towards understanding agri-environmental program participation, there may be multiple factors above and beyond environmentally related issues that are determining non-participation among dairy farmers.

Finally, this research was made possible by funding provided by an Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) project at the University of Guelph. All activities—including interviews, workshops, survey, and logistical planning—were conducted within the outlined parameters of the project. In addition, these research results are presented with the ethical approval of all participants involved, and with due respect for appropriate privacy restrictions.

Overview: Outline of Chapters

The chapters in this dissertation include the following material.

Chapter Two: Theoretical and Conceptual Framework

This chapter introduces the three core areas of this research:

- social structures in social networks
- the adoption and diffusion of innovations
- and, adaptive management.
In all three areas, the contributions of key authors in the field are reviewed, and their relationship to the objectives of this research is assessed.

Chapter Three: Research Methodology and Methods

The first part of this chapter reviews the methodology used to conduct the research, including:

- the preliminary fieldwork conducted
- the methodological theories, including mixed methods
- the integration of the mixed methods
- the qualitative and quantitative aspects of the methods
- the design of the research, and its proposal to the advisory committee
- the fieldwork and sampling strategies

The second half of the chapter details how data from the fieldwork were analyzed, and how validity was tested. It also explains the value of the various research elements: the survey, interviews, and workshops, and the tests of frequency, correlation, association, and regression.

Chapter Four: Program and Watershed Descriptive

This chapter reviews the significance of the watersheds and the programs. The first half of the chapter details the geographical, cultural and historical context of the Grand River and South Nation watersheds in southern Ontario. The second half of the chapter describes the purpose, nature, and structure of the three agri-environmental programs covered in this research: the Environmental Farm Plan, the Rural Water Quality
Program, and the Clean Water Program. Also covered are their specific distinctions and particularities, in terms both of geography and of relationship to each other.

**Chapter Five: Description of Research Participants**

This chapter gives an overview of the empirical results of frequency tests in this research, including information on aspects such as the general characteristics of survey participants (as related to their degree of participation). These characteristics include individual factors such as farmers’ education, age, sex, familiarity with communication technology, and how many generations they had lived on the farm; and farm business factors such as land size and herd size; plus farm income, location, practices, project choices, organizational membership, and plans for farm succession.

**Chapter Six: Analysis of Data and Findings**

This chapter reviews relationships between farmers’ degrees of participation in programs, and important variables of their (a.) socio-economic levels, (b.) social influence and innovation, and (c.) their perceptions of program value. Both quantitative and qualitative material from fieldwork is reviewed and compared—both with the overall test results, and with the results of each specific watershed.

**Chapter Seven: Discussion**

This chapter renews the discussion of the core theoretical research areas, in light of the qualitative and quantitative test results. These are analyzed in relation to the three core areas: social structures in social networks, adoption and diffusion of innovations, and adaptive management.
Chapter Eight: Conclusion, Recommendations and Future Research

This chapter presents a summary of the research, and concludes by highlighting the broader significance of this work for the academic community (including related literature). It offers a set of policy recommendations based on the research findings, and a series of considerations for future research on similar topics.
II. THEORETICAL AND CONCEPTUAL FRAMEWORK

Introduction
This chapter presents the goal, objectives and hypotheses of the research, and uses a framework of three streams of conceptual thought to analyze them. Although this method creates some overlaps, each stream is introduced separately—since it provides an important way to organize the study.

The primary goal is to advance our application of agri-environmental management with a greater and more nuanced understanding of how program participation is influenced and motivated by the social dynamics that affect dairy farmers. To achieve this goal, a clear definition is required to outline the context being outlined in a theoretical framework. Social dynamics is considered as the following equation for the parameters of this study:

$$SD = SE + SI \times SS \times SN + FP^3$$

Social dynamics positions the social networks of individuals (and the relationships that maintain those networks) as fundamental to the function of social structures. Since the hypotheses being tested compare farmer participation to social dynamics, this allows us to see the context in which participation patterns emerge. The theoretical contribution of adaptive management in this research provides a framework for better understanding the programming element of social dynamics. These theories are intended to provide an analytical framework to assess the socio-economic motivators of participation as a source of innovation in agri-environmental management, policy-making and programming.

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3 SD = Social Dynamics, SE = Socio-economics, SI = Social Influence, SS = Social Structure, SN = Social Networks, FP = Farmer Perception.
CORE AREA 1: Social Structures in Social Networks

This section introduces a central concept of the theoretical framework that explains agency within social dynamics. While dairy farmers, as individuals, have individual agency and knowledge, they are also part of a larger social structure. They act as a result of their own decisions, but they also operate within certain social norms.

Social Structure in Decision-Making Processes

An ongoing debate, in the social sciences community, is the degree to which individuals are free to determine their decisions and behaviour within the social structures of their culture. Sociologists such as Emile Durkheim and Karl Marx first developed theories around this question in the 19th century. By the early 20th century, sociological theory began leaning toward the idea that social structure serves a function of stabilizing individuals in societies. Marx wrote extensively about the social and technical relationships of production in different social models—including capitalism, in which the owners of a means of production extract profit (surplus value) from the work of others who sell their labour for a wage. Capitalist ideology combines with state control to legitimize social structures. However, a tension remains in social theory between individual possibilities in society, and the larger social dynamic that organizes individuals to think and act in certain ways.⁴

In the second half of the 20th century, Pierre Bourdieu, a French sociologist, moved beyond the binary debate of social structure versus human agency. He used “thinking tools” such as *habitus* and *field* to form his *practice theory*. This enabled analysis of how social structure influences human behaviour, and also the capacity

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⁴ New and emerging social structures and “norms” in decision-making for agriculture are essential to consider for this research. How has the formula of knowledge and power been challenged and changed in the information age for farmers and programmers? Do farmers have greater capacity to navigate their own choices?
people have for changing the social structures they live in. Individuals (or agents, as he called them) move through life becoming socialized in fields. This term means a set of relationships in a social domain where limited amounts of capital, prestige, privilege and rank are contested. Individuals internalize the guidelines for relationships in any given field, making those guidelines part of their habitus.

**Habitus**

Within the concept of habitus is the notion of “habits”. The use of this term is not unique to Bourdieu. Scholars from Aristotle, Ockham, Aquinas, and Pierce to Durkheim, Weber, Merleau-Ponty, Husserl, and Elias have worked with ideas related to those developed by Bourdieu. More recently, scholars such as Garfinkel (1967), Schutz (1972) and James (1976) have worked on the issue of human habits (Maton, 2008, p.56).

Habitus becomes the internal structure which guides people through their social world, the mental construct that shapes understanding, perception, evaluation and appreciation of social phenomena. Bourdieu called this the “internalization of structures” in the social world (Bourdieu, 1989, p.18). Habitus relates closely to an individual’s position in the social world. People acquire different types of habitus depending on their social circumstances (Ritzer, 2004, p.520). Habitus is both lasting, in that an individual’s habits existed before their lifetime, and is also malleable, continually being shaped and modified by the individuals. This is the power of the concept: although habitus perpetuates the status quo by internalizing social structures, which shape and direct

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5 A contemporary of Bourdieu, British sociologist Anthony Giddens, also provided a significant contribution to moving beyond agency versus structure with his “structuration” theory. It emphasizes the duality of structure and agency: these are neither independent nor determining behaviour, but rather rules and competencies on which individuals can draw.

6 The objective of this research is to explore the capacity of habitus to help advance understanding of how, dairy farmers’ in this circumstance, both embody certain perceptions and habits in their practices, and how those practices have a relationship with the agroecosystems they inhabit. More so, how do these practices and perceptions relate to the shape of agri-environmental programs.
people’s thoughts toward appropriate choices, it is not unchanging. Individuals do have the capacity and the need to change and adapt, to face the often contradictory and challenging situations in which they live (Myles, 1999; Ritzer, 2004).

Habitus does not negate the possibility of individual strategic calculation (Bourdieu, 1993, p.5). That said, people recognize that their personal goals are more likely to be attained by following social rules and obeying regularities, even if these are not made explicit in the society (Wacquant, 1992, p.25). Bourdieu might argue that all agents are free to make decisions based on their knowledge and resources—but that those decisions follow from a structure of generally predictable habits, expressions, behaviours and attitudes (Maton, 2008, p.50). For example, an individual dairy farmer may want his or her agricultural sector to operate in a certain way; but only through collective action and organization are greater accomplishments more likely to be realized.7

Bourdieu noted that individuals internalize the habits that help them obtain the goals they wish to achieve (Maton, 2008, p.58). In this sense, habits are not natural or innate, but rather the conditioned context of an individual within a specific society, time, or set of values. For Bourdieu, this represents the arbitrary power of social structure. Even more provocatively, he stated habits are internalized “subjective expectations of objective probabilities” (Bourdieu 1990, p.59).

In many cases, individuals’ habitus structures may clash. For example, Bourdieu conducted fieldwork in Algeria in the 1950s, investigating the clash of values (including traditions, inclinations and worldviews) between the agricultural practices of peasant

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7 This context of social structure as embodied in habitus, within fields (using Bourdieu’s practice theory), comes into relationship with social networks. Through the greater capacity of broader social relationships, farmers are able to resist and/or build alternatives to the present order, and redefine their relationship with programs, regulations, etc.
farmers, and the socio-economic and organizational structure imposed by French colonizers. The cognitive dissonance experienced by the Algerians, as noted by Bourdieu, was a fundamentally different kind of pressure on the formation of social standards than the pressures experienced by Algerian farmers in a pre-colonial society (Maton, 2008, p.60).

In this research, the concept of habitus is used to explain participation patterns in agri-environmental programs as a result of social interaction. This view has the potential to alert us to new possibilities, and new ways of seeing relationships—ways that could lead to environmental change (Bernstein, 1996, p.136). Bourdieu gave habitus the power of an evolving force in its capacity for both individual and group action, while recognizing the tendency of social structures to persist (Wacquant, 2002).

Field
Directly related to Bourdieu’s concept of habitus is that of field: the social space—composed of conditions, events and transactions—in which individuals interact (Thomson, 2008, p.69). People conduct themselves within a social field in a way that embodies their habitus: that is, they behave in a way that they feel is natural and common. For example, a group of dairy farmers might meet at an annual general forum to discuss developments in their sector, make operational changes to their organization, and decide what industry practices are desirable, acceptable or controversial.

An important aspect of a social field is that it (like habitus) is constantly changing, though certain elements always remain the same. Every field has an organizing

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8 For additional concern/critique of Bourdieu’s central concepts around practice theories see: Goodman, J.E. & Silverstein, P.A., (Eds.). (2009). Bourdieu in Algeria: Colonial Politics, Ethnographic Practices, Theoretical Developments. Lincoln: University of Nebraska Press. Authors Colonna, Reed-Danahy, and Hammoudi each critique Bourdieu’s obsessive focus on power and domination, a highly subjective perspective of Bourdieu’s from his own life experience and “split habitus” of coming from a peripheral region of France to a position of great power. The authors argue that Bourdieu selected empirical data to fit his theories while ignoring the competence and accountability of his research subjects.
characteristic, along with particular knowledge and expertise that individuals must internalize to adapt and advance (Thomson, 2008, p.70). While a field such as the dairy farming sector has defined hierarchies, with thought leaders and various organizations, there are considerable possibilities for change to occur (Bourdieu, 1988, p.25). In fact, that capacity for change—both at the individual level of habitus and at the social level of field—are a major focus of this research. Participation in agri-environmental programs is an expression of habitus within the field of farming practice that increasingly requires farmers’ agreement with environmental practices, due to increasing public expectation.

In any field, complexity defies a simplified definition of social actors. For example, in the field of watershed land-use planning in Ontario, the interested parties include dairy farmers, environmental programmers, and government agencies. How do these various users collaborate, and conflict, with one another, in their individual goals of land-use management, and their collective efforts toward farm profitability and/or ecosystem sustainability?

Critics of Bourdieu's concept of “field” view it as too deterministic and structured, too heavily invested in the status quo, to have the capacity for social change. Other concerns about the concept include the need for social scientists to consider both material and conceptual shifts in a society—such as evolving demographics and technologies, which can alter the expected habits of individuals (Thomson, 2008; Vandenberghe, 1999; Raedeke et al, 2003). Bourdieu responded to these critiques by developing a research methodology to move beyond analytical simplification.

This concept of an ongoing evolution of internal and external influences on individuals in societies is part of Bourdieu's unique contribution to sociology—and one of the foundations of this research. Bourdieu’s practice theory is used here to help analyze
how dairy farmers’ habits and social expectations are conditioned in their field of work. It is also used to understand how the farmers’ actions (or inaction) of participating in formal agri-environmental programs can provide insight into how social and environmental change takes place.

Another important concept to consider is reflexivity, which Bourdieu considered a valuable analytical process—as did Anthony Giddens, a British sociologist (Bryant & Jary, 2000; Cohen, 1989; Craib, 1992; Held & Thompson, 1989; Ritzer, 2004). This is the belief that individuals can, and do, become conscious of how to alter the social structure and their place in it. The distinction between Giddens’ and Bourdieu’s research lies in how free will is realized in relation to structure and agency. Writers such as Ritzer (2004) and Layder (1985) argue that individuals in Giddens’ social construct have greater capacity for action and change than in Bourdieu’s construct. This research outlines how Bourdieu’s work reveals conscious awareness of individual potential for action and change, while remaining aware of recurrent and dominant tendencies and structures in society.

**Integrating habitus and field in Bourdieu’s practice theory**

As noted above, habitus theorizes that the context in which people think, feel and act is embodied in their cultural history and social structure. Practice theory helps to make sense of how dairy farming, in relation to agri-environmental programming, has evolved into a distinct field in which farmers interact; and in which their habitus conditions specific types of practice (Bourdieu, 1991). Practice theory can describe why some farmers do not consider certain actions and practices, while others view them as priorities or obligations.

How do social agents such as farmers or programmers embody seemingly natural, life-motivating conditions? In this sense, the use of habitus and field as “tools”
for social analysis can be valuable for individuals and groups. Researchers are aware of how the language of a certain field (such as farming) creates goals, assumptions, objectives and actions that are unique to that field—but those objectives may be quite different, or at most only overlap, with those of other parties, such as agri-environmental programs (Raedeke et al, 2003, p.76). An examination of the habitus and field of dairy farming reveals the social relations critical to the practice of farming and the potential changes that can and do take place to introduce alternatives (Glenna, 1996; Shucksmith, 1993).

Bourdieu also emphasized the importance of reflexivity in research processes. In his view, social scientists should remain conscious of the implications of their research agenda, especially if it could lead to changes in public policy. For example, policy adaptations to meet the needs of environmental programmers to promote ecosystem sustainability may conflict with adaptations to meet the need of the farming sector to produce food.

**Social Networks**

For this research, social network theory is included in the framework of social structural analysis, as outlined above. Social Network Analysis (SNA) examines connections between people. Social networks can guide how problems are addressed, how organizations are run, and how successfully individuals can achieve their objectives through collective effort. SNA as a methodology has various sub-theories, methods, software, and research emphasis. Analysis can look at the structure and parts of a social system, or the behaviour and attitudes that characterize the ties in a specific population.

While social structure theories, including those of Bourdieu, look at how individuals embody habits in their social context, and how they are socialized, SNA is more interested in the order and context of the ties between people. This viewpoint adds
to the theoretical framework of this research, in that it gives the same consideration to the ties between individuals as to the individuals themselves. SNA considers individuals’ habitus through their social connections to understand the influence on decision-making. In the farm context, tests consider variables such as farmer location, social knowledge sources, immediate neighbour influence, event attendance, social referral, and participation in farm organizations.

SNA remains challenging and controversial because it can be difficult to assess how a relationship between two people might directly influence a decision. As a tool, a part of what SNA develops is statistical collections of correlations between variables to suggest their validity in a given population. But this alone could not tell us why those tendencies exist in an individual farmer. For example, testing for the relationship between “attending social events” and “Degree of Participation” does not account for the knowledge development, communication, and interaction that foster those types of practices in farmers. For this reason, SNA must be embedded in a broader analysis of social structure to provide a fuller picture.

Three researchers who have advanced the study of SNA are worth noting for their contributions to this project: Harrison White, Mark Granovetter, and Barry Wellman. A short introduction to the work and significance of each follows.

American Sociologist Harrison White first emerged in the 1960s with important contributions to SNA, developing models of social structure that identified patterns of relations between individuals. In his most influential book, *Chains of Opportunity*, he writes that people and their positions in a social structure are not the main source of significance for analysis, but rather the *types of connections* they have with other
individuals. White’s methodology uses quantitative analysis of social roles rather than attributes of individuals, such as education, income, age, etc. (White, 2008; Wellman, 1988).

A further value of White’s SNA work is its ability to reveal patterns of social relations both in and between Bourdieu’s fields (Samuelson, 1979; Coase, 1990). White’s methodology develops structure within relationships or networks: people as farmers or program coordinators exist in relation to others in the community. For example, within the social structure of interrelated farming networks, the Ontario Federation of Agriculture exists in relation to other types of farming organizations, such as the Dairy Farmers of Ontario, or the Christian Farmers’ Federation of Ontario (Steiny, 2007).

One of Harrison White’s students, Mark Granovetter, advanced White’s research with a more nuanced analysis of social networks. Network analysis often looks at the meaning of relationships between people—such as how, via social networks, individuals can collectively reach goals. One of Granovetter’s most influential concepts is the nature of social ties that connect individuals. In his 1973 article, “The Strength of Weak Ties,” he outlined how it is not the closest social ties that are most valuable for new job opportunities and knowledge, but rather loose associations with more distant colleagues and acquaintances. The premise is that close associates share most of the same common knowledge, practices, and technologies and therefore are less likely to be aware of new or different knowledge. A new contact for a farmer or group, for example, might introduce new ideas, information and perspective. Granovetter’s research is applied to this field work with variable tests of social knowledge sourcing and farm

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organization social networks. This research considers whether “weak ties” between individual farmers are more likely to lead to greater program participation (Granovetter, 1973).

Granovetter defined variations in social networks in the form of tie strength. Strong ties exist in close relationships, where the sharing of similar knowledge and information reduces the potential for novel insights; weak ties are the main source for new insights in social networks; and absent ties involve contacts with other community members (such as a neighbour) with whom there may be repeated transactions, but insufficient contact to create even a weak tie. This concept is valuable to this research for its recognition of the variety of relationships between people, and of the fact that new knowledge and insights can come in forms that may not seem obvious.

The third SNA researcher worthy of note is Canadian sociologist Barry Wellman, who has looked at social networks that are not constrained by location. This is relevant, since ideas in farming practice can come from anywhere in the world—a trend that is increasing in the modern interconnected world. Wellman examines how an individual’s social network has less to do with place, and how networked individuals transform how knowledge is obtained—and put into action. Internet-based “virtual” connections between farmers are a major consideration in the dynamic of decision-making. This is similar to the premise behind studies of global networks, and the opportunities they give individuals (Wellman, 1988, 2001).^{10}

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^{10} See Friedman, T. (2005). A Brief History of the 20th Century. New York: Farrar, Straus and Giroux. Friedman’s argument is that the late 20th century and the early 21st century are marked by the capacity of “networked individuals” to work with their network towards innovation and advancement. Notable examples include Bill Gates and Mark Zuckerberg. In addition, the work of Alvin Toffler and Manuel Castells also advances understanding on the influence of the information society on social structures and social networks.
CORE AREA 2: Adoption and Diffusion of Innovations

Researchers have long studied the processes by which individuals adopt new practices and innovations. Agricultural sector analysis has some of the earliest studies in this respect (Rogers & Shoemaker, 1971; Rogers, 1983). Adoption and diffusion of innovations (ADI) theory will be elaborated here, including more recent use to understand motives for pro-profit/productivity farming innovations versus motives for greater agri-environmental sustainability (Ryan, 1999; Pampel & van Es, 1977).

In the 1930s, ADI was first articulated in the analysis of hybrid seed corn adoption in the state of Iowa, USA. New seed corn was being introduced as “superior” to traditional varieties available to farmers. Rural sociologists Bryce Ryan and Neal Gross provided a system of understanding how some farmers tried new seeds, while others remained cautious or skeptical about them (Gladwell, 2002, p.196). Valente and Rogers (1995) chronicled the development of adoption-diffusion research that Ryan and Gross initiated at Iowa State University in the 1930s and 1940s, with their pioneering paper (Ryan & Gross, 1943). Joe Bohlen and George Beal advanced ADI into the 1950s and 1960s, writing articles, including one with their student, Everett Rogers (Beal, Rogers, & Bohlen, 1957; Bohlen, 1967), as well as influential reports (Beal & Bohlen, 1957; Beal & Rogers, 1960). Buttel, Larson and Gillespie (1990) argue that adoption-diffusion was considered the most important area of scholarship from the 1950s to the 1970s. Rogers (1995) claimed that by the mid-1990s more than 4000 academic publications had been written on the topic (Bell, 2004, p.267). The influence of ADI as an analytical tool (or as a point of comparison) remains. We continue to define innovation characteristics with ADI terms such as: early adopters; early majority; late majority; and laggards. In addition, characteristics like age, income, and education were often considered primary determinants of certain innovation tendencies. In hindsight, there is increasing
awareness that ADI theory and methodology tends to assume a broad range of
individual motivation factors about technology, development, profit motive and the social
aspects to innovation diffusion. However as a foundational framework in agricultural
research, ADI remains a valuable research methodology from which to launch analysis.
This is especially evident through more recent studies that frame their analysis with use
of Rogers’ diffusion of innovations concepts (Gamon et al, 1994; Alonge & Martin, 1995;
Gamon & Scofield, 1998; Guerin & Guerin, 1994; Marra et al, 2003; Sattler & Nagel,
2010; Reimer et al, 2012b).

Theories, Concepts and Critiques of ADI

The influence of ADI on agricultural policy over the past four decades has been
significant for farm programs. Research emerging from fieldwork using ADI theory often
has found that certain farmer characteristics would define lead innovators in
communities, and therefore these farmers should be targeted and served first in
promoting the adoption of new technologies. This approach in agricultural programming
has driven some Ontario-based agri-environmental programs (Serman & Filson, 1999,
p.75). The argument has continued that segmenting farmer populations into certain
consistent characteristics is an effective and efficient way to deliver agricultural
extension programs (Roling, 1988; Rogers, 1995). Serving categorized leaders first,
under Rogers’ theory, would diffuse an innovation through a population. Categorized
leaders were often considered to have profit motive as a leading innovation factor, as
well as the financial capacity to pay for the innovation as determined by their income, or
farm sales (an economic indicator) (Swanson et al, 1986; Ryan, 1999, p.154).11 Through
the 1980s, the economic, profit-motive assumption in ADI was generally considered

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11 Education and age also are important in creating openness and willingness to adopt new techniques
that can (at least temporarily) raise farmers’ profits above the average. However once new techniques
become generalized throughout a farming population, rates of profit slip back to average again.
accurate with researchers. Some scholars, however, began to look at the limits of the ADI model. G.M. Hooks wrote that “farmers who do not have access to adequate capital and land resources cannot adopt the technologies regardless of their psychosocial propensities to do so” (Hooks et al, 1983).\(^\text{12}\)

Similar research placed emphasis on education (Carlson et al, 1981; Ervin & Ervin, 1982; Gale et al, 1993) or age as a leading factor in adoption of innovations (Schertz & Wunderlich, 1982; Black & Reeve, 1992; Smit & Smithers, 1992; Reimer et al, 2012b). Some recent scholarship has focused on the characteristics of the innovation itself. Malcolm Gladwell has noted how the lifecycle of an innovation is tested by trial and error. There are many innovations that do not even make it past the stage of “early adopters” because the product or practice does not prove relevant or useful to individuals beyond the most experimental (Gladwell, 2002, p.198). In the context of agri-environmental programming, this research partially considers what set of social conditions lead toward certain on-farm agri-environmental innovations (like manure lagoons) to become common among dairy farmers while others (such as tree planting along waterways), are practiced by a small minority.

ADI also recognizes that the earliest adopters run risks that their actions might lead to either an improved quality of life or to financial loss and the potential of social isolation and ridicule from their community (Gerber & Hoffman, 1998, p.141). From these ideas, implementation of new farming innovations requires a supportive social infrastructure that agri-environmental programs may provide (Marshall, 2004; Filson et al, 2011, p.62).

\(^{12}\) However, financial limits are built into Diffusion of Innovations theory, as E. Rogers theorized that richer farmers tend to be “early adopters.”
Understanding agri-environmental programs requires some specific elaboration on some of the assumptions behind traditional ADI frameworks (Roling & Wagemakers, 1998, p.10). Rational choice theory was, according to Niels Roling (a former student of Everett Rogers), the basis of scientific education for a generation of agricultural professionals. In Roling’s work, rational choice theory as a methodological and theoretical structure has been criticized for a range of its assumptions (ibid, 11). Roling references Thomas Kuhn’s 1962 book *The Structure of Scientific Revolutions* on paradigm shifts in scientific learning. For example, when models of investigation and analysis increasingly conflict with growing scientific knowledge, the basic rules of analysis shift so that positivism and economic rational choice, as theories with which ADI is generally associated, are challenged. While the importance of economic sustainability remains especially powerful as a motivator in agricultural development, social factors including organizational and government support, effective regional policies, adult education, and extension and outreach are fundamental to innovation adoption (Roling & Wagemakers, 1998).

Additional social context for reframing ADI is Jürgen Habermas’ communicative action theory (1984, 1987) which places emphasis on reaching consensus not by controlling things (instrumental rationality) or beating opponents (strategic rationality), but through shared learning and collaboration (communicative rationality) (Roling & Wagemakers, 1998, p.13). Other scholars have advocated “targeted policy approaches” rather than generalized agricultural development strategies, so that policy mechanisms through grants and extension are geared toward particular locales or individual farmers and their farm operations (Knowler & Bradshaw, 2007, p.42). This leads to the prospect of a new form of agricultural programming that requires farmers to become fellow
experts and collaborators, instead of “users,” “receivers,” or “adopters” of specialists’ wisdom and technologies (Roling & Wagemakers, 1998, p.10).  

Another persistent issue with ADI has been the emphasis on a “top-down” format of innovation that does not sufficiently consider inequity and the context in which different farmers take actions. There is an assumption with the ADI model that there is a trickle down sequence from a farm leader or government extension agent to the majority of farmers. Farmers as a population tend to become agglomerated using ADI theory, deemphasizing the nuances that influence decision-making, as well as the individual capacity of farmers to make independent choices (Serman & Filson, 1999; Roling, 1988; Ryan, 1999). Segmenting populations might allow for different communications and outreach strategies between groups of farmers for example, but the lines of segmentation depend on the type of innovation being promoted. For example, in a study of adoption of hybrid seeds, a farmer might be considered a lead innovator, but that same farmer might be considered a laggard in a study on conservation tillage practices.

More recent research into ADI has addressed these nuances. For example, comparing farm size (acreage) a common ADI indicator and farm operation complexity, Napier et al (1984) have looked at indicators such as types and amount of crops and/or livestock farmed rather than just farm size to assess adoption of conservation tillage. Simply measuring the size or scale of an operation does not necessarily denote the complexity of production. For example, a 1000-acre wheat farm is less complex and less likely to have an environmental impact on water quality than a 150-acre intensive hog operation that produces massive amounts of manure. Nuances in adoptions of innovations have also looked at the biophysical aspects of farms. Dunlap & Martin

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13 This is an important critique of ADI: diffusion of agricultural learning does not have to start with experts in universities, but rather can be much more nuanced and de-centralized, involving a complex, interactive learning process.
argue that adoption research must pay attention to farm landscape and the ecological suitability of specific innovations. Different landscape dynamics, not just farmers’ socio-economic propensities, will affect adoption rates of new innovations.

Despite these critiques of ADI theory, the model firmly remains a topic of discussion in agricultural development research. After decades of testing and fine tuning the base model of ADI, its concepts and implications remain worthy of consideration.

**ADI Theory Applied to Sustainable Agriculture**

The effectiveness of ADI in analyzing conservation and sustainability adoption and diffusion has received considerable attention, especially in the past 40 years (Pampel & Van Es, 1977; Mellish, 1998; Ryan, 1999; Serman & Filson, 1999; Loftus & Kraft, 2003; Prokopy et al, 2008; Flores et al, 2011; Grady et al, 2013; Reimer et al, 2013). Pampel & van Es (1977) tried to dichotomize agricultural technologies as either profit-driven (commercial), or non-profit (environmental). Their research found that environmental innovations differed based on potential to improve farm profitability. The results intended to show that different factors affect which innovations are adopted by farmers (Ryan, 1999, p.153). van Es went on to look closer at the factors and conditions that lead some farmers to respond to public good or environmental incentives (van Es, 1983). Carlson & Dillman (1986), and Lee (1983) based fieldwork on whether farmers are more inclined toward farming practices that have economic value rather than environmental benefit. Aiken (1984) and Beus & Dunlap (1990) have argued that sustainable farming is not as conducive to larger sized farms. Swanson (1986) agreed, stating findings based on field research that as farming acreages increase, environmental concerns decrease. This conflicts with other research findings on farm size correlation to beneficial management practices (Serman & Filson, 1999).
Nowak (1987) proposed that we must use methodologies that look beyond solely economic explanations or farm income characteristics alone to explain the variability in adopting conservation innovations and practices. Ragin (1994) contextualized this further by promoting a mixed method approach described as *retroduction*, which further positions quantitative measures alongside qualitative approaches. Thompson et al (2012) have compared different types of quantitative random sampling methods to better understand the responsiveness to natural resource management, while Grady et al (2013) have used a mixed-method approach that combines use of; government records, interviews, and in their case, aerial photographs to cross reference findings. The study is additionally useful for policy directed application by distinguishing between 'structural' (buffer strips, grassed waterways, tree-shrub establishment, wildlife habitat management), and 'operational' (nutrient management, manure lagoons, tillage practice, conservation crops) farming practices. Studies by Genskow & Prokopy (2010) and by Prokopy et al (2011a) have focused on understanding conservation adoption within a framework of social indicators, measuring awareness, attitudes, constraints and behaviours under a conceptual framework focused on stakeholder 'ownership over the adoption research process. The use of mixed-methods approaches are being applied increasingly to gain greater insight to the complex social psychological motives shaping farmer attitudes and behaviours (Kaiser et al, 1999; Napier, 2001; Burton, 2004; Ahnstrom et al, 2008; Reimer et al, 2012).

The adoption and diffusion of innovations in conventional agriculture have developed differently than those in sustainable farming practices. Gerber & Hoffman (1998) argue that while productivity technologies such as hybrid seeds or chemical fertilizers have used more traditional ADI research and extension spread by established scientists and agribusiness companies, sustainable agricultural practices and techniques
have often developed through trial and error by farmers themselves. Alternately in the EU, for example, scientific recognition of sustainable agriculture innovations has been the condition under which government bodies provide financial incentives to further promote certain farming practices. However in notable cases this has generated problems because critics have claimed that farmers incline toward “greener” practices for the financial incentives rather than for a stewardship belief in greater sustainability (Gerber & Hoffman, 1998, p.42). Baumgart-Getz et al (2012) have recently revitalized this focus, stating that further research is required into better understanding adoption payment incentives.

The adoption of sustainability innovations has also been viewed through the lens of culture and ethnicity. In the Grand River watershed, efforts have long been underway to work with Mennonite communities to promote conservation practices. Working with these communities has been successful because of the skill, patience and trust fostered between Conservation Authority extensionists and Mennonite farmers (McCallum, 2003, p.64).

When applying the ADI model to sustainability programs in agriculture, some researchers have suggested that voluntary, educational initiatives should be combined with mandatory requirements to increase conservation practice numbers (Gale, 1992; Filson et al, 2011, p.78). This relates to a ‘European-style’ policy referred to as cross-compliance. In Ontario’s farming culture, a combination of voluntary and regulatory-type programming has met with mixed success. Arguments have been made that development of sustainable farming practices in this province require a unique “made in Ontario” focus (Filson et al, 2011, p.80). There are also structural and organizational challenges with the diffusion of sustainable agriculture. Insufficient time and financial
commitment by programmers can foster indifference in the farming population (McCallum, 2003; Agnew & Filson, 2011, p.118).

The Grand River Conservation Authority exemplifies adopting conservation innovations in programming. Extensionists with the organization have found that involving farmers and landowners in outdoor activities, like fishing, hiking, and stream walks, fosters an environmental awareness and builds excellent social capital and trust (Agnew & Filson, 2011, p.121). It is being recognized that individual conservation adoptions may reflect or relate to the amount of social capital in a community and broader social system (Pretty & Ward, 2001).  

Some studies have found that social capital can positively influence the adoption of conservation technologies (Warriner & Moul, 1992), although not all studies have found this to be a significant influence (Carlson et al., 1994). Similarly, some analysis has identified membership in producer organizations as a positive influence on adoption (Smit & Smithers, 1992; Swinton, 2000), although, again, this finding has not been identified in all analyzes (Traore et al., 1998). An analysis of environmental practice adoption in Ontario noted that:

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14 Social capital is a popular term in recent decades for use in social science research applications. Bourdieu’s definition is ‘Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group (or community)’ (Bourdieu, 1985). Bourdieu in part distinguishes social capital from Coleman (1988) and Putnam (1993) by characterizing where social relations tend to create power over people by maintaining status quo in social structure hierarchies. He emphasized that social capital acts as a resource to yield influence and the capacity to exercise control over social relationships. Social scientists such as Wall et al (1998) have further emphasized that levels of social capital do not necessarily translate into improved economic standards, as is demonstrated in their research in peripheral regions of Canada. For this research, there is recognition of the broader diversity of interpretations and applications of social capital; however the term is used primarily as a means of assisting in an understanding of how resources are brought to social networks that form relationships, associations and bonds of shared knowledge in farming practice. Social capital mobilizes resources that are brought to the table by individuals as members of a group (Bourdieu, 1985; Coleman, 1988).
“Individuals connected strongly to the agricultural community tend to implement commercial innovations over environmental innovations. Individuals employed off-farm full-time tend to be less connected to the agricultural community, and this may explain their willingness to adopt environmental innovations and their lack of commercial innovations.”

(Ryan, 1999, p.161)

The reference does not specify which agricultural community, a shortcoming since there are now social networks of farmers focused on sustainable agricultural practices. Knowler and Bradshaw (2007, p.48) add that there is “hope in further research into social networks as an influence on sustainable agriculture.” Floress et al (2011) have addressed this in part with a study to define in greater detail the relationship between social capital in general, its relationship to social networks as bridging and bonding organisms and their application in understanding natural resources management.

Social networks have been found to be important in creating opportunities for farmers to interact with each other. Knowler and Bradshaw (2007) reached this conclusion in a synthesis of conservation tillage adoption literature. The challenge remains in how to measure both local networks, and increasingly, the contacts that individuals and farmers have with those outside of their communities. While people cannot be made to socialize, more opportunities could be made for meetings. Well-organized institutions that are dedicated to sustainable agricultural development can lead in diffusion of sustainable practice innovations. Educational opportunities increase adoption by raising awareness through knowledge and information. Educational workshops build learning cultures where openness to new practices and technologies form part of an evolving habitus in a farm population. Research that looks at how different types of farming practice adoptions take place is an especially rich opportunity for ongoing research (Saltiel et al, 1994; Prokopy, 2008, p.309).
In addition, recent studies have focused on how access to information in decision-making influences adoption of farmer conservation practices, even if there is strong evidence that farmer attitudes, values and culture remain determinants in the use of that information (Morris & Potter, 1995; Loftus & Kraft, 2003; Fairweather & Campbell, 2003; Prokopy et al, 2008; Reimer et al, 2013). While recognizing the complexity of adoption, and taking access to information further, Baumgart-Getz et al (2012) identify access to quality information and knowledge about conservation programs, financial capacity and connection to related agencies and social groups as major factors towards practice adoption and participation.

These recent contributions to the analysis of ADI make the work of agricultural development complex. An adaptive management process as a way forward is detailed here.

**CORE AREA 3: Adaptive Management**

**Historical Context**
Adaptive management originates in the second half of the 20th century primarily from ecologists addressing methodological shortcomings in their experiments and analyzes. Canadian C.S “Buzz” Holling is considered one of the most important contributors to the concept. His original research in ecology followed the Popperian philosophy of science view that hypotheses must be falsifiable in order to be testable. Based on field work, he found in his ecosystems research, questions would emerge that often would not, or could not be reduced to a single issue relating, for example, to a specific plant, insect or natural resource. While Holling does not refute Popper’s premise of falsifiable hypotheses, he did begin to elaborate upon how ecosystems, like social systems, often do not have sufficient information or knowledge to build the most correct hypotheses or set of research questions. The recognition of this complexity was an important scientific
contribution of adaptive management. This research works with these foundations of adaptive management analysis by posing a multilayered, multivariate, mixed (qualitative-quantitative) analysis to internalize the social complexity of agricultural practice (and change process), while still positioning individual variable tests within a more traditional, Popperian falsifiable hypothesis framework.

The work of Holling and his colleagues tested various methodologies that could address the multiplicity of interrelated variables in applied research, ranging from ecological studies in biology, to social scientific analysis of farming systems. In the 1970s, Holling and researchers at the Institute of Applied Systems Analysis (IIASA) in Vienna, Austria began to lay the foundation for a social dynamic framework of adaptive management. It was at the IIASA that first consideration was made for ecosystem and social uncertainty, inherent randomness, surprises in evolution, and the capacity for systems to develop ecological and social resilience.

Holling and colleagues began to also notice how the simplifications in ecological and biological research had their counterparts in socio-economic and political research. Relevant to this research, adaptive management theory could look at the potential and actual shortcomings of policies or programs that tried to control for one variable. For example, agricultural scientists and economists have developed technological policies and supporting infrastructure for farm practices, such as the use of fertilizers and pesticides to reduce yield variations. Short term production targets may be met and

15 A reason why adaptive management has been helpful for this research is its applicability in analyzing agri-environmental practice adoption from a multiplicity of perspectives and factors.

16 The current research on adaptive management that C.S. ("Buzz") Holling and colleagues continue to pursue is through the Resilience Alliance based in Stockholm, Sweden.

17 The focus of the third section of analysis for this research is to understand farmer perceptions of program value, in this sense, providing the resources by which to make adaptive management applied and practical.
management efficiency increased, however, soil resources are stressed and farmer responsiveness to ecosystem feedback is deemphasized. Soil resources may eventually enter a phase of exhaustion and collapse, primarily because the agro-ecosystem did not develop sufficient feedback indicators to promote broader adaptiveness and adjustment awareness but rather narrow responsiveness to the variable of crop productivity (Holing, 1995; Berkes & Folke, 1998, p.11). This scenario and the emphasis on crop productivity, the defining characteristic of many modern natural resource management policies, is the reason that Holling grew suspicious of related social and economic theories. In this sense, he is also considered an important contributor to the early development of ecological economics.

Holling remained aware that we do not have all the tools we need to live truly sustainably. We learn from the experience of controlling too tightly for narrow agricultural production variables (such as high yield crops), at the expense of social and ecosystem variables. Holling’s research also pointed out the complexity of social and environmental variables and feedbacks. Ecosystems (and human social systems) remain wild, random, mysterious, and in continual change. Adaptive management suggests that we need to be more dynamic and adaptive to the changes constantly around us. Doing so, we can develop the thinking, policies, and negotiating tools that help improve the overall path of human and agricultural development. Tools could include diverse and flexible regulations and laws, feedback monitoring, responsiveness on a variety of fronts, and new policies grounded in experiential knowledge (Roling & Jiggins, 1998, p.289). This shift in thinking about ecosystems, human management, and science moved toward a more deeply interdisciplinary approach in policy making. Rather than reduce research to narrow disciplinary investigations, this approach looks at relationships and indicators from several sources of evidence. Adaptive management remains aware of the limits of
present knowledge and concepts, technologies and methods to deal with our challenges (Brunner et al, 2005, p.ix). It is the premise of these management concepts that formed the incentive for the multivariate analysis laid out in this research framework.

**Applications in Adaptive Management**

An important extension to the idea of adaptive management is resilience which refers to the cyclical nature of resource use within ecological and social systems. Phases include: exploitation; conservation; and release and reorganization (Gunderson & Holling, 2002). Ecosystems are unstable and in constant flux in slower or faster rates of change. Variables that determine the state of change can be monitored (Neudoerffer & Waltner-Toews, 2007, p.189). Ecosystems (like social systems) need attention to their boundaries of stability (or instability). There is an ongoing cycle of potential growth, innovation, resistance, rigidity, collapse and renewal in an infinite variety of combinations. Scientists, researchers, programmers, and policy makers can develop their collective adaptive capital by monitoring when and if rigidity begins to develop. Indicators of rigidity in farming systems can include, for example, measurement of poor soil and water quality, and poor animal health. Holling has stated that he feels the world is becoming less resilient — ecologically, economically, socially, and politically. The potential for change is greatest among individuals and small groups, and becomes more challenging in larger, more complex systems. Adaptive management recognizes unpredictability, change and uncertainty. In this regard, policies are treated as “experiments” from which managers can learn (Holling, 1978; Walters, 1986). Adaptiveness translates as well into organizations (like farm groups) that learn from flexible guidelines (Lee, 1993), and social and ecological feedback that is monitored and evaluated to shape and improve policy (Berkes & Folke, 1998, p.10).
While knowledge about adaptive management has been building for decades, there remain challenges to its application. For example, researchers who have considered the application of adaptive management in the northwestern USA note that while we can be aware and conscious of unpredictability in nature, “the problem is an inability to integrate valid and appropriate community interests when possible, or to balance them when necessary, to protect or advance the common interest of the community.” (Brunner & Steelman, 2005, p.9)

Brunner & Steelman argue that adaptive management is best when grounded in relevant policy for real people in real places, not abstracted scientifically. Program managers need to realize that people are motivated by a myriad of subjective, location specific perspectives, influenced by factors that are at times cultural, and at times beyond their control, and not determined by consistent laws (ibid, 19). The potential for adaptive management is not only to remain open to social and political evolution, but to facilitate it.

Emerging out of ecological science, human-social indicators are some of the most fundamental aspects of adaptive management. There needs to be “full recognition of people in managing any regional resource base, and indeed it is vital to avoid a potential clash [or backlash] between people and those working toward ecological sustainability” (Brunner & Steelman, 2005, p.7). Avoidance of this principle has been one of the biggest challenges to the environmental movement over the past few decades.  

There are several examples from Ontario where newly introduced regulations have been

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18 This point can be a serious note of awareness with environmental programmers, and the results of the data. There have been strong backlashes to environmental programming, such as the Nutrient Management Act, Source Water Protection Planning, and the Species-At-Risk Act. The Lanark Landowners Association is an example of this. But this reactionary force is also a part of what Bourdieu’s social structural “practice theory” helps to contextualize.
met with strong resistance from the agricultural community. For this reason, among others, adaptive management serves as a valuable theoretical research tool.

**Supply Management and Adaptive Management**

As this research incorporates the principles of adaptive management, the uniqueness of supply management in the Canadian dairy sector is important to consider because, arguably market context affects decision-making and responsiveness to environmental practice adoption, therefore it is important to situate the evolution of dairying within its own complex social system as well.

Prior to the 1960s, dairy farmers in Ontario and Canada faced a volatile commodity sector of surpluses in milk production, and low prices. It was in the context of a collective effort to bring greater order and security to dairy farmers that the 1965 Milk Act was introduced as enabling legislation by the Ontario provincial government to create a supply controlling marketing agency for dairy farmers that would include; formula pricing, milk pooling, rationalized transportation, point of sale processing, and production quotas (Pfeiffer & Filson, 2004, p. 128). The successful experience of supply managed dairying in Ontario promoted the impetus for the model to go to the national level, Canada-wide in 1970. As of 2013, supply management continues to exist in Canada, one of the last sectors in the world to withstand the pressures of free trade agreements and neoliberal economic policies to control of the supply of dairy products for Canadian consumers, however ongoing scrutiny and pressure, both internally and externally put into question the future of this form of ordered commodity marketing.

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20 Under supply management, dairy farmers are required to by quota, which translates into the amount of milk that a farmer is permitted and allocated to officially sell into the collective milk pool. Quota fluctuates in cost and quantity per unit depending on supply and demand cycles in the provincial and federal pooling system.
(Pfeiffer & Filson, 2004). In addition, throughout this research the argument is that dairying in Canada has important decision-making factors which are beyond the marketplace alone, including farmer decisions on environmental impact, such as how lands are managed for feedstock and animal manure disposal.

Another important consideration is the economic volatility in the Canadian dairy sector, even though it is supply managed. This volatility would support the cautious decision making processes often required by dairy farms. For example, in Ontario, between 2007 and 2012, the number of dairy farms was reduced from 4,533 to 4,029. This is a reduction of over 500 dairy farms in only five years.21 In 1980 there were 56,360 dairy farms across Canada with an average herd size of about 31 milking cows. By 2012 there were 12,529 dairy farms with an average herd size of 77 milking cows. This is nearly an 80% reduction in total dairy farms in just over 30 years -- though total milk productivity and output per dairy farm Canada wide has increased by over 250% in the same time frame.22

An even more important consideration for this research is that dairy, like other farm sectors, needs to manage its operation through internal decision making (on-farm productivity choices) and external decision making through compliance with regulations. Programs such as the EFP, RWQP and CWP need to consider how to adapt their outreach to livestock farms that have significant nutrient and feedstock production impact and distinct land use patterns. These are environmental and social decisions not just market-based management decisions specific to supply managed farming.

21 Kulasekera, Kumuduni. 2013. Statistics Section, OMAFRA.

Situating the Theoretical-Conceptual Framework

Postill (2010) has noted that practice theory can provide the ‘middle path’ between social structural studies and that of individual attitudes and behaviour by recognizing agency in social practices as internalized social order while still retaining capacity for invention and improvisation. As noted, practice theory combines Bourdieu’s concepts of habitus and field in a synthesis of grounded observation through empirical research. Practice becomes manifest through tests of specific variables in streams of theoretical inquiry and cannot be understood without regard to the broader social, political and organizational structure in which those practices operate (Postill, 2010).

Bourdieu’s practice theory helps to look at the daily decisions and opinions of, in this case dairy farmers, using empirical research to identify patterns in perception to examine individual reasoning and how it might translate into decisions regarding behaviour in program participation. These perceptions form the habitus of daily life (Lui, 2013). Practice theory helps make sense of social influences and networks as ‘officializing strategies’ where behaviour and decisions, appearing disinterested, can be linked to social group dynamics (Acciaioli, 1981). While practice theory is not without its critics (Schatzki, 1987), it has the capacity for testing the complexity of social dynamics in structural and institutional change (Warde, 2004, p.3).

Using practice theory helps examine how diffusion through social groups and institutions emerges to become more widely known, to teach and improve practices, to promote and legitimate those practices. Practice theory also helps to understand how, in this case, farm organizations help institutionalize practices, but also how these practices diffuse informally through mass media, social gatherings and personal conversations. In this sense, farming practices, are nurtured, protected, and sometimes rejected through becoming collective knowledge property based on shared understandings, know-how.
and standards (Warde, 2004, p.18). In addition, in this context, practice theory as the overarching conceptual framework is compatible with a modified constructivist methodology that stresses focus on the degrees of agency within a structuralist framework (Lau, 2004, p. 371).

Within this overarching framework of practice theory, this research is focused in part on social structure expressed through social network connectivity. Variables of inquiry span the range of social factors such as; location of farmers in relation to active participants, farm continuity (generations on farm and farm succession plans), social knowledge sources, social event frequency and quantity, social referencing and communication technology use (Granovetter, 1973; Samuelson, 1979; Wellman, 1988, 2001; Coase, 1990; Steiny, 2007; White, 2008).

Also within the overarching framework of practice theory is a focus on the characteristics of diffusion of sustainable agricultural practice adoption and innovation (framed here as program participation).23 To do this, variables are tested in different groupings. Socio-economic characteristics such as farm size and income are analysed as in previous studies (Pampel & van Es, 1977; van Es, 1983; Lee, 1983; Aiken, 1984; Swanson, 1986; Carlson et al, 1986; Beus & Dunlap, 1990; Serman & Filson, 1999). Motivation for program participation is analysed in the context of program finances and incentives schemes (Gerber & Hoffman, 1998; Baumgart-Getz et al, 2012). Attitudes in relationship to behaviour regarding program participation are analysed (Kaiser et al, 1999; Napier, 2001; Burton, 2004; Ahnstrom, 2008; Genskow & Prokopy, 2010; Prokopy et al, 2011a; Reimer et al, 2012). Program participation is also understood as the context

23 The author recognizes that diffusion of innovations in farmer adoption practice takes place far above and beyond that alone of participation in the three programs in question. Indeed, some of the research findings indicated that farmers undertake more sustainable farming practices without participation in programs, however for the parameters and purposes of this study, the measurement and analysis of participation in programs was used as an organizing principle.
of practice and habitus within the use and development of social dynamics behind information and knowledge sharing through programs, organizations, and social networks (Carlson et al, 1986; Smit & Smithers, 1992; Morris & Potter, 1995; Traore et al, 1998; Ryan, 1999; Swinton, 2000; Pretty & Ward, 2001; Fairweather & Campbell, 2003; Loftus & Kraft, 2003; Knowler & Bradshaw, 2007; Prokopy et al, 2008; Agnew & Filson, 2011; Filson et al, 2011; Baumgart-Getz et al, 2012; Reimer et al, 2013)

The theoretical-conceptual framework illustration below visually integrates the components of this research. Arrows on the right side of the sphere imply “movement” of the social structure in a process of continual improvement through enhanced, adaptive understanding of the social dynamics of dairy farming. Participation is the key determining variable. Both quality and quantity of participation is measured using the theoretical streams outlined above. Participation is used as the dependent variable manifesting social behaviour in an analysis of socio-economic, social influence and program perception variables. Participation, in the context of this research is an expression of practice, of the habitus of farmers in real life applications. Participation is understood as action within a social structure that has overlapping social network dynamics in ‘fields’ of action. Participation is also understood as the manifest expression of the diffusion of a practice innovation within a social structure (within and between specific, porous social networks). Additionally, participation is an indicator of the effectiveness or lack of effectiveness of adaptive management in relation to specific farmer perceptions of the value of programs.

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24 As a technical clarification, as noted in introduction, and again in the methodology chapter, Participation [P] (and Super Participation) is described as a category of actual project-practice implementation on a farm through the EFP [P] and potentially the RWQP or the CWP [SP]. Participation in the EFP workshop however, as an educational vehicle of the OSCIA is captured separately as ‘workshop aware’.
A diversity of studies has examined participation as a focus of analysis on farmer adoption of sustainable farming practice. As noted, these studies have ranged from understanding financial incentive effectiveness (Kraft et al, 1996; Franks, 2003; Maybery et al, 2005; Lambert et al, 2006; Dupont, 2010; Reimer et al, 2012a), technical information (Napier, 2009), farm size-tenure and community type characteristics (Franks, 2003), perception of government programs (Kraft et al, 1996), cultural beliefs and values (Sullivan et al, 1996; McCann et al, 1997; Maybery et al, 2005; Reimer et al, 2012a), the influence of the agricultural sector in a jurisdiction (Warriner & Moul, 1992). However, the combination of socio-economic, social influence (social structure in social networks), and program perception characteristics as outlined and combined in this study of program participation is a distinguishing feature of the research as operationalized in the following chapter on methodology.
The large overall sphere represents ‘social structure in practice’ as the operating principle of this research. Society advances, specifically dairy farming in this context, through infusions of new innovations/practices into social networks and into the practices of individual dairy farmers (manifest as their ‘habitus’) over time. Adaptive management is a living managerial-organizational practice, as well as...
**Conclusion**

This chapter has outlined the theoretical and conceptual foundations of the analysis by this research thesis that is primarily concerned with advancing agri-environmental management. These theories and concepts increase awareness of how farm practice is influenced by social structure (constructed as positioning within social networks and expressed as habitus within fields). The three core streams outlined above help describe social dynamics using methods to: analyze those socio-economics; analyze the social relations between people and the influence of network innovation on an individual’s decision making; and to analyze how perceptions develop about programs.

The theories of social structure in social networks enable a combined analysis of individuals embodying habits that are acquired in a collective setting. The setting, described as a “field,” contains all the restrictions and freedoms within which actors navigate toward their goals. Relationships between people and their related organizations are as important to the social structure as the ideas embodied in any one person. Relationships, both immediate and irrespective of location, matter in how the overall social system functions.

The theoretical concept of diffusion of innovations enables a deeper analysis of what motivates and/or enables innovative action of individuals in their social networks and social structures. What are the characteristics of innovative individuals? What is the source of that innovation? Are there social conditions that make certain locations and the people within them more innovative? How can policy, programming and planning guide innovation outcomes? How do we account for innovations, like sustainable farming practices, that are not only motivated by financial reasons?

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an idea to work towards. Individuals, social networks (in their respective ‘fields’) and the social structure are all made porous in terms of exchange, interaction and evolution of innovations/practices.
The conceptual basis of adaptive management enables analysis that considers socio-economics as complex as natural systems. The concepts help our models of assessment and action overcome simplification and be aware of and monitor interconnections and relationships. Adaptive management emphasizes that systems are in constant change and therefore our responses in, programs, planning and policies need to be equally flexible and adaptive.

These theories combined situate the conceptual capacity to address the goal, objectives and hypotheses outlined for this research.
III. RESEARCH METHODOLOGY AND METHODS

Introduction
Before detailing the development of research methods for this thesis, it is important to outline some of the conditions that sparked interest in the social factors in decision-making processes in agri-environmental management among Southern Ontario dairy farmers.

A dairy focus emerged out of an awareness of the impact of animal agriculture on the natural environment. The comprehensive 2006 UN-Food and Agriculture Organization publication *Livestock’s Long Shadow*, outlines the significant use of natural resources and strain on ecosystems by animal agriculture. Dairy farming in Ontario has an opportunity to build a more sustainable balance between natural resource management and food production. Dairy farming is an important area of agri-environmental programming and policymaking because of its significant interaction with the natural environment. A significant amount of land resources are dedicated to dairy herds since the vast majority of dairy farms grow their own feedstock, and crops for feed and bedding. The land that dairy farmers manage has direct and indirect significance for rural and urban populations, ecosystem health, and water quality. Additionally, dairy barns produce significant volumes of manure and farmers’ management of it, including collection, storage and disposal, is important and part of the reason behind the 2002 Ontario Nutrient Management Act.

The social scientific and, in particular, the sociological emphasis of this thesis research considers the processes in how agri-environmental policy-making and programming can better foster greater sustainability in farm practice through greater program participation?
Development of the structure and implementation of this thesis research has been facilitated by projects by the author at the University of Guelph. The first project was an OMAFRA-funded study of farmers’ decision-making and planning in relation to the Ontario Greenbelt Act. The study involved a series of three workshops across the Greater Toronto Area to analyze farmer concerns with the implications of land use restrictions under the new act. Another OMAFRA-funded study focused on the outline of this research and involved a comparative review of dairy farmer responses to: the Canada-Ontario Environmental Farm Plan; the GRCA-Rural Water Quality Program; and the SNC-Clean Water Program.

In 2009, with support from a second OMAFRA study, a research relationship was established with the Communications and Planning (C&P) Department at the Dairy Farmers of Ontario (DFO). The author and the head of the C&P department collaborated in interview and survey design and development. Critical to the success of research outreach to dairy farmer participants was the agreement by the DFO to share confidential contact information on dairy farmers located within both watersheds with the author. This collaboration between the author and the DFO provide a degree of trust that was vital to the participation of farmers in both the qualitative and quantitative aspects of the fieldwork. In addition to the OMAFRA research project, a research grant provided by South Nation Conservation and the Eastern Ontario Water Resources Committee enhanced the capacity of fieldwork interviews, data collection and workshops conducted in eastern Ontario in the summer and fall of 2009.

In 2010, a funding grant from Industry Canada’s MITACS-Accelerate Internship Program provided additional capacity to complete core elements of this research project and build additional collaboration with the DFO through a review of applied environmental technologies in the international dairy sector. Analysis for the DFO
included scanning best practices and policies from across North America, Europe and New Zealand. This work increased rapport with dairy researchers both in Canada and internationally. A final project related to this research was completed in the fall of 2011 for the Ontario Soil and Crop Improvement Association that involved a review of communication strategies for farming agencies, and how to best evaluate programming effectiveness with clients.

**Methodological Theory**

Attention is now directed to how the methodology developed. After the author completed required doctoral course work in rural development, planning, and extension, faculty advisors recommended conducting a series of preliminary meetings and interviews with dairy farmers in Ontario to gain a greater sense of their response to the ideas being developed for this research. The advisors argued that the research design would have broader relevance and resonance if the goal and objectives were grounded in comprehension of farmers’ lived experience.

The beginnings of this methodological approach can be credited in great part to researchers working in the 1970s at the Indiana Center for Evaluation (Wolf & Tymitz, 1977; Guba 1978, 1981). In the naturalistic-constructivist method, the researcher enters a new situation with the intent of uncovering the needs of participants in the study (Rubin-Mallins, 1982, p.57). Guba (1981) outlined the distinction between responsive (or adaptive) and pre-ordered (or set) research approaches. In naturalistic-constructivist research, the valued perspective is pluralistic. Audience concerns and the researchers’ methods are interactive. Feedback and communication are continuous, adaptive and research is responsive to the needs of the population (Rubin-Mallins, 1982, p.57). Methodological aspects of naturalistic-constructivist fieldwork emphasize: an emergent process; consideration of “big picture” elements; responding rather than attempting to
control participant responses; promoting research that is open-ended and conducting interviews that gain awareness of multiple and complex values (Rubin-Mallins, 1982, p.58).

In the naturalistic-constructivist process, the researcher obtains information from diverse sources including; program documents, grant proposals, budgets, test results, local newspapers, and materials from related organizations. Multiple viewpoints and the values of respondents are carefully presented with an aim to make the findings directly relevant and useful to the target population (Rubin-Mallins, 1982, p.59). Naturalist-constructivism views the nature of reality as relative, depending on the observers’ point of view. Because of subjective bias and perspective, the researcher must be responsive to the design process regarding the perspective of a diverse range of stakeholders (in this research, dairy farmers, including the diversity within the sector itself) (Fishman, 1992, p.264). Guba and Lincoln (1989) intended that naturalistic-constructivist methodology would move past perceived bias in previous qualitative research and evaluation by explicitly acknowledging pluralism (Huebner & Betts, 1999, p.342). For Guba and Lincoln, truth seeking in research and evaluation was a hermeneutic process, because it is interpretive (using tools), and dialectic, because it represents an ongoing comparison and contrast of divergent, subjective opinions with a goal of providing increasingly higher levels of value and synthesis (Fishman, 1992, p.266). This evolving series of ‘emergent constructions’ builds on previous insights by involving those who produce, use, implement or can benefit from the source of the research (or evaluation) (Huebner & Betts, 1999, p.350).

The naturalistic-constructivist researcher identifies stakeholders, elicits their construction of the form and process of the topic (in this case the EFP, RWQP or the CWP), and its range of claims, concerns and issues. The researcher always using
context and method (hermeneutics) and discussion process (dialectic) (Guba & Lincoln, 2001). Important as well to this form of research methodology (to ensure as much credibility as possible), the evaluation needs to maintain rigorous standards (Guba & Lincoln, 2001).

The methodology used in this research, relates closely to an integrated methodology promoted by Charmaz (2000; 2006; 2008; 2009) through her development of a ‘constructed grounded theory’. In the context of this research specifically, it may be termed ‘modified naturalistic-constructivism’ because the driving theoretical framework, Bourdieu’s practice theory, and the related goal and objectives are in part deductive, testing the applicability of that theory. For example, this research has used random sampling rather than purposive sampling for conducting interviews and workshops with research participants. However, like Charmaz, this is research is also within an inductive, interpretive tradition as well, understanding and building theories from data findings in their context. Additionally, the epistemic position of this methodology uses a modified naturalistic-constructivist approach in the practical sense of building scientific knowledge with practitioners (dairy farmers) in the field. This situates the approach closer to a critical realism in contrast to idealist constructionism which has a tendency to argue that the environmental crisis is epistemologically constructed and is subject to different interpretations based on different cultural norms, conceptualizations and discourses (Foster et al, 2011).

Finally, this methodological approach incorporated Lincoln & Guba’s argument for the legitimate use of intuitive or tacit knowledge at all stages of the research process.

26 Random selection sampling helps to reduce bias associated with picking respondents purposively. Random sampling is further cognisant of the epistemological issue of random selection (a more positivistic approach) compared to a purposive sampling process (interpretive approach) for conducting interviews and workshops. This acknowledgement and selection of random sampling adds further to the ‘modified naturalistic-constructivist’ approach to this research methodology.
because ‘the nuances of multiple realities can be appreciated only in this way; because much of the interaction between researcher and respondent occurs at this level; and because tacit knowledge mirrors more fairly and accurately the value patterns of the researcher’ (Lincoln & Guba, 1985).

Inspired by the outlines of a naturalistic-constructivist research approach, preliminary interviews were initiated using this process. The motivating goal being to help understand social dynamics involved in dairy farmer participation in agri-environmental programs. The author was interested in combining quantitative and qualitative methods that would provide the tools to facilitate this goal. Researcher bias was reduced as a result of cross-referencing quantitative survey data with qualitative interviews and workshop data.\(^\text{27}\)

The survey data from this project would be inferential because only a sample section of the larger dairy farming population could provide their insights. Statistical testing would be probabilistic because we are never sure if the inference, based on collected sample data, truly applies to the population of dairy farms in the two watersheds (Bhattacherjee, 2012).

As noted, the author combined inductive (theory-building) and deductive (theory-testing) reasoning by combining questions based on awareness of positivism (research that considers measurement as a force behind legitimacy) with post-positivism (research that makes inference about social phenomena from observed logical reason) (Bhattacherjee, 2012). In this sense, this research is a modification of core tenants of naturalistic-constructivism as outlined by Guba and Lincoln.

\(^{27}\) For example, one of the initial hypotheses of this research stated that dairy farmers with greater degrees of social network connectivity would be more inclined to participation in the three agri-environmental programs. The data findings do not completely support this initial hypothesis.
As a methodological objective, this research intends to advance a conceptual framework of analysis that is practical for future policy development conscious of the role social science research provides in asking critical questions (Flyvbjerg, 2001).

**The Value of Mixed Methods Research**

Social science research and analysis is becoming increasingly interdisciplinary and complex. There is greater pressure on research to complement methods and understand multiple methods that can facilitate communication, promote collaboration, and provide superior recommendations (Johnson & Onwuegbuzle, 2004, p.15). Mixed methods research follows the method of classical pragmatists (C.S. Peirce, William James, and John Dewey) (Johnson & Onwuegbuzle, 2004, p.16).

Mixed methods research offers value in practice for those who would like to see methodologies describe and develop techniques closer to what is often used in practice (Johnson & Onwuegbuzle, 2004, p.15). Both quantitative and qualitative research use empirical observations to address research questions. Sechrest and Sidani (1995, p.78) point out that both methodologies “describe their data, construct explanatory arguments from their data, and speculate about why the outcomes they observed happened as they did” (Johnson & Onwuegbuzle, 2004, p.15). In addition, social science research attempts to provide warranted assertions about specific groups of human beings and their changing, lived social environments (Biesta & Burbules, 2003).

Mixed methods research uses a pragmatic method and approach. Its logic of inquiry includes the use of induction (or discovery of patterns), deduction (testing of theories and hypotheses), and abduction (uncovering and relying on the best of a set of explanations for understanding results) (de Waal, 2001). At its best, it is more inclusive, pluralistic, and complementary than qualitative or quantitative methods alone. It suggests that researchers take an eclectic approach to method selection and the
conduct of research. What is most fundamental are the research questions. Research should ask questions in a way that offers the best chance to obtain useful answers (Johnson & Onwuegbuzle, 2004, p.17).

The defining characteristics of quantitative research include: a focus on deduction; confirmation; theory/hypothesis testing; explanation; prediction; standardized data collection; and statistical analysis. The defining characteristics of qualitative research include: induction; discovery; exploration; theory/hypothesis generation; the researcher as primary instrument’ of data collection; and qualitative analysis (Johnson & Onwuegbuzle, 2004, p.18).

**Integrating Mixed Methods**
In applied fields of research, the case for a multi-strategy approach has acquired strong support in the past decade (Tashakkori & Teddlie, 2003; Bryman, 2006, p.98). While a decision about design issues may be made in advance (and for good reasons, when data is generated), surprising findings or unrealized potential in the data may suggest unanticipated beneficial consequences of combining quantitative and qualitative methods (Bryman, 2006, p.99). Mixed-methods offer strength in the complementary process of seeking elaboration, enhancement, illustration, cross reference and clarification between quantitative and qualitative methods. Mixed methods research develops insights by combining methods that inform each other through sampling, implementation, and seeking to extend the breadth and range of knowledge by using different techniques of inquiry (Greene et al, 1989, p.259). Mixed methods are further defined by the following descriptions: completeness; process-oriented; greater confirmation of unexpected results; greater credibility; context; greater illustration of nuance; discovery and confirmation; diversity; and enhancement.
Quantitative and Qualitative Aspects Specific to this Research

The epistemological framework for this research aimed to enable a practical methodology to collect data. Research questions evolved between preliminary interviews, the development of the research proposal, the qualitative interviews and workshops, and the survey questionnaire. This enabled an analysis of the function of social structures in social networks and also a flexible interpretation of participants’ description of their role(s) in the field of analysis.

Interviews, workshops and the survey provided an inventory of social variables on the habitus of dairy farming. These variables provide an understanding of program participation as outlined in the theoretical framework. This research analyzes elements of decision-making, but also organizational structures in order to assess how to better develop adaptive programs (Ostrom, 1990, 2005).

Preliminary Fieldwork

With a naturalistic-constructivist process in mind, preliminary fieldwork began by using a snowball technique of developing contacts in the Ontario dairy sector. At first this involved conversations with the thesis committee, all of whom had experience conducting research with the dairy sector. Introductory meetings were held in early 2009 with program managers at the Rural Water Quality Program in the Grand River and the Clean Water Program in South Nation Conservation. Meetings were also arranged with representatives from the Ontario Soil and Crop Improvement Association (that manage the Environmental Farm Plan), and with a research representative from the DFO. A few

28 The combination of preliminary and secondary interviews, workshops and a survey provided the ongoing, hermeneutic (tools) and dialectic (dialogue) outlined in a naturalistic-constructivist approach. Preliminary interviews enhanced the secondary interview questions to be more relevant and specific; the first round of workshops in both watersheds address the driving research objectives and hypotheses; the survey proved an opportunity for a more objective response to the research questions; the second round of workshops, even those attended by only two farmers in one instance, provided a collective dialogue with knowledge building characteristics distinct from the surveys and interviews.
initial contacts were made by telephone calls to dairy farmers, and the author also attended the Southwestern Ontario Dairy Farming Symposium in Woodstock, Ontario in February 2009. This provided an opportunity to meet farmers based in Southwestern Ontario and to begin fielding questions related to this research project.

In March 2009, preliminary meetings were held with dairy farmers. These first few interviews were less structured than those that took place once the research proposal had been developed and approved. Nine preliminary interviews were conducted with farmers in southwestern Ontario, two outside of the Grand River watershed, the first in Middlesex County, and another in Huron County, while the other seven took place within the Grand River watershed in Waterloo Region, Halton Region, Wellington County, Hamilton-Wentworth Region, and Brant County. In April, 2009, attendance at the Alfred College Organic Dairy Conference in eastern Ontario provided more contacts to conduct five interviews in the South Nation watershed area: two in Ottawa Region, and three in Prescott-Russell Region. By the spring of 2009, a network of dairy farmer contacts in both watersheds was developing through face-to-face meetings and contact recommendations made by word of mouth. Some of the farmers met in these initial interviews became extensively involved in the research by attendance at both workshops in their watersheds. The results from these fourteen preliminary interviews in southwestern and eastern Ontario formed the basis for the shaping of the research proposal.

**Research Proposal Process**

Designing the research proposal for actual fieldwork involved focused strategic planning based in a guiding theoretical framework and from the insights of the preliminary interviews. The proposal set out six weeks of qualitative fieldwork, first in the South

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29 Please see Preliminary Interview Guide in Appendices.
Nation watershed (in the summer of 2009) and then the Grand River watershed (in the winter of 2010). This would be sufficient time to conduct interviews and hold workshops in each region. The quantitative survey questionnaire was proposed for winter, 2010.

Meetings with dairy farmers were arranged from references given by the initial set of contacts developed from preliminary meetings in winter, 2009 and from a list of dairy farmer contacts provided in confidence by the DFO. Once the research fieldwork design had been developed and approved by the advisory committee, the University of Guelph was provided with documentation for approval from the Research Ethics Board. Attached in the appendix is all the written material that was provided to all farmers prior to interviews. A letter to participants assured them of full confidentiality, and that all handwritten material from interviews, workshops and online/participant written response surveys would remain confidential. Handwritten notes were the primary means of data collection for all interviews, which were then transferred to computer copy. In the workshops, a note taker who signed an agreement of confidentiality was hired to record participants’ answers directly onto a laptop computer. All documents are stored in secure files with coded access passwords by the author. As noted above, funding for implementing the research proposal was enabled through a combination of project grants.

The research proposal was designed to address what leads to the great variation in the dairy farming community in participation in agri-environmental programs in Ontario. As noted in the theoretical framework, participation was determined to be the dependent variable since it was considered an explicit expression of decision making translated into action.
Because of differences in the type of participation given the uniqueness of the programs and research objectives in question, the variable was organized into four categories. 1. “Non-participation” would identify which research participants had not taken part in the EFP educational workshop; implemented any on-farm project after having completed the EFP, or not participated in either of the watershed programs (which incidentally was only possible if a farmer had completed the EFP educational workshop). 2. “Workshop Aware” would identify research participants who had completed the EFP educational workshop, but had not implemented any on-farm project. 3. “Participant” would identify research participants who had completed the EFP educational workshop and also completed an on-farm project. 4. “Super Participant” would identify those research participants who had completed the EFP educational workshop and also completed an on-farm project through a combination of support from the EFP and their watershed program (either the RWQP or the CWP).

The researcher considered that the best way to explain variation in participation would be through a mixed method analysis of farmer socio-economics, social structures in social networks, and the adaptive management capacity of the programs in question. The research would be led primarily by empirical findings that would include observation, analysis and interpretation.

Fieldwork Data Sample Collection Process
In July, 2009, fieldwork began in South Nation watershed. A base camp at Alfred College was established because of the convenience of a University of Guelph campus from which to conduct fieldwork interviews in eastern Ontario. The DFO provided, under an agreement of confidentiality, a full list of all dairy farms within the Grand River and South Nation watersheds. This list helped the author contact prospective interview participants into both watersheds. The author grouped dairy farms into counties/regional
municipalities, and townships. A systematic process then organized farms in each township from largest to smallest based on Milk Production Volume (MPV), numbers that were included in the DFO list. Phone calls were systematically made to each dairy farm in each township, alternating from the largest to the smallest farms, and so moving toward middle-sized farms. This was an effort to select interviewees from all sizes of dairy farms and all regions of the watersheds. Because there are more dairy farms in regions where a larger percentage of land is in the actual watershed, there were more interviews in central watershed regions. The research population was precisely defined because of the known number of dairy farmers in the two watersheds. In 2009, there were 797 dairy farms in the Grand River watershed, and 526 dairy farms in South Nation watershed, totalling of 1,323 dairy farms in both watersheds (DFO, Statistical Resources, 2009).

In South Nation watershed, thirty-one interviews were conducted over six weeks. Research participants were invited to attend the planned workshops at the end of each face-to-face interview, and through additional phone calls to dairy farmers in both watersheds (using the same method of contacting small, medium and large operations for the interviews). Additional workshop invitations were emailed to those interviewees who had provided a way to maintain contact with them.\(^{30}\)

The first of two South Nation workshops was conducted on September 1, 2009 at the office of South Nation Conservation in Finch, Ontario with six dairy farmers attending. Four of those who attended had been interviewed in the weeks prior.

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\(^{30}\) The purpose of conducting workshops in addition to interviews was to obtain a broader social context to the research objectives. In group settings, individuals would be potentially prompted to provide greater insights into shared, collective experiences and perspectives beyond individual options.
In the late fall of 2009, the quantitative survey questionnaire was designed. The survey was reviewed by the thesis committee, the director of research at DFO, the director of the RWQP, the director of the CWP, and two OMAFRA project team members. A French language version was translated by a University of Guelph student. The data results in French were back translated via Google Translate, and with the author's basic comprehension of the French language. Survey approval was granted by the University of Guelph Office Of Research in December 2009. The survey was tested via SurveyMonkey with a core group of dairy farmers from December, 2009 to January, 2010 in the Grand River watershed to collect comments and preliminary impressions for two weeks. No modifications to the survey were made.

To increase farmer participation, incentive prizes (a draw for gift certificates to Canadian Tire) were offered to the first-, second- and third-place winners. While the online, SurveyMonkey version of the survey remained open and available for dairy farmers to complete, in February 2010, the survey was mailed out from the DFO office to all dairy farms, in both watersheds, which had provided addresses. 499 surveys were sent to South Nation watershed farms (133 in French and 366 in English)\(^{31}\), and 794 to Grand River watershed farms. It is important to note that in one year, between 2009 and 2010, there were 30 fewer dairy farms in the two watersheds, from 1323 farms in 2009 (797 in the Grand River watershed, and 526 in South Nation watershed) down to 1293 farms in 2010 (794 in the Grand River, and 499 in South Nation), with greater reduction taking place in South Nation.

The survey roll-out via email and SurveyMonkey, or via mail out was conducted according to DFO knowledge of preferences indicated by dairy farmers. The mail survey

\(^{31}\) The DFO office has an inventory of French and English speaking dairy farmers, including the preferred language of communication that each dairy farmer has indicated in how they receive media.
was attached to the package that includes the monthly *Dairy Producer* magazine and included a return envelope.\textsuperscript{32} All written survey responses were returned to the DFO head office in Mississauga to be picked up by the author. After the initial mailing in February, an email reminder was sent to dairy farmers in late March, and again in April.\textsuperscript{33} Surveys received by SurveyMonkey were transferred to an Excel file. Surveys received by mail-in were transferred first to SurveyMonkey and then to an Excel file. This enabled collection of all surveys into one Excel file for analysis in SPSS.\textsuperscript{34} In total, 100 surveys were received via SurveyMonkey, and 139 surveys were completed by mail-in.

In the winter and spring of 2010, sixteen interviews took place with dairy farmers in the Grand River watershed. In May, 2010, the first Grand River workshop was held in Wellington County. Seven dairy farmers and a note taker from the University of Guelph attended. One of the dairy farmers present had been interviewed by the author prior to attending the first Grand River workshop. In July, 2010 the second South Nation watershed workshop took place at the South Nation Conservation office in Finch, Ontario and six dairy farmers attended, including a note taker. Five of those present had been interviewed by the author prior to their participation in the second workshop. In addition, four of those present at the second workshop were present at the first South Nation workshop. Also in July, 2010, the second workshop took place in the Grand River watershed with two dairy farmers present and a note taker.\textsuperscript{35} One of the two dairy

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\textsuperscript{32} A copy of the survey that was sent via email and mailed out to dairy farmers is included in the Appendix.

\textsuperscript{33} The author acknowledges in hindsight that a Dillman et al standard practice of sending a second full survey questionnaire should have been used towards a higher response rate. The lower response rate in turn may be linked to the abbreviated survey instrumentation process.

\textsuperscript{34} Extensive care and caution were used in transferring mail-in surveys into Excel. On regular occasions mail-in survey responses were re-checked after entry into Excel.

\textsuperscript{35} Significant planning went towards each workshop, including large numbers of phone calls for invitation to attending, purchasing refreshments, and hiring a note taker. The author did not know until the night of the workshop how many dairy farmers would attend. Even though the second workshop in Grand River watershed was attended by only two dairy farmers, it still provided an opportunity to address
farmers present had been previously interviewed by the author, and had also taken part in the first Grand River workshop. Because many survey respondents did not provide their name in the SurveyMonkey or mail-in responses to the questionnaire, there is no measure of the number of survey respondents who might have also have been interviewed or taken part in the workshops for this research. By August, 2010, all fieldwork data collection, including interviews in the two watersheds, four workshops, and 239 collected surveys, was complete. All fieldwork data collected was from dairy farmers.

The samples from the three different types of fieldwork provide a diverse source of data for analysis for the research goal and objectives. The qualitative fieldwork interviews and workshops provide methodological balance to the survey. A confidence level of 95.5% was not reached with the survey questionnaire. 239 total survey responses out of a population of 1293 registered dairy farms in 2010 in the two watersheds provide a confidence interval (or margin of error) of 5.73.\textsuperscript{36} 18\% or nearly $1/5^{th}$ of all dairy farms participated from the two watersheds. The 138 survey respondents from the Grand River watershed, out of a population of 794 dairy farms, provide a confidence interval of 7.59. Approximately 17\% of all Grand River watershed dairy farms participated in the survey. The 101 respondents from South Nation watershed, out of a population of 499 dairy farms, provide a confidence interval of 8.72. Approximately 20\% of all South Nation watershed dairy farms participated in the survey.

\textsuperscript{36} The confidence interval (or margin of error) is the plus-or-minus figure usually reported in opinion poll results. For example, of the 239 total survey responses, the confidence interval of 5.73 indicates that, if we asked 80\% of the entire population of registered dairy farms a question, we can be “sure” that between 74.27\% (-5.73) and 85.73\% (+5.73) of the population would have picked that answer.
Data Analysis

Frequency Analysis (Quantitative)

The first tests conducted were simple tests of frequencies in SPSS to provide a descriptive overview of the distribution of characteristics of the sample population from survey responses. The detailed results of these tests are provided in Chapter 5.

Chi-square test of association and Spearman’s rho test of correlation: Valuing for Significance

For all the quantitative analysis, two types of tests were run depending on whether they had scale or nominal value in relation to the ordinal scale of participation developed (NP, WA, P, SP). The objective was to test the relationship and tendency for there to be greater participation rates linking the range of variables outlined.

One way to test this was through chi-square tests of association (also known as Pearson’s chi-square test), which helps to decide whether the difference between observed (results of data) and expected values (hypotheses regarding participation) are actually significant. Tests that were run through SPSS for chi-square determined significant or insignificant depending on a figure of 0.05 or 5%.

The second test that was conducted was with Spearman’s rank order correlation coefficient. This is a non-parametric measure of statistical dependence between two variables. Non-parametric measure matters because accurate sampling distribution can be obtained without requiring knowledge (of parameters) of the probable distribution (such as “Participation” and “Education”), which in this research is helpful. Spearman’s test allows identification whether two variables, independent in their own right and not inferring causation to the other variable, increase or decrease across datasets in relation to each other. Spearman’s correlation coefficient gives a numerical value that summarizes the strength and direction of the relationship between the two variables.
Spearman's rank order correlation is preferred because Pearson's correlation would have required continuous data but the data analyzed I'm analyzing with Spearman is not continuous.

For example, it was assumed in this research that higher education would have a correlation with greater likelihood of participation in the EFP, RWQP or CWP. This is a hypothesis that suggests a positive correlation between education and environmental farm practice. The tests using Spearman's rho were conducted in SPSS with ordinal or scalar data to determine degree of significance.

**Regression Analysis**

In addition to conducting chi-square tests of association and Spearman's rank order correlation tests, regression tests were completed to compare multiple variables together to determine potential patterns in predicting participation in programs. At first, all of the variables were forced into a regression analysis using the optimum theoretical model that would mine the data sample. This involved an initial testing using participation as the dependent variable and an ordinal four point scale made up of; 0 = Non-Participant, 1 = EFP workshop aware, 2 = EFP Participant (having completed an on-farm project) and 3 = EFP and RWQP or CWP Participant [Super Participant]. The regression test was conducted in SPSS\(^{37}\) and included all variables together in three tests, run separately within the categories of; i. Socio-economic predictors, ii. Social influence predictors and, iii. Farmer perception. Because of the limited valid cases and lack of sufficient variation in data, the regression tests were not able to provide sufficient value in the ordered probit format. As a result, the data was modified to allow the application of binary logistic regression. The recoding was completed in the following manner: 0 = Non-Participation and 1 = EFP workshop aware became 0 = Non-Participation, while 2 =

\(^{37}\) The multinomial probit was too sparse to give meaningful results.
EFP Participant, and 3 = EFP and RWQP or CWP Participant became 1. This modification allowed for greater ease of testing in regression on a binary 0-1 scale.

New tests were run in this 0-1 format in binary logistic regression with all variables, again in their respective groupings aligned with the three streams of theoretical analysis: i. socioeconomic variables, ii. social influence variables and iii. farmer perception variables. In addition, combinations of variables were combined and tested in binary logistic regression to reveal any potential inconsistencies in prospective significance related to predictors of participation. After these tests were run, several variables emerged as predictors of participation, and these included; Income (Raw Data)\(^38\), Internet Use, Farmland Managed (Aggregated), Farmers’ Value Perception of EFP/RWQP-CWP, Farmers Perception of EFP/RWQP-CWP Communications, and Farmers’ Value Perception of EFP/RWQP-CWP Planning and Outreach.

In this context, these predictor variables were developed into an equation that would be run under binary logistic regression. The specification of the two binary logistic regressions run are; i. \(Y = f (\beta x_1 + \beta x_2 + \beta x_3 + \beta x_4 + \beta x_5 + \beta x_6)\), where \(Y = \text{Program Participation} \{Y = 0 > \text{Non-Participation}; Y = 1 > \text{Participation}\}; \beta x_1 = \text{Income}; \beta x_2 = \text{InternetUse}; \beta x_3 = \text{Farmland Managed (Aggregated)}; \beta x_4 = \text{Farmers Value Perception of EFP}; \beta x_5 = \text{Farmers Perception of EFP Communications}; \beta x_6 = \text{Farmers Value Perception of EFP Planning and Outreach}, and ii. \(Y = f (\beta x_1 + \beta x_2 + \beta x_3 + \beta x_4 + \beta x_5 + \beta x_6)\), where \(Y = \text{Program Participation} \{Y = 0 > \text{Non-Participation}; Y = 1 > \text{Participation}\}; \beta x_1 = \text{Income}; \beta x_2 = \text{InternetUse}; \beta x_3 = \text{Farmland Managed (Aggregated)}; \beta x_4 = \text{Farmers Value Perception of RWQP-CWP}; \beta x_5 = \text{Farmers Perception of RWQP-CWP Planning and Outreach}\).

\(^38\) Income Raw Data refers to survey respondents providing their exact gross farm sales for 2008 without the data being aggregated into categories.
Communications; β×6 = Farmers Value Perception of RWQP-CWP Planning and Outreach. The results are presented in the chapter 6, data findings.

**Modified Naturalistic-Constructivist Open Coding of Qualitative Data**

The primary way by which Lincoln & Guba (1985) operationalize their naturalistic-constructivist approach is to encourage researchers to ground theories in the data by employing hermeneutics (tools and methods) and dialectics (stakeholder dialogue) in an iterative, evolving process. Like Charmaz (2006), data is 'coded' into ideas or hunches that emphasize grounding in constant comparison techniques. The following sequence of tools and methods were followed using a modified naturalistic-constructivist approach that also included continual loop back to previous results to build greater detail and nuance into research questions;

- Formation of an originating goal and objectives (outlined in the introductory chapter, Chapter 1, and theory chapter, Chapter 2), guided development of a preliminary interview guide.
- Preliminary Interviews conducted
- Research proposal shapes fieldwork interview guide and 1st round of focus group from combination of; goal and objectives, theoretical development, and preliminary interview findings
- South Nation interviews and 1st workshop conducted
- Survey developed
- Grand River Interviews and 1st workshop conducted [fieldwork interview guide unchanged]
- 2nd round of workshops take place with enhancement to questions around goal and objectives.
- Quantitative analysis of survey conducted
• Qualitative analysis of interviews and workshops completed within coding framework of three streams (i.e. socio-economics, ii. social influence, and iii. farmer perception) and specific variables in each stream.

Within a naturalistic-constructivist approach, qualitative data is coded through a combination of researcher and stakeholder constructions to converge meanings, while exposing contradictions, potential negative alternatives and acknowledging the limits of representativeness (Guba, 1990, p.26). In addition, the naturalist-constructivist approach adds credibility by: adopting well established research methods (i.e. here with Bourdieuian practice theory, adoption and diffusion of innovations theory, Social Network Analysis theory, Adaptive Management theory, quantitative survey); familiarity with the culture of study (several related projects and several years of interaction with the dairy sector by the author); random sampling; triangulation (interviews, workshops, survey); tactics to increase honesty of informants (letters ensuring confidentiality and freedom to participate); frequent debriefing (61 interviews in total and two rounds of workshops spanning nearly 12 months); peer scrutiny (survey guide developed by the primary author and an academic advisory committee at the University of Guelph, the head of research at the Dairy Farmers of Ontario, and two agri-environmental policy analysts at the Ontario Ministry of Agriculture, Food and Rural Affairs [OMAFRA]), and member checks (secondary round of interviews and workshops, presentation of authors’ research findings to a public OMAFRA environmental sustainability forum ) (Shenton, 2004).

All interviews were recorded by hand on notepad and transferred as accurately as possible to a computer as quickly as possible. All workshops were recorded by note taker directly to a laptop computer. All interview and workshop notes were coded into the

39 Please see Appendix J, Figure 4 for table on representativeness of quantitative and qualitative data from this study in relationship to provincial farm statistical averages.
variable categories within the three respective theoretical streams corresponding to the quantitative survey which are; i. socio-economics, ii. social influence, and iii. farmer perception. Qualitative data was further coded for analysis into related scales of intensity within each variable in accordance with answer options in the survey. This scaling was combined with tacit knowledge scanning of the responses by the author with consciousness of the three streams of theoretical analysis, and with awareness of potential ‘negative evidence’ in the qualitative data that might contravene the representativeness of any particular set of reoccurring themes in the interviews and workshops (Prokopy, 2011, p.10A).

**Conclusion**

This methodological framework developed from an intention to analyze dairy farmer responses to agri-environmental programs. The research focuses exclusively on sampling dairy farmers in two peri-urban watersheds environments in southern Ontario. Both watersheds border some of the largest population agglomerations in Canada, and this has potential implications for a range of decision-making factors that include information accessibility, education, farm income and land values. In addition, the financial capacity of the regions in the two watersheds is unique in relation to less central watersheds in southern Ontario, and to agricultural watersheds in other Canadian regions.

The focus on three agri-environmental programs, the Environmental Farm Plan, the Rural Water Quality Program (RWQP), and the Clean Water Program (CWP) all have Ontario-based applicability. All three were established and began in the first half of the 1990s. In addition, the two watershed agencies managing the RWQP and CWP respectively require farmers to have completed the EFP workshop prior to application for
participation in their programs. In this additional context, the research methodology focused its applicability for policies in agri-environmental program management.
This chapter delves into the history and context of the watersheds in this study, and the three programs in question. Background is provided on the emergence and development of the programs and how they relate to each other.

Watersheds Profile

The Grand River and South Nation watersheds are both situated prominently in areas of southwestern and eastern Ontario respectively, where good farmland neighbours some of the largest population centres in Canada.

Within the boundaries of the Grand River watershed are the large population areas of Kitchener-Waterloo-Cambridge and the city of Guelph. The Grand River watershed is also influenced by the metropolitan, commuter dynamics of Greater Toronto and Hamilton. The Grand River is important in Canadian history. At the end of the American Revolution in the late 18th century, a large exodus of British United Empire Loyalists moved out of the United States and into what became Upper and Lower Canada. In Upper Canada (what became Ontario in the 19th century) the Grand River valley was valued for its location, forests and quality farmlands. Under the Haldimand Proclamation of 1784, land in the Grand River watershed was granted by decree to the Haudenosaunee First Nations, through their Mohawk leader, Thayendanegea (Joseph Brant) for their loyalty and alliance with the British army during the American War of Independence. Over time and through a long series of land transfers in the coming decades, immigrants from the United States, Canada and Europe moved into the area. Today, the Six Nations reserve is still the largest and most populated First Nations reserve in Canada, and lies entirely within the boundaries of the Grand River watershed.
It is also important to note for this study that the land on this reserve is significantly forested and forms an important part of the Carolinian forest ecosystem that is unique to southern Canadian biodiversity.

The Grand River Conservation Authority (GRCA), the organization responsible for watershed management of the Grand River, has a significant programs and operations budget due largely from a prime farming and industrial economy within its territory. This unique circumstance is an important consideration regarding policy and programming in relation to other watersheds in the province.

Another important consideration for this research is the unique influence of the Mennonite communities in the Grand River and how they have helped shape the character of the region and this research. According to DFO statistics, in 2009 there were nearly 800 dairy farms in the Grand River watershed. Based on family names within prominent Mennonite communities, around 300 dairy farms, or about 40% of the dairy population are Mennonites in the watershed. Working with farm level data, the milk production volume from these farms is smaller than the average non-Mennonite dairy farm in terms of herd size and milk volume produced (DFO Statistics, 2009). Mennonite communities are primarily centred in the townships of Wellesley and Woolwich in Waterloo Region, Mapleton and Wellington North in Wellington County, and Perth East and Perth North in Perth County. Roughly equivalent to their presence in the region, approximately 40% of the respondents to the survey for this research were from the Mennonite communities. This is inferred from a combination of family names left in the survey response, remarks in the comments column and township and county indicated in the survey. There are parts of the Grand River where the Mennonite population remains the majority demographic. Historians have identified their arrival in the area as early as the beginning of the 19th century from places such as Pennsylvania, Switzerland
and Germany. The 1981 census identified over 70% of all farmers in Waterloo region as Mennonites (Fretz, 1989).

The Mennonite communities are referred to in the plural because there is a broad diversity of variations within this Christian denomination. Of the many different Mennonite groups in the region, some are among the earliest settlers, while others have arrived in the past decade. Development of differences between these groups has often related to degrees of openness to change and the adoption of new technologies; including the use of tractors, electricity and communication technologies. More “liberal” groups, who form the majority, participate extensively in government programs to the same degree as non-Mennonites (Loeffler, 2000).

Alternately some conservative Mennonite groups have maintained a culture of distrust toward government programs from their collective experience in Europe. These groups have remained hesitant to adopt newer practices, especially those promoted through government. For example, the Nith watershed, a sub-watershed of the Grand River, remained an area of concern regarding farm practices that were resulting in extensive soil erosion, sedimentation and nutrient and bacterial contamination of watercourses. In the late 1990s concerted efforts on the part of GRCA staff and technicians to meet with more conservative Mennonite groups to share and articulate the perspectives and concerns regarding watershed-wide ecosystem sustainability have been met with positive responses (Loeffler, 2000). Improved communications and ongoing collaboration and respect have been a positive attribute of the reported success of working with the Mennonite communities (ibid, 2000). Two Mennonite farmers were interviewed in this research. On both of these dairy farms; computers, the internet, tractors and trucks were standard technologies.
Alternately, the South Nation watershed in eastern Ontario is characterized by high quality farmland located in the metropolitan-influenced region between Ottawa and Montreal. South Nation Conservation (SNC) manages a significantly smaller population base than that of the GRCA but has a strong dairy farming sector in the watershed with a history going back to the early 19th century.

The area is uniquely positioned at the crossroads of English and French speaking Canada. For example, the local Franco-Ontarian Producers' Association is dedicated to the needs of French-Canadian farmers in the province. In Glengarry County, a separate municipality before the amalgamation of Stormont-Dundas-Glengarry, there is a prominent Scottish-Canadian community, among whom there are significant numbers of dairy farmers.

The region of eastern Ontario and South Nation watershed in particular face unique pressures and opportunities of valuable farmland competing with the demand and expectations of a growing non-farming, rural commuter population. The region has several colleges, including St. Lawrence College in Cornwall, the French-language campus of the University of Guelph at Alfred College, and the English-speaking, University of Guelph at Kemptville College. Recent decades have seen an influx of dairy farmer immigrants from European countries, especially Germany and Switzerland. Important to the area as well has been a political movement most strongly advocated by the Lanark Landowners' Association. While not isolated specifically to South Nation watershed but rather to the eastern Ontario region at-large, farmers have organized and responded strongly against what has been argued as over-regulation of land use through restrictions in the form of biodiversity habitat and environmental protection laws.
In sum, it is important to consider the influence of dairying in the two watersheds of this study. When average dairy farm size is taken into account, well over two million acres of land is under management (owned and rented) by the nearly 1,300 dairy farmers in the Grand River and South Nation, or close to 1/5th of all provincial farmland (DFO Statistics, 2009).

**Programs**

This section provides an overview of the three programs that are the focus of this research; the Environmental Farm Plan (EFP), the Grand River Conservation Authority-Rural Water Quality Program (RWQP) and the South Nation Conservation-Clean Water Program (CWP).

**Environmental Farm Plan**

The organization that administers the EFP and the Canada-Ontario Farm Stewardship Program (COFSP) is the Ontario Soil and Crop Improvement Association (OSCIA). While primary focus here will be to introduce the EFP program, it is also important to note that the COFSP will be referenced as the program that provides the actual funding cost share for implementing projects once an EFP action plan is proposed and peer-reviewed.

In the 1980s, programs such as CURB (Clean Up Rural Beaches) and SWEEP (Soil and Water Environmental Enhancement Program), existed as pilot agri-environmental initiatives but the EFP was created in large part as a reaction to the Canada Green Plan, a federal initiative toward more proactive environmental management across the country. The EFP gained momentum in the early 1990s during the New Democratic Party government of Premier Bob Rae when the Environmental Bill of Rights (EBR) was introduced under then Minister of the Environment, Ms. Ruth Grier. The government, through planning and public statements emphasized that considerable
environmental management contributions would be expected from the agricultural community (Grudens-Schuck, 2000 in Knierim, 2007). In response to this, a coalition of farm organizations (including the Ontario Federation of Agriculture, the Christian Farmers Federation of Ontario, the Ontario Farm Animal Council, and AgCare [Agricultural Groups Concerned about Resources and the Environment]) formed the Ontario Farm Environmental Coalition (OFEC). This new organization mobilized farmers to create a “made by farmers” response to the EBR. This coalition gained inspiration for developing the EFP program from modeling the Farm*A*System whole farm management assessment tool originating in Wisconsin in the United States. The tool provided 21 worksheets that farmers would go through in an educational framework to develop a way of thinking about the relationship between their farm and the environment.

From the earliest trial run of the EFP in 1992, there have been several studies conducted on its effectiveness. One study has suggested that greater results have been accomplished through the program than would have been the case with regulatory and legislative standards alone (Deloitte, 2007, p.50). With the creation of the EFP, the agricultural community has proactively responded to a growing public sentiment with a program deemed appropriate by farmers under increasing regulatory pressure (Smithers & Furman, 2003, p.344; Stonehouse, 2000, p.3 in Knierim, 2007). Initial funding through the federal Agricultural Adaptation Council of AAFC was very limited in assisting farmers in implementing on-farm projects.

From early developments the EFP has evolved financially with increased incentives from federal and provincial governments. The program remains voluntary and principally, farmer-led. Farmers complete an educational workshop to assess the

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40 Personal interview, Dr. John Fitzgibbon, June, 2011.
environmental state of their operation. They are provided with knowledge about beneficial management practices and techniques that can reduce risk to the natural environment. The educational spirit of the EFP is that farmers will volunteer to adopt better practices into their daily habits (Deloitte, 2007, p.50). The actual time commitment from farmers to attend a two day workshop, including development of an action plan, is a significant effort of coordination between farmers, OSCIA program administrators, and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

The development of the action plan, through following the workbook manual, is based on self-assessment. Technical advice is provided by OMAFRA and OSCIA staff. Farmers have the ultimate say on judging their farming conditions and practices. While this point can be considered one of the most contentious aspects of the assessment, the workbook guidelines continue to be adjusted for conformity with new legal and regulatory requirements and the latest management practices (Knierim, 2007). Once an initial self-assessment is complete, farmers can have their plans peer-reviewed, and from an action plan can be enhanced by a review committee to choose projects eligible for funding from the existing EFP budget for that year in the respective county (Knierim, 2007).
In December 2003, a 5-year Canada-wide agreement was developed into the Agricultural Policy Framework (APF) with collaboration between the federal government and the provinces, including OMAFRA. The agreement significantly increased joint funding for the implementation and maintenance of programs such as the EFP. In fact the EFP remained one of the most significant agri-environmental programs and funding limits were raised during the APF (2004-2009) to a maximum ceiling of $30,000 on certain on-farm projects (Ontario MNR, 2005, p.26).

Over the past decade, there have been several assessments of the EFP program (Cuddeford et al, 2004; Higgins, 1998; Consulting & Audit Canada, 2002; McCallum, 2003; Morrison & Fitzgibbon, forthcoming) and weaknesses have been identified. With the EFP, farmers are not required to change their plans in response to peer evaluations. EFP program success has largely been measured by numbers of completed workshops,
or completed on-farm projects rather than measured, positive changes to the natural environment itself. In addition, the standardized format of the EFP workbook may not be sufficient to assessing the diversity of variations in different farm-types and on-farm problems. Once potential threats to the natural environment are acknowledged by the farmer, the sole responsibility (or initiative) remains with the farmer to make changes. Complex or multi-faceted problems can remain ignored or avoided, and farmers are not required to monitor or report actions implemented (or not) on their land (Cuddeford et al, 2004, p.2).

By 2006, approximately 25,000 (about 50% of all) Ontario farmers have participated in the educational workshop aspect of the program; about 16,000 (or about 64%) have presented an EFP action plan for peer review. Detailed evaluation of the actual numbers of implemented projects, in terms of farms, and total land involved, remains fragmented, and farm-level specific data is restricted over confidentiality concerns (Knierim, 2007). While OSCIA is subject to regular audits by an external consultancy, a remaining weakness of the program is the lack of clarity on built-in monitoring and evaluation mechanisms to document environment benefits from implemented on-farm activities and completed projects (Knierim, 2007).

Currently, the Canada-Ontario EFP has two decades of applied experience and represents a government (provincial and federal) investment of over $1.5 million annually (OSCIA, 2010). In addition, according to OSCIA, leverage funds from farmers themselves toward project implementation have been close to $150 million since the program began. Still, there are several important areas of consideration for improvement within the present design of the program.
Much of the analysis and evaluation of the EFP has been conducted after phases of the program have been implemented rather than prior to project roll out. A more proactive approach in the future of conducting pre-evaluations would ensure that program phase goals more clearly reflect the environmental improvement goals initially identified (Summers et al, 2008, p.447).

Political Scientist Eric Montpetit offers a critical perspective on the development of the EFP and the limitations to its effectiveness. Montpetit’s argument builds on identifying how Canadian federal environmental policy emphasizes education and moral suasion over command-and-control regulation (Montpetit, 2003, p.90). He critiques this approach as “stalled at a low level of performance [because], a focus on education poses no threat to the economic viability of [industrial] agriculture, but its environmental effectiveness is questionable” (Montpetit, 2003, p.96). Additionally, “education is by nature a nonintrusive approach. While it may in some circumstances serve to convince farmers to change their farm practices, it creates no obligation. Farmers who are unconvinced, or who accord a greater weight to their interests than to their beliefs, can resist a change in their practices without suffering any consequences” (Montpetit, 2003, p.103).

The context for an educational approach to environmental awareness for the farming community comes from programs launched in the 1980s that informed farmers about soil erosion minimization through different practices. Farmers often adopted and adapted their practices (ibid, 2003, p.98). However, environmental programs cost time and finances, and if incentives were insufficient their effectiveness remained at a low level of performance. Montpetit focused on the context within which the EFP was developed. Farmers developed the program in a highly collaborative process that is primarily concerned with the promotion of agricultural production interests. “Self-
regulation of the agri-environment is possible in Ontario because the structure of the relationship between farm groups and OMAFRA, in other words, the policy network, has become one of clientelism.” (Montpetit, 2003, p.100).

In more recent years, the EFP has become part of a larger matrix of environmental regulations and programs, including the Clean Water Act and Source Protection Planning Committees, and the Species-At-Risk Act with its incentive programs administered through the Ontario Ministry of Natural Resources. The landscape of agri-environmental regulations in the post-Walkerton era give programs like the EFP an importance that build on the complex challenges beyond Montpetit’s critique. The federal agricultural policy program (Growing Forward 2008-2013) made less federal transfer funds available to farmers than the previous federal ‘Agricultural Policy Framework’, and this translated again into a different operating capacity for the EFP and related agri-environmental programs in Ontario.

Representatives of the EFP defend that the program is particularly suited through its voluntary basis to work with the interests and capacity of farmers themselves and in turn make implemented actions more meaningful and sustainable (Rudy 2003 in Knierim, 2007). Knierim argues that despite being farmer-led and voluntary, the EFP has evolved into a program with greater responsibility, accountability and coordination between farmer groups, third party inspections, OSCIA as the administrative and managerial lead in the program, and federal-provincial government funding streams.

By 2011, there have been three adaptations to the EFP workshop and workbook format, and approximately one-third of all Ontario farmers have actually adopted or implemented a new practice with the EFP. In the context of recent and extensive evaluation of EFP programming by external analysts, emphasis has been focused on
understanding in greater context the inaction of a significant population of farmers who have yet to participate in the EFP program.

In a recent article by Morrison and Fitzgibbon (forthcoming), the authors focus attention on the EFP within a financial, political and governance context. According to their analysis, the EFP has moved through distinct phases of evolution, from a first decade (1992-2002) marked by significant farmer-led direction and active engagement by their organizations. The authors argue that the early success of the EFP was tied to self-governance by the farmer community principled on a; voluntary, confidential, non-regulatory focus on environmental education and awareness. Confidence in data management under the EFP was not to be shared outside the farm community. During the first decade of the EFP, financial incentives were also very modest, so the motive for on-farm practices was primarily stewardship-based, however in a post-Walkerton era, environmental regulations such as the Nutrient Management Act and the Clean Water Act would significantly change policy direction in the province of Ontario. Under the federal ‘Agricultural Policy Framework’, there was a massive increase in federal funding to farmers to participate in the EFP and implement projects and practices on-farms. Morrison and Fitzgibbon argue that this infusion of federal government funding shifted the emphasis to a government agenda and away from a farmer-led one. The EFP in the mid-2000s entered a politicized phase where organizations such as the watershed-regionally based Conservation Authorities, and the Ontario government created Greenbelt Foundation ‘began to leverage the EFP program for their own ends’ (Morrison and Fitzgibbon, forthcoming, p. 16).

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41 The Walkerton, Ontario tragedy in May 2000 involved an incident of water contamination at a local treatment plant where several people died as a result. Investigations into the cause of the tragedy were multiple and complex, but did include concerns with farming practices in the region.
The second phase of the EFP through the mid-2000s shifted greater attention to financing cost-share of best management practices while funding for education and capacity building was not matched. Environmental policy adoption literature notes that the severity of environmental problems forms an important motivating factor in leading governments to create and implement environmental conservation policies, and it is also clear that in Ontario, in light of legislation such as the Greenbelt Act, Clean Water Act, Species-at-Risk Act and the Nutrient Management Act, that a broader and growing environmental consciousness has developed in the larger body politic in relation to the management of agroecosystems (Janicke, 2005; Hays et al, 1996; Hoornbeek, 2004; Reimer et al, 2013).

**Grand River Conservation Authority: Rural Water Quality Program**

The Rural Water Quality Program (as an initiative of the Grand River Conservation Authority) took form in the mid-1990s when Waterloo Region developed a Water Protection Strategy with the intention of protecting and improving water quality at the source. Waterloo Region has a tradition of supporting its agricultural sector evident through the presence of the Mennonite farming community, farmers markets and a committed Waterloo Public Health department that integrates agri-environmental initiatives through progressive regional policy. In this context, the RWQP emerged with water quality “targets” in mind. The program addresses issues such as microorganisms and microbial contamination from agricultural runoff chemicals, sedimentation and habitat health (Ryan, 2000). The RWQP is the first of its kind in Ontario where a regional municipality works with the agricultural community to share costs in the protection and improvement of water quality at its source (Ryan, 1999, p.61).

Waterloo Regional municipality and the GRCA recognized early the value in working with the Ontario Federation of Agriculture and OSCIA in the development of the
program. Additional discussions with OFEC lead to agreement that the RWQP should use the EFP as a base requirement for involvement in the program (Ryan, 1999, p.62). The multifaceted action plan included: educational outreach, financial incentives and payments for maintaining certain beneficial environmental practices and features. The main operating principle involves a conscious, clear, shared work ethic of operating with methods that have been tested through the EFP (Ryan, 2000). The program is voluntary like the EFP, so those who participate are already unique in their initiative. Those who intend to receive cost-share funding have their proposal reviewed by a local committee of farmers, similar in many respects to the EFP. Guiding principles of the RWQP build on project cost-share, fostering positive community spirit, avoiding organizational duplication, working with existing credibility, reducing delivery costs, focusing on solutions and being people-centred (Ryan, 1999).

Between 1998 and 2008, the RWQP has operated with an annual expenditure budget ranging from approximately $365,000 in 1998, to a maximum of $4.1 million in 2003, down to $3.9 million in 2008. Total funds allotted between 1998 and 2008 have been approximately $23.6 million. The top five most highly funded projects aimed at water quality improvement are congruent with projects under the EFP, and include, in order of popularity: (i.) Manure Storage, (ii.) Fragile Land Retirement, (iii.) Clean Water Diversion, (iv.) Livestock Fencing and, (v.) Septic Systems Repair (GRCA, 2009).

The following Grand River counties invested the most in the RWQP between 1998 and 2008: (i.) Wellington County ($10.1 million), (ii.) Waterloo Region ($9.5 million), (iii.) Brant County ($1.4 million), (iv.) Oxford County ($465,000), and (v.) Perth County ($362,000) (GRCA, 2009). However, this is partially contextual logic, as different counties have different percentages of their territories within the Grand River watershed, and different percentages of that land in agricultural production.
The RWQP has built on GRCA accountability and credibility with farmers in the region, funding organizations, municipalities and the broader public. This has also reduced costs of operation and allowed for a focus on extension (Ryan, 2000).

Innovations in the program have included continual adaptation to the needs of farmers. On-farm projects and practices that have less direct agricultural benefit for the farmer (such as buffer strips or wetland restoration) receive higher funding rates. Fragile lands deemed valuable to the watershed ecosystem which is removed from agricultural production can receive payment for up to 3 years on an annual basis (Ryan, 2000). More recent convergence with source water protection planning provides substantial additional project funding.

The RWQP demonstrated adaptiveness by allowing for harmonization with EFP top-up, cost share, where in some cases, projects can receive up to 80 or 100% of funding for implementation. This coordination has addressed an on-going concern of farmers to simplify the complexity and bewilderment that can exist in the programs with “paperwork” guidelines. Additionally, this coordination has resulted in greater consistency across the watershed and in turn has eased overall management (Ryan, 2000).

By 2008, at the 10th anniversary of the RWQP, more than 500 farmers have completed over 800 projects in the watershed. Tracey Ryan, the program coordinator notes that “an important lesson learned in the past 10 years was the value of taking time to develop a common understanding of issues so everyone could speak the same language (Ryan, 2009, p.4).
South Nation Conservation: Clean Water Program

The South Nation watershed in eastern Ontario covers an area of 3,900 square kilometers. There are fifteen townships and four counties in its territory. The region has significant areas with highly productive agricultural land that has good water supply, flat terrain and good soils. In more recent decades, the long tradition of farming in the region has had to face growing concerns over nutrient and bacterial contamination of the South Nation River linked in significant part to farming practices. The Clean Water Program is an initiative of South Nation Conservation, and has some important similarities with, and differences from, the Environmental Farm Plan, and the Rural Water Quality Program.

The Clean Water Program developed out of a coordinated attempt to: address concerns to reduce phosphorus levels in water; reduce agrichemical contamination of surface and ground water; encourage landowner long-term beneficial action plans; provide funding grants; and to have the farming community actively contribute to improve the South Nation River’s ecosystem health (Ferreyra et al, 2007, p.14).

Between 1993 and 2009, over $2 million was granted to local farmers and landowners for 631 projects that involve a range of actions and practices (SNC, 2009, p.13). While there are 13 different on-farm project types, proposals are considered on a case-by-case basis as it demonstrates potential to improve surface or ground water quality in the watershed (SNC, 2009, p.8).

The top five most chosen projects with the CWP have been, in order: (i.) Septic System Repair, (ii.) Manure Storage, (iii.) Well Decommissioning, (iv.) Livestock Access Restriction from Waterways, and (v.) Milkhouse Wastewater Projects.

Manure storage facilities are the largest financial investment from the CWP, with approximately $1.1 million dollars invested between 1993 and 2009, matched with $5.7 million in funds from landowners. The CWP has often covered about 20% of the
installation costs of a manure storage facility. Providing the additional top-up funding from financing received through the COFSP. It is important to note the differences in cost-share funds provided to farmers and landowners depending on the specific project. For example, the CWP covers a majority of well-decommissioning or livestock-fencing restriction costs.

A distinguished outreach and extension feature of the CWP is its network of farmer-community representatives who serve as representatives of the program to farmers in respective regions of the watershed. In 2009 for example, 4 CWP program representatives made over 100 visits to South Nation farms, attended meetings, training sessions and events to meet with farmers and promote the program. The CWP considers the use of these representatives as a nominal cost compared to employing trained technicians as is the case with the RWQP (Ferreyra et al, 2007, p.15). The CWP has a committee made up of members from the regional community which includes several dairy farmers. CWP funding is derived from combined governmental, not-for-profit and business organizations in the region.

Like the EFP and the RWQP, the CWP emphasizes confidentiality and right to privacy for landowners applying for project grants. Over the past ten years it is evident that particular CWP on-farm projects have risen in popularity in relation to agri-environmental regulatory legislation. For example, the Nutrient Management Act requires large livestock operations to plan for the disposal of their manure, and manure lagoons rose in popularity as a subsequent result. Projects such as buffer strips have been unpopular in comparison. Between 1993 and 2009, only 7 CWP buffer strip projects have been completed. This suggests the dominance of certain types of farming over others (SNC, 2009, p.15). As of 2009, over $2 million has been granted to farmers
and landowners for over 600 projects addressing non-point source pollution and water quality (SNC, 2009).

A more recent connection is the passing of the Clean Water Act in October, 2006 by the Ontario Ministry of the Environment. The act requires communities to monitor municipal drinking water sources, identify potential sources of contamination, and create and carry out plans to protect those sources (SNC, 2009, p.26). Source water protection planning outlines that local planning committees implement adaptive solutions across the province. In Eastern Ontario, the Raisin-South Nation Source Water Protection Committee, with representation from the CWP Committee, draws on their capacity and knowledge from this existing, well established partnership. The CWP forms part of a network of environmental initiatives underway in eastern Ontario. The program remains committed to sharing the costs of ecosystem health through collective responsibility, not only by farmers, but by making funds available so that projects become more affordable (Ferreyra et al, 2007, p.16).

Conclusion
This chapter has outlined the context within which the research goal, objectives, and hypotheses have been developed. The two watersheds of the Grand River and South Nation are uniquely positioned as two agriculturally productive areas of Ontario. Both face the pressure of land use development aimed at balancing food production with ecosystem sustainability. The three programs in question offer incentives to undertake projects broadly considered beneficial to the agri-environment. Important as well is that the three programs have a similar life history of emerging out of the early 1990s, and are now entering their third decade of experience and operation. Finally, dairy farming in the watersheds remains prominent and in relation to the programs, is important because of the ongoing concern with soil health, agro-chemicals and animal manure.
V. DESCRIPTIVE PROFILE OF RESEARCH PARTICIPANTS

This chapter presents an overview of the characteristics of the dairy farmers who are the focus of this research. To provide further context, a general introduction to dairy farming in Ontario is necessary. In July 2011, there were approximately 321,000 milking cows on Ontario dairy farms. This compares to the approximately 470,000 in July 1986. In 2011 there were 4,134 dairy farms in the province, with an average herd size of 77 milking cows per farm. In 2010, dairy products were Ontario’s top-earning agricultural commodity, with $1.7 billion in market receipts for the sector. The top five milk-producing counties in Ontario in 2011, measured in thousands of kilolitres, were Oxford (281,000), Perth (278,000), Stormont-Dundas-Glengarry (208,000), Wellington (208,000), and Prescott-Russell (193,000). The five counties with the greatest number of dairy farms in 2011 were Perth (388), Wellington (371), Stormont-Dundas-Glengarry (351), Oxford (329), and Prescott-Russell (281) (McGee, 2011).

The counties or regional municipalities that have some or all of their territory within the Grand River watershed are Brant, Dufferin, Haldimand, Halton, Norfolk, Oxford, Perth, Wentworth, Waterloo, and Wellington. Municipalities with some or all of their territory in South Nation watershed are Ottawa, Stormont-Dundas-Glengarry (S-D-G), Leeds-Grenville, and Prescott-Russell.\footnote{McGee, B. 2011, OMAFRA, Statistics Canada.}

As noted in the Methodology Chapter (Chapter three) the survey questionnaire was sent to all dairy farmers in both watersheds resulting in 239 completed surveys (138 from Grand River, and 101 from South Nation). The most completed surveys (47) came from Wellington County; the second most-completed (34) came from S-D-G.
Fourteen preliminary interviews were conducted in the winter of 2009 (2 outside the Grand River watershed, 7 inside the Grand River watershed, and 5 in South Nation watershed). There were 47 secondary fieldwork interviews completed (31 in South Nation, 16 in the Grand River). In addition to survey participants and their response rates outlined in the methodology chapter (Chapter 3), four workshops—two in the Grand River, two in South Nation were completed. The Grand River workshops were attended by seven and two farmers respectively; and the South Nation workshop by six farmers on both occasions.

**Description of Survey Participants**

**Degree of Participation**

Four categories were established to organize the responses from survey participants, in both watersheds:

- **Non-Participants (NP):** Survey respondents who indicated that they had not taken part in either the Environmental Farm Plan (EFP) or the Rural Water Quality Program (RWQP) in the Grand River watershed, nor the Clean Water Program (CWP) in the South Nation watershed.

- **Workshop-Aware (WA):** Respondents who had attended the EFP educational workshop, but had not gone on to complete an actual on-farm project.

- **Participants (P):** Survey respondents who had completed an on-farm project after completing the EFP educational workshop.

- **Super-Participants (SP):** Respondents who had both completed the EFP, and received funding for an on-farm project through either the RWQP or the CWP, in their respective watersheds.
For Grand River survey respondents, out of a total of 138 participants, 42 (30%) were Non-Participants; 28 (20%) were Workshop-Aware; 35 (25%) were Participants; and 33 (25%) were Super-Participants. For the South Nation respondents, out of 101 participants, 33 (33%) were Non-Participants, 14 (14%) were Workshop-Aware; 44 (44%) were Participants; and 10 (10%) were Super-Participants.

These numbers indicate that at least 50% of all survey respondents had actually completed a project on their farms. Exact numbers of on-farm projects completed by participants were not available — either because the farmer was unwilling to share project specifics, or was unaware of them. For example, in some cases, a different family member from that interviewed may have been responsible for filling out the forms and completing the project through a respective program. Conversely, some 50% of respondents had not implemented the EFP, or even taken the workshop. Non-participation in the watershed-specific programs was assumed, since the EFP is a prerequisite for both the RWQP and the CWP.

The following chapter sections analyze social factors, in order to develop a greater understanding of the social contexts in which farmers make decisions about their operations. Outlining these factors provides greater insights into how farmer demographics might lead toward the goal of greater participation in environmental programs.

**Comparative Profile of Survey Representativeness**

The comparative set of statistics in Appendix I – Figure 4 serves to demonstrate the degree of representativeness between quantitative data obtained from the survey questionnaire with provincial and regional averages. Comparative statistics were obtained from the 2011 and 2006 Census of Agriculture for Ontario. In addition, to profile a sense of representativeness in the regions of the Grand River and South Nation
watersheds, farmer statistics are provided for Wellington County (located in the Grand River watershed), and Prescott-Russell Regional Municipality (located in South Nation watershed). These Statistics Canada data sets have been compared with the data obtained from the survey questionnaire. Total farms and total dairy farms were provided for all categories when available. The sex of farmers was profiled and compared because it was a survey question. It is notable that there are a higher percentage of males participating in the survey than is the average at the provincial level. The average age of dairy farmer respondents to the survey is younger in both watersheds than the provincial average by about 5-7 years. Herd size at the provincial average was compared to the two regions of focus (Wellington and Prescott-Russell), and with survey respondent averages. Generally, the herd size on the average farm in Ontario is equivalent to or slightly larger than survey participants for this research, but significantly smaller than farmers interviewed.

From the comparative scan of farmland managed (acres owned and rented), the provincial average is significantly smaller than respondents to the survey. In some cases survey respondents, such as in South Nation watershed, are managing farmlands nearly three times as large as the provincial average. Finally, income was compared between the provincial, regional, and survey respondent averages. Similar to farmland management size, income among survey respondents are nearly double or more than the provincial average.
**Education**

**Table 5.1: Highest levels of formal education attained by survey participants**

<table>
<thead>
<tr>
<th></th>
<th>GRCA total # (%)</th>
<th>SNC total # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School</td>
<td>40 (35)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>Secondary School</td>
<td>27 (23)</td>
<td>26 (35)</td>
</tr>
<tr>
<td>Post-secondary Apprenticeship or College</td>
<td>36 (31)</td>
<td><strong>33 (45)</strong></td>
</tr>
<tr>
<td>University</td>
<td>13 (11)</td>
<td>11 (15)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>116 (100)</strong></td>
<td><strong>74 (100)</strong></td>
</tr>
</tbody>
</table>

One important observation to be drawn from the education data shown in Table 5.1 is that Grand River watershed participants had, on average, less formal education than South Nation watershed participants. About a third (35%) of Grand River respondents had progressed only as far as primary school, while 45% of South Nation respondents had some degree of post-secondary education. This may explain the potential influence of this survey cohort, in a comparison between the two watersheds. These figures are probably influenced by the Mennonite communities in the Grand River watershed, since education beyond elementary school is not emphasized in the Mennonite culture (Loeffler, 1999).

It should be considered whether there is a connection between farmers’ formal education, and their participation in programs. A significant amount of research has already been conducted on the connections between education and the likelihood of adopting beneficial management practices through environmental programs (Ryan, 1999; Serman & Filson, 2000). Close to half of respondents in both watersheds had some degree of post-secondary education (primarily agricultural college diplomas).
Age

In the Grand River, 115 farmers provided information on their age, as did 72 in South Nation. The average Grand River survey participant age was just over 46, while those interviewed were slightly older at 49. In South Nation, survey and interview participant averages were identical at 49, with the average age of all participants in their mid to late 40s. Although the average farmer age in Ontario is increasing, this group is slightly younger than the provincial average. One reason for this may be the fact that many farmers in the dairy community are part of a family tradition. Acquiring milk quota requires a significant investment of capital, which must often be built up over generations. This means that new entrants into dairy farming face significant obstacles—a situation that creates unique dynamics of continuity in many families.43

Sex

Over 90% of survey respondents were male, with a slightly greater female participation in South Nation than in Grand River (8% compared to 6%). During the interviews conducted, conscious effort was made to gain the insights of women on the programs and issues central to this thesis. On several occasions, when calling on dairy farms, initially a woman would answer, and recommendations were often made to call back to speak to her husband (or father). Three women were interviewed out of the total. On several occasions, a farm couple was interviewed together. In these specific cases it was insightful to gain a broader perspective on opinions about the programs. In the Grand River watershed workshops there were no women present at either event (even though women were invited). In the South Nation watershed workshops, women were present at both events.

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43 For additional commentary on dairy supply management and new entrants to the sector, please read; FarmStart, (2010). *New Farmers and Alternative Markets Within the Supply-Managed System*. Metcalf Food Solutions. Toronto: Metcalf Foundation.
In the second Grand River watershed workshop, the questions were asked, “What is your sense of the role of women in influencing participation in the (EFP & RWQP) program?” & “Do you see the role of women as unique to how a family farm takes part in these programs?” At the same workshop, it was noted to the participants that most attendees were male. One of the participants stated that in eastern Ontario there are more females participating on milk committees. As noted, the number of female respondents in the South Nation watershed survey was slightly greater than for the Grand River watershed. Additionally, another workshop participant noted that their wives make dairy farms operate more feasibly, providing off-farm income and helping with finances. In another example, a farmer mentioned that Jersey Ontario gives awards to hardworking couples who work at off-farm jobs while also managing dairy herds.

**Land Managed**

**Table 5.2: Farmland Managed (Owned and Rented combined) by Research Participants – Location and Size**

<table>
<thead>
<tr>
<th></th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>S # (%)</td>
<td>I</td>
</tr>
<tr>
<td><strong>Grand River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brant</td>
<td>2(100)</td>
<td></td>
<td>1(100)</td>
</tr>
<tr>
<td>Dufferin</td>
<td>1(50)</td>
<td></td>
<td>1(50)</td>
</tr>
<tr>
<td>Haldimand</td>
<td>5(36)</td>
<td></td>
<td>9(64)</td>
</tr>
<tr>
<td>Oxford</td>
<td>1(20)</td>
<td></td>
<td>3(60)</td>
</tr>
<tr>
<td>Perth</td>
<td>3(50)</td>
<td></td>
<td>2(25)</td>
</tr>
<tr>
<td>Waterloo</td>
<td>11(32)</td>
<td></td>
<td>14(41)</td>
</tr>
<tr>
<td>Wellington</td>
<td>2(20)</td>
<td>12(24)</td>
<td>21(42)</td>
</tr>
<tr>
<td>Wentworth</td>
<td>2(50)</td>
<td></td>
<td>1(25)</td>
</tr>
<tr>
<td><strong>South Nation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-G</td>
<td>3(75)</td>
<td></td>
<td>1(100)</td>
</tr>
<tr>
<td>Ottawa</td>
<td>2(18)</td>
<td>6(100)</td>
<td>7(64)</td>
</tr>
<tr>
<td>P-R</td>
<td>1(6)</td>
<td>2(8)</td>
<td>9(60)</td>
</tr>
<tr>
<td>S-D-G</td>
<td>11(31)</td>
<td>4(44)</td>
<td>14(40)</td>
</tr>
</tbody>
</table>

Note: some survey percentages do not equal 100% because survey respondents did not provide farm size data. I=Interviews, S=Survey, # = Number of Interviews (% = Percent of Total), Small= less than 200 acres, Medium=201 to 600 acres, Large=601 acres and up. Please refer to map in introductory chapter (chapter 1) for location of interviews.
Land managed by dairy farmer participants in this research was aggregated into a combined total of (land owned and rented). Of those interviewed in the Grand River watershed, the average farmland size was 495 acres, while those surveyed was 350 acres. For South Nation watershed participants, average farmland being managed was 685 acres for those interviewed and 585 acres for survey respondents.

In southwestern Ontario and in the Grand River watershed, land values and acreage costs are higher than in eastern Ontario because of longer growing seasons and greater population pressures competing over land use. In South Nation watershed, we see that farmland acreage managed is significantly larger than in the Grand River watershed. In eastern Ontario, there is less of an emphasis on renting land, as land values are relatively more affordable, and feedstock crops require different planting/harvest patterns. For example, nearly one fifth of South Nation watershed survey respondents manage land in excess of 800 acres.

**Herd Size**

117 respondents indicated their herd size for the Grand River watershed, and 73 respondents did so for South Nation watershed. As noted, while the average milking herd size for dairy farms across the province is approximately 77, for participants in this study it is quite varied. For survey respondents in the Grand River watershed, the average milking herd size was 59, somewhat smaller than the provincial average. This can be attributed again to the Mennonites participating in the survey, who tend to have smaller herds on average. Milking herd size jumped to 116 amongst interviewed Grand River farms, significantly larger than the provincial average and markedly larger than

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44 Milking herd size refers to all dairy cattle on a farm that are actively being milked. The total number of cattle on each of these farms is greater because they include; calves, heifers and dry cows. Milking herd size is often the main reference point in dairy farm analysis because the number of milking cattle a farm has, at least currently in Ontario and Canada corresponds to the supply-managed milk quota that any particular dairy farm has allowance to produce.
survey respondents. In South Nation watershed, of the 101 survey respondents, milking herd size average was 80, nearly identical to the provincial average, while those interviewed in South Nation watershed averaged a herd size of 113. In both watersheds, herd sizes of interviewed farmers were somewhat larger than the provincial average.

**Farm Income**

The overall income and economic well-being of a dairy farm is considered in this research as a factor that influences farmer inclinations, perceptions and conditions toward agri-environmental participation. When asked, “What were your gross farm sales for 2008?” the average farm income from 89 Grand River watershed survey respondents was just under $452,000, while the equivalent from 56 South Nation watershed survey respondents was just under $568,000. The distinction is notable again between the two watersheds. The survey respondents in the Grand River watershed included proportionately more Mennonites than South Nation watershed, and they generally operate smaller farms and herds, and tend to have smaller gross farm sales and lower income.

Two additional questions focused on farmer income. These were intended to distinguish what percentage of the overall farm operation receives revenue from dairy products, and to what extent off-farm revenue contributes to total family income. These questions were considered as potential factors in dairy operation diversification, to give insight to the span of alternatives that a farm family was considering. When survey participants were asked, “What percentage of your on-farm revenue comes from dairy?,” the results from 114 Grand River watershed respondents’ indicated an average of 88%, while the results from 74 South Nation watershed respondents indicated an average of 79%. In both watersheds, dairy farmers were obtaining over four fifths of their income from dairying alone. A slightly higher degree of diversification taking place on South
Nation watersheds was generally supplemented in the form of revenue from surplus cash crops or veal calf sales.

The third question about farm income related to off-farm income. The assumption here was that farmers (and farm families) engaged more extensively in social networks outside their immediate dairy surroundings would more likely have perspectives beyond an agricultural one. In turn, a spouse employed through an off-farm job might contribute financial revenue and add knowledge to the farm operation that could include information about environmental programs.

Table 5.3: Survey respondents indicating to what degree off-farm revenues contribute to their total income

<table>
<thead>
<tr>
<th></th>
<th>GRCA total # (%)</th>
<th>SNC total # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly</td>
<td>8 (7)</td>
<td>7 (10)</td>
</tr>
<tr>
<td>Somewhat</td>
<td>11 (10)</td>
<td>11 (15)</td>
</tr>
<tr>
<td>Slightly</td>
<td>35 (30)</td>
<td>12 (16)</td>
</tr>
<tr>
<td>Not at all</td>
<td><strong>62 (53)</strong></td>
<td><strong>43 (59)</strong></td>
</tr>
<tr>
<td>Total</td>
<td><strong>116 (100)</strong></td>
<td><strong>73 (100)</strong></td>
</tr>
</tbody>
</table>

Between 50 to 60% of dairy farms in both watersheds indicated that off-farm revenue was not contributing to total income. What this question also reveals is that nearly half of all dairy farms are obtaining some income from a spouse working off the farm, or from some other source of revenue. Diversified incomes, separate from dairy, are supplementing overall finances in both watersheds.

**Location: County and Township**

All of the counties or regional municipalities within the two watersheds have some degree of representation in the survey. County level participation resulted in 117 responses for the Grand River watershed, and 75 responses from South Nation
watershed. Township level participation resulted in 113 and 74 responses for Grand River and South Nation watersheds respectively. To a great extent, the number of survey respondents from each county corresponds to the percentage of land in the county also in the watershed. In order of most prominent as represented in the Grand River are: Wellington, Waterloo, and Perth. For South Nation, these include: Stormont-Dundas-Glengarry, Prescott-Russell, and Ottawa. Greater detail on the location of participants was obtained by asking respondents to indicate their township, the assumption being that areas with greater numbers of project participants might have a social influence effect on their neighbouring farmers.

For the Grand River watershed population, a significant proportion of respondents were from Mapleton, Perth East and Wellesley townships in particular, all of which are also located centrally in the watershed. Survey responses from this area came primarily in the form of mail, and in relation to surnames from the mailing list (where respondents could have the option to include their address); a significant number could be identified as part of the Mennonite community.

In South Nation watershed, there was a significantly higher response rate from La Nation and North Dundas townships than from other townships. These townships are in the centre of watershed, and also have the largest concentration of dairy farms in eastern Ontario. La Nation municipality in particular is a largely French-Canadian township.

**Generations on Farm**

A question asked “How many generations have you been on this farm” and resulted in 135 responses for the Grand River watershed, and 94 responses for South Nation watershed. On average and with minimal differentiation, dairy farm families in both watersheds have been based on their current farm for 2 to 3 generations. Most farmers
are descendants of settlers from the late 19th or early 20th century. There are also those
dairy farm families who have been on the same land for 5 or more generations, and
represent about 12% of respondents for both watersheds. In addition to those who have
been settled for long periods of time, there was also a significant portion of participants
who are first generation on the farm. Several interviewees noted how rising European
farmland prices over the past 2-3 decades has led to immigration of dairy farmers from
countries such as Switzerland, the Netherlands, Germany and England in pursuit of
lower land and regulatory costs.

Farm Succession
The survey questionnaire asked: “Do you have a son or daughter who plans to take over
the farm when you retire?” There were 74 (76%) respondents from the Grand River
watershed and 57 (70%) respondents from South Nation watershed who answered this
question. Some comments also included “too early to tell” and “I hope so.” From the
qualitative interviews, it became evident that comments like these came from younger
farmers starting families. The slight variation between the two watersheds is minor but
may relate to the strong community and family traditions in the Mennonite community.
The assumption in this question is that if there are plans for a family member to take
over one’s investments, then it would lead to more sustainable practices, and in turn,
participation in the EFP, RWQP or CWP. In the second Grand River workshop, a farmer
from Wellington County noted that “if you know someone is going to take over the farm,
you’re willing to spend the money so that the next generation has a better shot at it.”

Farm Practice
The purpose of questioning farm practices was to determine the extent to which survey
respondents apply “beneficial management practices.” Answers ranged in the affirmative
to as many as 8 practices. The question assumed that more practices followed would
have more likelihood of greater engagement with emerging trends in farm practice overall.

**Table 5.4: Percentages of conservation practices being used by survey respondents**

<table>
<thead>
<tr>
<th>Practice</th>
<th>GRCA %</th>
<th>SNC %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop rotation</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>Minimum tillage</td>
<td>50</td>
<td>68</td>
</tr>
<tr>
<td>Windbreaks or shelterbelts (natural or planted)</td>
<td>42</td>
<td>29</td>
</tr>
<tr>
<td>Winter cover crops</td>
<td>39</td>
<td>12</td>
</tr>
<tr>
<td>Pasturing milking cows</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>No tillage</td>
<td>22</td>
<td>37</td>
</tr>
<tr>
<td>Rotational grazing</td>
<td>7</td>
<td>18</td>
</tr>
</tbody>
</table>

More specifically, as the table indicates, nearly all farmers in the survey now practice crop rotation (a broadly recognized soil quality improvement practice). Minimum and no tillage practices are more common in the South Nation watershed. Winter cover crops are used significantly more often in the Grand River watershed at nearly 40% with only 12% practicing this in the South Nation watershed.

**Farm Project Choice**

In both watersheds, building manure storage facilities remains the most popular on-farm project for dairy farmers. Arguably, this is the most immediately beneficial and practical project available to reduce manure runoff into waterways. In the aftermath of the Walkerton crisis, and in light of the Ontario Nutrient Management Act, manure storage facilities are readily taken up on larger dairy farm operations.45

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45 Part of the regulatory parameters of the 2002 Ontario Nutrient Management Act is the requirement for livestock farms of a larger size, measured as being over 300 animal ‘units’, or approximately 275 dairy cows, to complete a Nutrient Management Plan.
Table 5.5: Most recent and most popular on-farm projects completed by survey respondents through the EFP and the RWQP or the CWP

<table>
<thead>
<tr>
<th>Project</th>
<th>GRCA # (%)</th>
<th>SNC # (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure Storage Facility</td>
<td>41 (48)</td>
<td>32 (44)</td>
</tr>
<tr>
<td>Milkhouse Wastewater System</td>
<td>24 (28)</td>
<td>19 (26)</td>
</tr>
<tr>
<td>Well Decommissioning</td>
<td>19 (22)</td>
<td>8 (11)</td>
</tr>
<tr>
<td>Erosion Protection</td>
<td>11 (13)</td>
<td>5 (7)</td>
</tr>
<tr>
<td>Cropping Systems Technology</td>
<td>9 (11)</td>
<td>17 (23)</td>
</tr>
<tr>
<td>Tree Planting</td>
<td>9 (11)</td>
<td>7 (10)</td>
</tr>
<tr>
<td>Livestock Access Restriction to Water</td>
<td>9 (11)</td>
<td>6 (8)</td>
</tr>
<tr>
<td>Septic Storage Repair, Upgrade, Replacement</td>
<td>7 (11)</td>
<td>7 (10)</td>
</tr>
</tbody>
</table>

Note: Some respondents indicated more than one project and therefore the totals do not add up to 100%.

The purpose of outlining the numbers of different projects is to highlight the momentum and favorability of certain projects over others. Table 5.4 makes clearly evident the contrast in popularity between different on-farm projects.

Farm Organizations

Questioning farm organization membership provided 79 and 75 responses from the Grand River and South Nation watersheds respectively. The survey and interview questionnaire asked farmers about their farm organization affiliations. Optional responses could include membership with the main farm groups, and dairy breed associations. The majority of respondents indicated membership with Holstein Ontario (over 90% of the provincial dairy breed are Holsteins). The Ontario Federation of Agriculture (OFA) is also the largest general farm organization for the majority of farmers. Of interest is the disproportionately large number of memberships with the CFFO (the second largest farm organization in Ontario) in the Grand River watershed cohort. This can be attributed again to the significant numbers of Mennonites participating in the survey.
Nearly 25% of all respondents are also members of local milk production committees. This is notable because membership in these committees provides additional opportunities to learn about agri-environmental programs. Close to 10% of respondents are involved not only with their main organization (either OFA or CFFO), but also with a local milk production committee, and with the Ontario Soil and Crop Improvement Association (OSCIA).

During interviews in the South Nation watershed, one of the dairy farms visited had the farmer and his family members extensively engaged in several farm and regional organizations. This same farmer had also been involved in strategic planning for his farm’s nutrient management plan. His family was extensively connected to the agricultural sector in their area. This is a unique example of a highly integrated dairy farm family extensively involved with farming organizations.

In another township in South Nation watershed, three farmers gave specific insights into their interaction with farm organizations. One emphasized his change of membership between two leading Ontario-based farm organizations because of concern over program spending and a greater faith in planning with his neighbouring farmers rather than with distance province-wide decision-making. This echoes responses to some survey questions where farmers still rely primarily on neighbours for insight and advice. A third South Nation watershed dairy farmer noted his activity on many fronts with the local county Federation of Agriculture as well as his local milk committee. He stated that farm organizations “are his life.” A fourth South Nation watershed farmer was equally active with several leading farm organizations, especially in regard to emerging organic and grazing management efforts underway in the region. This farmer considered access to U of G is a vital resource in the region.
Amongst the interviews conducted in the South Nation watershed, several gave specific insights to farm organization membership. One couple provided unique insight into the dynamics of an actively engaged farm family since their work involves local animal care and extension to area farmers. They have also been loosely associated with the Lanark Landowners Association, and expressed concern that the three main Ontario farm organizations (OFA, CFFO and NFU) “fight against each other” while in Quebec all farmers are united under the Union de Producteurs de Agricoles (UPA).

Another dairy farmer in South Nation watershed and her family remain active with the Union de Cultivateurs de Franco-Ontarians (UCFO), an organization committed to French-speaking Ontario farmers. Her farm is actively involved with OFA, OSCIA, Holstein Ontario, a local dairy committee, the St. Albert cheese cooperative, and a local food cooperative. She noted “participation is essential even if you received a good education because you still need to stay informed.” Her involvement in an emergent local farm group that addresses financial and environmental management challenges was also distinct and notable. An additional La Nation township interviewee referred to this same organization. The group, with approximately 20 members, meets regularly to share information on effective dairy management planning. While the group originated with financial concerns, environmental aspects have emerged out of the former. This group retains a consultant to inform members on the latest regulatory and legal developments affecting dairy farming in the province and Canada.

One Ottawa Region farmer indicated that he had served as an OFA board member, but had more recently converted to the CFFO because of concern that the OFA compromised too much in regard to government regulatory pressures. A second Ottawa region dairy farmer, marginally active with the OFA and Holstein Ontario, clearly stated disinterest in farm organizations. While this farmer continued to read farm and
dairying media, he planned to diversify his life and was frustrated with what he felt was the marginal return on investment in dairying. He added his wife's disinterest with dairy farming only exacerbated the sentiment. A third Ottawa dairy farmer, as a member of the financial-environmental management group mentioned above, noted that this group “has better feed rations for their herds, better manure calculations, better crop rotations, and better custom applications of manure than the majority of dairy farmers in the area. With professional crop consultants, we identify weeds specifically, so that we don't have to spray without reason.” Farmers interviewed with association to this planning group seemed to value the insights that membership provided.

During the South Nation interviews, when asked; “How does your involvement in these groups help in decision-making,” farmers responded that “It is educational”; “It is good to see what others are doing, especially on farm tours.” “It can develop a circle of colleagues and friends, that rather than talk to only your most immediate neighbours, makes you more aware and see things you didn’t beforehand,” “Groups are good especially if they are cooperatives and when they can provide easy guidelines.” When asked; “Does this group provide help anything different than from your everyday circle of colleagues,” responses included; “With these groups the focus is more specific. In those groups [OFA, CFFO] it is the bigger issues. [In smaller groups] The advice is more objective. Farmers will tell you what did or did not work, but what works on one farm may not on another. It is more political, higher and more engaging.”

During the first South Nation watershed workshop held with a group of dairy farmers, the question was posed, “What is the potential strength in having a farm organization such as the OFA or the CFFO.” A participant from Alfred-Plantaget Township noted, “Their influence can be a diverse range of opinions, however a big problem can be the staff themselves. They are staff, not farmers, and therefore have a
completely different perspective, going home at 4pm, while we are still working. To a government program a farmer might say this won't fly, but a staffer might say we can get the guys to comply and say we allowed their say in it.” Another farmer at this workshop placed less emphasis on provincial organizations and more on regional farm organizations, adding, “...how difficult is it to address issues from head office. For example, we brought forward resolutions with the new Clean Water Act, but from the mothership they do not want to get too out of line.”

An overall impression from the qualitative data is that time commitments and social interaction are pragmatically focused on farm organizations that help facilitate agricultural profitability. While family, friends, and fellow dairy farmers serve as primary sources for decision-making, the multitude of farm organizations can focus on specific needs of their members. Interviews conducted by the author often noted that social networks such as local churches also provide a source of interaction, and evidently are where many dairy farmers congregate to share ideas. Greater contextual details on these findings will be introduced further in the next chapter.

During fieldwork interviews, three specific groups emerged worthy of mention. As noted, a group of primarily Franco-Ontarian farmers in South Nation watershed and eastern Ontario in general have created a group emphasizing continual improvement in management skills through financial and environmental planning. In the Grand River watershed, a group loosely associated by Dutch-Canadian ethnicity meet separately from the CFFO (also a significant Dutch-Canadian, though more Christian-focused group). Thirdly, different Mennonite communities continue to work closely as a uniquely cohesive social group quite different from the non-Mennonite dairying sector. Immediate and extended family support systems are important aspects to the community.
Mennonite networks, as noted by interviewees, provide a great deal of cost savings and capacity that compensates for their often smaller herd sizes.

General farm groups such as the OFA and CFFO are dedicated to overall productivity and may not address environmental issues unless it directly affects the “bottom line.” In most of the interviews and workshops, farmers remain cautious of overly centralized decision-making. However, there still remains a hesitant sense of general agreement that farm group and organizational involvement is central to staying informed, because as one farmer put it, “you can never get too many opinions.”

Communication Technology Use
The purpose of questioning communication technology use was to gain a sense of farmer interaction with information and data in the broader world, the assumption being that there is a relationship between “connectedness” and program participation. There were a total of 116 and 75 responses from the Grand River and South Nation watersheds respectively. Survey respondents were also asked: “Do you use the internet/email regularly (at least 3-4 times per week on your farm?).” In the Grand River watershed 58% of farmers indicated “Yes,” while in South Nation watershed 80% of farmers said “Yes.”

While 60% of Grand River watershed survey respondents claimed to use the internet regularly, 80% of South Nation watershed respondents claimed to do so. Again the influence of the Mennonite population may arguably have led to the lower communication technology results in the Grand River. However, Mennonite dairy farmers were visited during both the first phase and second phase of interviews. In both cases, the farmer used a computer, and in the second case, had internet access. As information, advertisements and websites become common place for farm organizations,
their use and access by farmers becomes not only another means of communication, but also a way to stay informed about new developments in the sector.

Conclusion
From the social factors highlighted above, there are important observations in farmers’ social circumstances that influence participation in agri-environmental programs.

The survey and interviews reveal that lifecycle stage is an element in capacity to undertake an on-farm project. Most program participants in this study were generally in their 40s. Herd size provides insight into the scale and intensity of farm impact on the environment. Larger herds are either obliged by regulation, or motivated by public pressure, to undertake different farm management practices on farm.

With participation as the central variable of measurement for this research, half of all research respondents in this study have some degree of direct experience with at least one of the three programs.

County and township location were included as determining factors because proximity to more active farmers in terms of on-farm practices was assumed to be an influence on participation. For example, the significant Mennonite population located in the central Grand River valley has an important influence on the results of this research. In central regions of both watersheds, greater efforts have been allocated to education and outreach by both the Grand River Conservation Authority and South Nation Conservation.

“Generations On-Farm” assumed that the longer a farming family has been connected to their land, the more care and concern they would project toward the environmental sustainability of their property. In line with generations on farm, the concern about farm succession was asked of research respondents, with the...
assumption being that continuity and commitment would encourage greater sensibility toward environmental management.

Education is often considered one of the most important determining factors in terms of farming practice. Respondents ranged in education from primary school through to post-graduate. Educational variability however might belie the subtleties within which learning and awareness take place. If intense community connectedness takes place as in the Mennonite community, than this may have greater influence than formal education. The South Nation watershed cohort had higher degrees of formal education on average than Grand River watershed respondents.

The vast majority of research participants were male, apart from a few interviews with couples and women. Consideration of farm land managed was included as a social factor because, like herd size, farm size has been assumed to influence the capacity for, or need to undertake on-farm projects because of government regulations. In addition, larger farms might have greater financial capacity to implement new farming practices. Results from this research note how much larger many of the South Nation dairy farms are compared to those in the Grand River watershed.

Farm incomes, like herd size and land managed are various factors that relate to the size and scale of a farm operation. Income, it is assumed, allows for greater likelihood of on-farm projects. Communication technology use (measured as internet frequency in this research) has been included assuming that respondents with greater use of the internet would be more aware of programs and in turn, participate more as well. Measurements of aggregated farm practices have been included as an indicator of overall awareness and application of “beneficial management practices.”
A social factor considered in this chapter was farm organization membership. Ontario farmers are for the most part a member of one of the three major general farm organizations (the Ontario Federation of Agriculture, the Christian Farmers’ Federation of Ontario, or the National Farmers’ Union-Ontario). By default, dairy farmers are also members of a dairy breed association such as Holstein Ontario or Jersey Ontario. Farm group membership in this research aimed to determine if greater organizational participation influences the implementation of greater environmental projects. To this effect, research determined that some dairy farmers are extensively involved in three or more organizations on an active basis. Can these farmers be considered thought leaders? From interviews and workshops, local organizations and social networks emerged worthy of mention. The collection of descriptive factors highlighted in this chapter form the context for the analysis to follow in Chapter 6.
VI. DATA ANALYSIS AND FINDINGS

Introduction
This chapter is an analysis of the data collected from the survey questionnaire, interviews and workshops. The previous chapter focused on a descriptive profile of research participants using various social factors, averages and general overviews. This chapter investigates the social dynamics concerning program participation. Since the research aims to advance agri-environmental management through greater awareness of farm program participation as influenced and motivated by the social dynamics of farming, three sections of analysis are included in this chapter. They are:

- individual socio-economic factors
- social influence factors toward program participation
- and farmer perceptions of program value

These three factors all have a corresponding objective and hypothesis to organize the inquiry. The hypotheses have been developed to be falsifiable. As noted earlier, the consistent dependent variable in each test is degree of participation in agri-environmental programs. Certain hypotheses led development of the questions asked of research participants.

As noted in the methodology section, chi-square, Spearman’s rho measurements of association and correlation, and the regression tests were conducted with significance at the .05% level. Test results that indicated anything at or below the .05 level are considered statistically significant.

In the first section, individual farmer socio-economic factors are analyzed as elements that can help provide insight into what leads to greater innovation (defined
here as agri-environmental program participation). Questions relate to: education, age, sex, land size, and farm income.

In the second section, social influence factors, an analysis provides insights into whether or not more socially active farmers have greater inclination toward participation in agri-environmental programs. Social influence is defined here as everything from immediate family and friends, to farm neighbours, fellow farmers, colleagues, and associates to farm organizations, contractors, consultants, and government officials. Social influence also includes the role of mass media, and the internet.

In the third section, farmer perception of agri-environmental program value, an analysis is conducted of how farmers think programs can improve, ranging from financing, participation promotion, and communication, organization and overall agri-environmental program effectiveness.

In this context, the chapter analyzes each variable question and the results of those questions (quantitatively and qualitatively) through these three sections, with their respective objectives and hypotheses.

a. Socio-economic Factors
This section analyzes fundamental aspects to a farmer’s socio-economic profile: education, age, land managed, sex, and farm income. This provides a profile to consider how influential these factors are in relation to agri-environmental program participation.

To this effect,

Objective 1: To analyze if specific socio-economic factors can lead to greater program participation.
Hypothesis: Degrees of participation are positively related to: education, age, land managed, sex, farm income.

Prior to analysis of each individual variable of socioeconomic factors assessing program participation, table 6.1 presents the data results from the various tests of correlation and association. Rather than a descriptive review of the table here, each variable is given greater attention in relation to degrees of significance and correlation value in respective subsections of the chapter.

Table 6.1. Survey responses to socioeconomic factors testing for Degree of Program Participation as Dependent Variable

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Overall</th>
<th>Grand River</th>
<th>South Nation</th>
<th>C/S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># (%)</td>
<td>Sig.</td>
<td>p</td>
<td># (%)</td>
</tr>
<tr>
<td>Education</td>
<td>190(80)</td>
<td>0.73</td>
<td>0.03</td>
<td>116(84)</td>
</tr>
<tr>
<td>Age (Agg’d)</td>
<td>187(78)</td>
<td>0.90</td>
<td>0.01</td>
<td>115(83)</td>
</tr>
<tr>
<td>Age (Raw Data)</td>
<td>187(78)</td>
<td>0.93</td>
<td>0.01</td>
<td>115(83)</td>
</tr>
<tr>
<td>Land Managed (Agg’d)</td>
<td>189(79)</td>
<td>0.34</td>
<td>-0.07</td>
<td>99(73)</td>
</tr>
<tr>
<td>Land Managed (RawData)</td>
<td>189(79)</td>
<td>0.23</td>
<td>-0.08</td>
<td>99(73)</td>
</tr>
<tr>
<td>Sex</td>
<td>188(78)</td>
<td>not valid</td>
<td>not valid</td>
<td>115(83)</td>
</tr>
<tr>
<td>Off-Farm Income</td>
<td>189(80)</td>
<td>not valid</td>
<td>not valid</td>
<td>116(84)</td>
</tr>
<tr>
<td>Income (Agg’d)</td>
<td>146(60)</td>
<td>0.40</td>
<td>-0.07</td>
<td>89(64)</td>
</tr>
<tr>
<td>Income Raw Data</td>
<td>146(60)</td>
<td>0.23</td>
<td>0.10</td>
<td>89(64)</td>
</tr>
</tbody>
</table>

Overall N = 239, Grand River N = 138, South Nation N = 101, Sig. = p-value, Agg’d = Aggregated, p = Spearman’s rho correlation, C = chi-square, S = Spearman’s rho

Education

The previous chapter noted that South Nation watershed respondents had higher degrees of formal education than Grand River watershed respondents. A test of education specifically in relation to agri-environmental program participation was run in SPSS. The question was, “What is your highest degree of education?” The Spearman’s

Please see Appendix F. for full details regarding this table.
rho test results indicate that there is no statistically significant relationship between levels of education and degrees of participation in the agri-environmental programs in question.

Overall, there is no distinction between high school and university education in agri-environmental program participation, or Super-Participation, however in the Grand River watershed there is a slight rise in participation from primary school to university-educated respondents while not statistically significant. In the Grand River watershed, as noted earlier, the influence of the Mennonite community, evident in responses to the survey questionnaire, impacted results. In the South Nation watershed, no distinct pattern emerged other than tendencies that secondary school educated respondents are also participants to a notable degree.47

**Age**

As the descriptive chapter noted, the average age of research respondents in both the interviews and survey were in their mid to late 40s. In this analysis, the assumption was that older farmers are more likely to be participants in agri-environmental programs. An initial test of correlation was run on this ungrouped data. The Spearman’s rho test results of ungrouped data indicate that there is no statistically significant relationship between age and degrees of program participation.48

The qualitative interviews reveal additional insights. A dairy farmer at the second workshop in the Grand River noted “The younger generations are willing to do a lot more on these [agri-environmental] programs. They are more into investment and keeping up to make things better for a long time. You want your land to last.” The same farmer added, “A lot of the time, the best thing a farmer can do is not to let your young son

47 Please see Appendix G – Figure 1, Education test results.
48 Please see Appendix G. – Figure 1, Ungrouped Data for Age test results.
come home from high school or right out of college. No, go away and work for 4-5 years in other fields and get to know the real world. Find out what it’s like away from home and then you will truly know if you want to farm or not.” This qualitative perspective contrasts with quantitative results by suggesting that investments in dairy farming and on-farm projects through the EFP, RWQP and CWP require knowledge, experience and commitment.

While there is substantial program participation with farmers in their 40s and 50s, the amount of responses from farmers in their 30s, especially from South Nation watershed breaks any clear response trend from farmers in their 40s. From the qualitative data, farmers noted some disagreement between generations in terms of planning on-farm projects, but ultimate decision-making often rested with the owner of the farm, who tends to be older.

**Land Managed**

Farm size was considered because land management choices can impact significantly on the environmental sustainability of surrounding ecosystems. As noted in Chapter 5, farm sizes in South Nation watershed are on average significantly larger than in the Grand River watershed, accounted for in part by differences in land values and soil productivity. Of all South Nation survey respondents, 20% manage over 800 acres of farmland. In the Grand River, a greater proportion of land is rented.49 This question assumed that larger dairy farms would have greater financial capacity to take part in on-farm projects through the agri-environmental programs in question, and be under greater regulatory pressure to complete projects to lessen their environmental risk. Two questions asked respondents to indicate; (a.) *How many acres do you own?*, and (b.)

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49 Please see Appendix I. Figure 4: Ontario, Survey Sample and Survey Region Dairy Farmer Representativeness. The farmland managed by the average research participant in both the South Nation and Grand River watersheds are significantly bigger than the provincial average.
How many acres do you rent? For the purpose of this analysis, the acreage numbers from both responses were combined to focus on overall farmland managed. Tests were run on the ungrouped data to look for a correlation between Farmland Acres Managed and Degrees of Participation. The Spearman’s rho correlation result for all three cases of ungrouped data was not statistically insignificant.50

An additional Spearman’s rho test was completed on grouped data. Responses were grouped into small (less than 200 acres), medium-sized (201 to 600 acres) and large (over 601 acres) farms. The results of this additional test indicated overall EFP participation rates at one third for small farms, and dipped to one fifth for large farms. Super-Participants represent a fourth of small farms and a fourth of large farms. In the Grand River watershed, a fourth of medium-sized farms are EFP participants, while over one third of large farms are Super-Participants. Comparatively, EFP Participation in South Nation watershed was strongest with small farms. EFP participation rates dipped for the largest farms, but rise slightly with large farms regarding Super-Participation despite fewer survey respondents in this category; however none of these results were statistically significant.

The cost of land in southwestern Ontario is substantially higher than in eastern Ontario. In the data sample it is notable that in the Grand River watershed, as farms get larger, there is a slight rise in participation, whereas in South Nation watershed larger farms participate less. However, these trends are so slight that they are only a marginal observation, and none were statistically significant.

Sex

Male to female response rates were compared in this research. The author made a clear and obvious preliminary fieldwork observation that a predominance of men are involved

50 Please see Appendix F. Figure 1 for Test Results of Ungrouped Data on Land Managed.
in the dairying industry in Ontario. Survey respondents were asked to indicate whether they are male or female. The chi-square test results indicate that there is no statistically significant relationship between sex and degree of program participation.

It is noteworthy to mention a greater presence of women than men at the workshops in South Nation watershed, and their greater willingness to participate in interviews, generally speaking, in comparison to interviews in the Grand River watershed. At the second Grand River workshop, a farmer noted that ‘a lot of wives have jobs off the farm, just to make the dairy farm [financially] feasible’.

**Farm Income**

Two questions were asked about farm incomes; one about off-farm income; and another about on-farm income. Financial security is considered a major factor in the capacity of farmers to participate in agri-environmental programs. One of the basic principles of the environmental Kuznets Curve is, as people become wealthier, they are more inclined toward environmental thinking and action (Shafik, 1994).

*Off-farm Income*

The first question was, “*Does off-farm income contribute to your overall revenue?*”. The chi-square test indicated that there were no statistically significant relationship between off-farm income and degree of program participation.

The assumption here was that off-farm income, either by a spouse, or through additional (non-dairy) income, would provide greater financial security to participate in the agri-environmental programs. While the tendency is very slight, having some degree of off-farm income suggests a greater capacity for participation in the agri-environmental programs.
The second question was “What were your gross farm sales for 2008?”. A test was run on the ungrouped data for both watersheds. The Spearman’s rho test of correlation indicated that there is no statistically significant relationship between gross farm sales and degree of program participation.

An additional Spearman’s rho test was run for qualitative purposes by grouping the responses into categories of: small (under $250K); medium (between $250K and $1M); and large income (over $1M) brackets. The test results on the grouped data also indicated no statistically significant relationship between gross farm sales and degree of program participation.

Qualitative fieldwork provides additional insight. While different perspectives and opinions on farm income were mentioned during interviews, the most prominent issue farmers returned to was indebtedness. Interviewees noted how operating costs often require financing beyond the capacity of most farm incomes, including the finance for completing on-farm agri-environmental projects. A dairy farmer from South Nation watershed added “If you want to improve, the only way to do it is to carry a lot of debt. If you want to expand, it is a bloody fortune. You have to borrow a lot of money and hope to pay it off before you die.” A dairy farmer nearing retirement from the Ottawa region of South Nation watershed echoed this sentiment, “A lot of dairy farmers are in debt, I imagine over 95% of them. If interest rates go up, everybody will be broke, people keep buying stuff.” The dynamic of farm income in relation to agri-environmental program participation in this context can only be understood in the broader range of issues facing dairy farmers in Ontario. Each year there are fewer and fewer dairy operations in the province while larger and larger farms become more prevalent. A dairyman from South
Nation watershed added “To be successful we need a stable environment, but change is coming. If supply management was eliminated in Canada, we would lose 50-70% of our producers, there are too many already in debt.”

b. Social Influence Factors
This section builds on the foundation laid above with an analysis of how social networks influence decision making in regards to agri-environmental program participation. A series of questions assess individual farmer engagement in a constantly evolving social network. The intention is to gauge how much social influence determines environmental action toward on-farm projects. To this effect,

*Objective 2: To identify and analyze the dynamics of social influence factors that can lead to greater program participation.*

Hypothesis: Farmers who participated in both the Environmental Farm Plan (EFP) and either the Rural Water Quality Program (RWQP) or Clean Water Program (CWP) (termed as Super-Participants) have significantly higher degrees of social network connectivity (location, generations on-farm, succession plans, social knowledge, immediate neighbour social influences, farmer social relations, social event frequency, social referencing, farm organization social network, and internet use).  

The reason for assessing if there is a relationship between farm location and participation is that the RWQP and CWP program emphasize outreach to farms in ecologically sensitive areas of their respective watersheds. In the Grand River

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51 Greater context on the meaning of social network connectivity is outlined in the theoretical chapter (chapter 2) under Core Area 1: Social structures in Social Networks, and Core Area 2: Adoption and Diffusion of Innovations. In addition, the methodological chapter (chapter 3) describes how the naturalistic-constructivist process of theory development for this study built on the concept of social network connectivity.
watershed, Wellington and Waterloo County governments have provided greater funding to the RWQP. This test intended to confirm if location in more ecologically sensitive counties of the watershed, that have also received greater program funding, would clearly translate into higher participation in the survey results.

Among Grand River watershed survey participants, the three most active counties in terms of EFP participation as a percentage of all survey participants were, in order; Dufferin (67%), Wellington (30%) and Perth and Waterloo tied at (29%). The most active counties in terms of participation as a percentage of all survey participants with the RWQP for this survey cohort were: Wentworth (50%), Wellington (38%) and Perth (29%). These counties are all relatively central to the Grand River watershed. In South Nation watershed, as a percentage of survey participants, the most active EFP participating counties were, in order: Stormont-Dundas-Glengarry (S-D-G) (57%), Leeds-Grenville (50%), and Prescott-Russell (P-R) (48%). The most active participants among survey respondents in the CWP of South Nation watershed were, in order: Ottawa (27%), S-D-G (11%) and P-R (8%). Noteworthy is that Ottawa dairy farmers have a greater percentage of participation in the CWP. Ottawa Regional Municipality provides direct funding to the CWP.

Prior to analysis of each individual variable of social influence factors assessing program participation, table 6.2 presents the data results from the various tests of correlation and association.

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52 This is notable because these three counties are located in the upper and central regions of the Grand River watershed, and received significant program outreach by the GRCA. As well, many survey participants from Wellington and Perth County are also Mennonite dairy farmers.
Table 6.2: Survey responses to social influence factors testing for Degree of Program Participation as Dependent Variable

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Overall # (%)</th>
<th>Sig.</th>
<th>p/V</th>
<th>Grand River # (%)</th>
<th>Sig.</th>
<th>p/V</th>
<th>South Nation # (%)</th>
<th>C/S</th>
<th>Sig.</th>
<th>p/V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generations On-Farm</td>
<td>229(95)</td>
<td>.05</td>
<td>-0.13</td>
<td>135(97)</td>
<td>0.14</td>
<td>-0.13</td>
<td>94(93)</td>
<td>0.22</td>
<td>-0.13</td>
<td>S</td>
</tr>
<tr>
<td>Farm Succession</td>
<td>131(54)</td>
<td>0.28</td>
<td>3.83</td>
<td>74(54)</td>
<td>0.06</td>
<td>7.28</td>
<td>57(56)</td>
<td>0.95</td>
<td>0.36</td>
<td>C</td>
</tr>
<tr>
<td>Social Knowledge Source</td>
<td>Programs</td>
<td>130(54)</td>
<td>0.98</td>
<td>1.21</td>
<td>72(52)</td>
<td>0.24</td>
<td>8.03</td>
<td>58(57)</td>
<td>0.06</td>
<td>12.34</td>
</tr>
<tr>
<td></td>
<td>Water Quality</td>
<td>99(41)</td>
<td>0.65</td>
<td>4.17</td>
<td>57(24)</td>
<td>0.71</td>
<td>3.73</td>
<td>42(42)</td>
<td>0.56</td>
<td>4.85</td>
</tr>
<tr>
<td>Immediate Social Influence</td>
<td>Neighbour's Participation</td>
<td>132(55)</td>
<td>0.34</td>
<td>3.35</td>
<td>90(65)</td>
<td>0.22</td>
<td>4.46</td>
<td>42(41)</td>
<td>0.50</td>
<td>2.37</td>
</tr>
<tr>
<td></td>
<td>Influence of Neighbour's Part.</td>
<td>131(54)</td>
<td>0.23</td>
<td>4.32</td>
<td>85(61)</td>
<td>0.07</td>
<td>6.97</td>
<td>46(45)</td>
<td>0.63</td>
<td>1.73</td>
</tr>
</tbody>
</table>

Overall N = 239, Grand River N = 138, South Nation N = 101, Sig. = Significance at 5%, Agg'd = Aggregated, p = Spearman’s rho correlation, V = Value, C = chi-square, S = Spearman’s rho

Generations' On-Farm

The purpose of assessing how many generations a farmer’s family has been on his or her farm was to consider if “connectedness to place” would influence greater inclination toward agri-environmental stewardship. The assumption was that if someone’s parents and grandparents had worked the same land, there might be greater sentiment toward the land than if one is a newcomer or renter. The question was “How many generations have you been on this farm?”. While Spearman’s rho tests for the Grand River and South Nation watersheds separately were statistically insignificant, in the overall category, there was a significance of 0.05, a correlation value of -.13 with an N = 229 (95%)\(^{53}\) between generations’ on-farm and degree of program participation.

Contrary to the initial hypothesis, newer farm owners tend to be more inclined to participate than long time farmers. The survey data demonstrated that a third of respondents who have been on the land for two generations or less were EFP

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\(^{53}\) Percentages in brackets (%) indicates what percent of the overall sample population; N=239 for overall responses, N=138 for Grand River responses, and N=101 for South Nation responses gave answers to the respective variable question.
participants. For Super-Participants, the pattern is similar to EFP participation.

Participation in both the EFP and in the watershed programs is highest with farmers who have been on farm for fewer than two generations. An alternative argument might suggest that participation is higher with recent migrants to the farm since “newcomers” have greater willingness to impress and fit in with local environmental standards and practices. Further to this argument, because newcomers may not yet have developed as strong informal networks, which may or may not include EFP participation, the ‘official’ culture of agricultural rules, regulations and practice, something to which new arrivals are more likely to connect with, are part of the pressure to ‘fit in’.

The qualitative data from a few farm interviews suggests concern about the potential difficulties in transitioning a farm between generations, and what it implies for changes to practices. One farmer from South Nation watershed added agri-environmental programs should “make farm transfers from generation to generation easier,” referring to the legal, financial and regulatory planning process. The results of this test suggest that length of time on-farm related to agri-environmental program participation is a complex relationship. For example, there could be a farm family that because of the fact that they have been on-farm for many generations might actually be resistant to changing farm practices.

**Farm Succession**

The social influence factor of farm succession (whether or not there are plans for the farm business to have a successor in-family), was considered an important determinant of participation in sustainability initiatives. The assumption was that there would be a greater sense of commitment beyond the short term if one’s children would continue the family business. The question was “Do you have a son or daughter who plans to take over the farm when you retire?”. The chi-square tests of association indicate that there is
no statistically significant relationship between having a son or daughter plan to take over the family farm and degree of program participation.

Qualitative statements by some farmers did note that with their children as successors, they would be more inclined to participate in agri-environmental programs. A dairy farmer from South Nation watershed added “to be successful, you need to be dedicated to do the job right. I work with my dad, and bought the farm from him. It is too early to tell if my daughter will follow. If you have young kids coming in, then yes, invest and spend more.” However, this statement contrasts with cases where a perception of difference between generations might actually resist agri-environmental program participation. A farmer from the Grand River watershed stated, “I have a son who might stay in the business. He returned from college and wanted to make changes to how we run the business and it lead to an argument. His plans were beyond the costs of what I wanted for the operation.” This statement is similar to that of another farmer from Wellington County, “My son got a degree from the University of Guelph, and wanted to modernize the barn with robotic milkers but my father did not want to go into debt.” This example not only illustrates the different generational perspectives on farm planning, but also the resistance to indebtedness as a strong decision-making motivator with some farmers in stark contrast to many identified above under the farm income variable tests.

Social Knowledge Source

Two questions were asked to analyze to what extent farmer knowledge about agri-environmental programs and water quality is influenced by one’s social network. Responses were narrowed down for analysis into three categories, “media,” “immediate,” or “broader” social network influence.\(^\text{54}\) The test assumed that a broader

\(^{54}\) To simplify this variable test, the variety of responses were reduced to three social network influence options; respondents who indicated ‘newspapers/media’ were grouped into ‘media’; those who indicated
social network would lead toward greater agri-environmental program awareness and
greater inclination to participate.

Programs

The first question was “How did you learn about the EFP or the RWQP/CWP?” The chi
square tests of association results indicate that there is no statistically significant
relationship between the social knowledge source of learning about the agri-
environmental programs and degree of program participation.55

Qualitative interviews reveal additional insight. One South Nation watershed
dairy farming couple indicated that agri-environmental program knowledge came
ironically as a result of “our tendency to stay out of government programs because, as
part of the Lanark Landowners Association, trees and wildlife became a big issue in
eastern Ontario. Property rights were being pinched and agri-environmental programs
such as the EFP came to attention.”56 Another South Nation dairy farmer in Prescott-
Russell became aware of the EFP by having "an engineering contractor from Quebec
install a manure lagoon who went above and beyond [Ontario] provincial requirements
using the higher standards enforced in Quebec." A farmer from South Nation noted
learning about the CWP through the ‘valued farmer-to-farmer extension program at the
SNC’.

‘family-friends-fellow dairy farmers’ were grouped into ‘immediate’; those who indicated ‘farm group’,
‘contractor/consultant’, ‘public farm event’, ‘government representative’ or ‘veterinarian/animal
nutritionist’ were grouped into ‘broader’ social influence. These categories were brought together, in
part, to test the Social Network Analysis element of the theoretical framework, namely the influence of
social relations on program participation, and the ‘distance’ of those relationships that have influence,
from immediate kin to web-based knowledge.

55 See Appendix G., Figure 2: Test Results for Social Knowledge Source.

56 The Lanark Landowners Association and its outspoken leader, MPP Randy Hillier, came to public
attention in the mid-2000s, reacting forcefully to what the group argued was over-regulation of land use
in eastern Ontario.
In the Grand River watershed, interviews provided more localized details. During one meeting, a dairy farmer indicated that agri-environmental program knowledge shared by consultants is often specialized financial or environmental management expertise. This same farmer, during the second workshop in the Grand River watershed noted “in my experience, learning about programs such as the EFP comes through OSCIA. It really depends on the issue you are looking at, and I read a lot of media.” A Mennonite farmer in the Grand River watershed learned about the EFP and the RWQP “through word of mouth,” “…my dad first did it. I also read Ontario Farmer, Dairy Farmer, Milk Producer and the Holstein journal. I have three brothers, one up the road, and two in the area with whom I share equipment and land work. We are all dairy farmers, and that helps. My wife also has family in dairy!” From another interview in the Grand River, a farmer noted “we share news about new things, like changes to the EFP, among a group of dairy farmers who moved up here together from an area southeast of here a few years ago”. One farmer mentioned “we learned about the EFP through our active church group. At church there are some dairy farmers”.

Both watersheds interviews included comments on learning about the EFP through OSCIA extension staff, or through their Source Water Protection Committees. Private contractors and consultants also figure prominently as a source of knowledge about the programs.

*Water Quality*

The second question on social knowledge sourcing was “From where do you get information when forming an opinion about water quality in the Grand River or South Nation watershed?” The chi-square tests of association results indicate that there is no
a statistically significant relationship between social knowledge source of learning about water quality and degree of program participation.

As programs, both the RWQP and CWP are focused on water quality conservation and restoration. Therefore it was considered important to analyse how awareness develops in the farming community about these programs. In the qualitative interviews, some farmers emphasized a connection between water quality and the health of their animals rather than a concern for ecosystems, which is the focus on the RWQP and the CWP. One South Nation watershed farmer stated “Dairy farms need good, clean, potable water so we think about where our water is coming from.” Another farmer from South Nation watershed added “farmers look after their water anyways because our wells are tested twice a year, and if it doesn’t meet grade standards we have a problem.” During the first and second workshop in South Nation, several farmers noted their growing concerns with how water quality was being addressed through programs such as the EFP, the CWP and related governmental regulatory pressures. Comments noted that while the city of Ottawa ‘dumps sewage into the river’ in comparison, one farmer noted ‘it is easy to pressure farmers into doing things. If you look at the CWP and a number of other related programs, the benefit to the farmer is very little.’ This same farmer in a personal interview added “it is not only agriculture that is responsible for pollution, but agriculture gets seemingly first attention”.

123
Immediate Social Influence

Two questions considered the social influence of immediate neighbours on decision-making.

Neighbour’s Participation

The first question was “Has your closest neighbour participated in either the EFP or the RWQP/CWP?” Respondents could answer “Yes” or “No.” Similar in certain respect to previous questions about a farmer’s locality, the assumption motivating this inquiry was to see if proximity to other agri-environmental program participants would influence participation. The chi-square tests of association results from the data sample indicate that there is no statistically significant relationship between a farmer’s immediate neighbour participating and their own participation in any of the three agri-environmental programs.

The limited difference in variations to this question did not provide sufficient data for inquiry. What was more revealing than the direct survey responses to this question was the insight from the interviews and workshops. A sense of indifference at times with knowledge of immediate neighbours emerged in the qualitative fieldwork. While many dairy farmers indicated knowing their neighbours, it did not seem to be that their most immediate were closest to them socially. One farmer from South Nation watershed added “rather than my neighbour alone, I found out about a [agri-environmental] program through a friend in the dairy industry who works for the DFO. I also have a contact at OMAFRA who is an agronomist and was encouraged to take part in the course. He recommended that I don’t apply for funding through the website because there wasn’t any [money] left.” Comments often shifted importance away from neighbouring farms. A farmer from Wellington County in Grand River watershed felt the importance of community farming dynamics even amidst concerns, “There are not many
left in dairying in this area. There were thirty dairy farms, and now there are two. Mennonites fix a lot of things for us around here. Labour costs are higher, and many quit because their wives don't like the lifestyle [of dairy farming].” A third farmer, also from the Grand River watershed, noted in the second Grand River workshop in response to neighbour influence that

“Things are totally different than twenty years ago. The sense of community is totally gone. We have too much Toronto influence around here. I rent from 6 different landlords, they all moved in from Mississauga, bought cheap land, and just want to live here. They want the ‘country lifestyle’ and couldn’t care less about the land. They want nothing to do with it! A lot of them are lawyers and doctors. But no, a lot of people don’t talk to neighbours unless you trade machinery or work for them. My best friend has pigs and I am buddies with him, and we get to know people through the dairy breed board thing. We make friends through that.”

**Influence of Neighbour’s Participation**

The second question on immediate social influence was “*Did your neighbour’s participation help you in making a decision about undertaking a project on your farm?*”, respondents could answer “Yes” or “No.” The chi-square tests of association results indicate that there is no statistically significant relationship between the influence of a neighbour in helping to undertake an on-farm project and degree of program participation.

In the vast majority for all three groupings, the response to this question was “No.” Overall response rates suggest that participation of a neighbour in the EFP, RWQP or CWP is not influential. This is echoed qualitatively in farmers’ comments. A retired dairy couple from South Nation watershed noted, “Rather than my neighbour, we went directly to the cooperative and to OMAFRA extension people who gave advice on a manure pit.” A dairy farmer from Prescott-Russell in South Nation watershed added “I mostly talk to other dairy guys and contractors.” While immediate neighbours may not be especially influential from the interview and workshop findings, dairy farmers within a
relatively short distance, in some cases, do serve a valuable knowledge sharing purpose. One farmer in the Grand River stating, “..there are about 15 to 20 dairy farmers within a short distance of us. They all think they know things best. We go to each other’s birthday parties.” A dairy farmer at the second Grand River workshop noted his selectiveness in dairy farmers whom he works and shares news with, adding 'I am guessing in my area there are about 10 dairy farmers left. I talk to one of them, my brother, and two close neighbours because we share machinery.”

The observations from these two questions about neighbouring dairy farmer influence are suggestive rather than definitive. Social networks such as family, friends, fellow dairy farmers, vets and contractors serve as important sources of knowledge about agri-environmental programs. Personalized networks developed specifically by the farmer seem to indicate greater influence on decision-making rather than immediate proximity.

**Farmer Social Relationships**
Before further analysis of distinct variables assessing social influence factors in relation to program participation, table 6.3 presents the data results from various tests of correlation and association.
Table 6.3: Survey responses to social influence factors testing for Degree of Program Participation (B)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Overall</th>
<th>Grand River</th>
<th>South Nation</th>
<th>C/S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># (%)</td>
<td>Sign. p/V</td>
<td># (%)</td>
<td>Sign. p/V</td>
</tr>
<tr>
<td><strong>Farmer Social Relations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful Dairying</td>
<td>197(82)</td>
<td>0.39 0.06</td>
<td>118(85)</td>
<td>0.30 0.10</td>
</tr>
<tr>
<td>Program Participation</td>
<td>120(50)</td>
<td>0.35 0.09</td>
<td>68(49)</td>
<td>0.61 0.06</td>
</tr>
<tr>
<td>Social Event Attendance</td>
<td>172(71)</td>
<td>0.58 0.04</td>
<td>101(73)</td>
<td>0.38 0.09</td>
</tr>
<tr>
<td>Social Referencing</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Recommend EFP</td>
<td>159(67)</td>
<td>0.00** 0.23</td>
<td>92(67)</td>
<td>0.03 0.22</td>
</tr>
<tr>
<td>Recommend RWQP or CWP</td>
<td>109(46)</td>
<td>0.01** 0.25</td>
<td>63(46)</td>
<td>0.02 0.30</td>
</tr>
<tr>
<td>Farm Organizations</td>
<td>154(65)</td>
<td>valid</td>
<td>79(57)</td>
<td></td>
</tr>
<tr>
<td>Internet Use</td>
<td>191(80)</td>
<td>0.80 0.99</td>
<td>116(84)</td>
<td>0.83 0.89</td>
</tr>
</tbody>
</table>

Overall N = 239, Grand River N = 138, South Nation N = 101, Sig. = Significance at 5%, p = Spearman's rho correlation, V = Value, C = chi-square, S = Spearman's rho

Two questions were asked to gain direct perspective from farmers on how important they consider social relationships to successful dairying and to agri-environmental program participation.

**Relationships for Successful Dairying**

The first question was “Having strong social relationships (with friends, family, and associates) is an essential key to successful dairy farming today?,” The assumption is that farmers who value social relations would also have greater participation in these agri-environmental programs. The Spearman’s rho test of correlation indicates that there is no statistically significant relationship between how much a survey respondent values the strength of their social relationships and degree of program participation. In the comment box of the survey question, several farmers indicated “being your own boss” as an aspect of dairy farming they most enjoy. Independently minded personalities might limit the importance placed on social relationships for farm operations.
A range of interview comments echo the quantitative responses. From South Nation watershed for example, a farmer noted that “one’s relationships are certainly one of the factors toward success, but you also have to do readings to keep informed.” Another dairyman in South Nation provided detailed emphasis on how social networks matter to success, but that these networks might lead toward “group think.” He added

“Now a lot of the dairy industry is funded by universities through pharmaceutical companies. My neighbour is a vet who was pushed by pharma companies. There is a now a push for more milk, more milk. Net profit matters more than overall output of milk. The dairy industry does not look at the farm as a whole, but rather pharma and high production. Guys who have high debts think how they are going to increase production to address their costs.”

Farmers emphasized with good social relations there is still a need to do the job. In interviews, some farmers noted the challenge is to obtain and retain good advisors to help the farm operation. Time off for a dairy farmer is difficult to obtain without a trusted social network. Some of the most organized dairy operations visited have full or part time staff, but more commonly help is obtained from extended family members. This was not just for vacations, but also for specialized work such as bailing or manure spreading. Most interviewees emphasized that a competitive market requires attention to detail and evolves with new management and technologies. Opinions on the value of social relations ranged from pessimistic, “not enough work is taking place together, every dairyman is for himself” from a farmer in the mid Grand River watershed, to a dairy couple in South Nation watershed who stated “yes, all people help with ideas; workshops, your electrician, your plumber, all give ideas and advice.”

Relationships for Participation in Programs

The second social relationship question was “Having strong social relationships is more characteristic of those farmers who take part in the EFP and the RWQP/CWP?” The Spearman’s rho test of correlation of the data sample indicated no statistical
significance between stronger relationships among agri-environmental program participants and their actual degree of program participation at the overall and Grand River level, but was significant at the South Nation level with a .01 significance, and a -0.37 Spearman correlation coefficient.\textsuperscript{57} Qualitative comments from interviews and workshops to this question were minimal.

**Social Event Attendance**

Regarding social event attendance, the question was “\textit{How many times a month would you say you attend a farming related event?}.” The assumption was that more frequent social event attendance would raise general awareness about environmental sustainability, and in turn participation. The Spearman’s rho test of correlation results indicates no statistically significant relationship between social event attendance frequency and degree of program participation. The question was phrased to ask about general farm event attendance rather than specific, environmentally-themed events.

From the interviews, farmers noted the large variety of social event opportunities. Most farm events have a specific theme or topic of concern that directs meeting attention. Interviewees indicated that attendance at, for example, source water protection planning events, or sitting on EFP peer-review committees for the local chapter of the OSCIA provides direct environmental awareness. One Grand River watershed dairyman stated “I think that's where a lot of it [environmental awareness] comes from. You go to these [OSCIA] meetings and you pick up a lot of information about dairy farming and land stewardship.”

Apart from environmentally themed events, interviewees directed attention to the fact that learning and discussion takes place at “social events” that are not officially agriculture related, but that brings farmers together. As mentioned above, social events

\textsuperscript{57} See Appendix G., Figure 2: Test Results for Farmer Social Relationships.
such as birthday parties or church gatherings were mentioned as an important source of learning and networking. One South Nation farmer mentioning that in addition to his membership with a uniquely regional farm management group, that ‘his wife is active in church groups’. Church events were mentioned by farmers as opportunities to share new developments and stay up-to-date because of their regular weekly occurrence.

A farmer in South Nation watershed noted “sometimes farmers need to be begged to attend events. They are asked, but fewer attend meetings now. Some sit there less engaged and even less to advocate.” This sentiment was echoed in the Grand River watershed by a farmer, “The only way to get people to come to a meeting is if there is a huge issue. If everything is fine, no one comes. If there is a huge problem, we could fill an arena.” The same farmer in a workshop noted “you can't blame the farm organizations; it is the farmers themselves! Farmers never show up to meetings. There is no way to make decisions if only ten people show up. In the winter time, you always go, but not in summer.” One farmer from Wellington County who had previously indicated a very active social event schedule also noted burnout can take place with publicly active farmers. “I was serving on the OFA board, and now I serve on the local milk committee, the County land stewardship committee, and the EFP peer-review. I've scaled down to about two meetings a month, and needed replacements because I was too busy!” Age and distance considerations are also important to take into account. One farmer stated that his social event attendance dropped off because meetings “drive me up the wall,” and that he would rather receive email summaries that take fifteen minutes to read.
Social Referencing

Questions on social referencing were developed to analyze if there are connections between recommending agri-environmental programs to friends and actual participation rates in those programs.

On a four point scale from strongly agree to strongly disagree; the first question was “I would recommend undertaking an on-farm project to a friend through the EFP.” The Spearman’s rho test of correlation for all three tests noted significance. There was a significance of 0.00, with a correlation value of -.23 for overall responses with N = 159 (67%), a significance of 0.03, and a correlation value of -.22 for Grand River responses with N = 92 (67%), and significance of 0.04, with a correlation value of -.26 for South Nation responses with N=67 (67%). These results show a positive correlation between social referencing and EFP program participation, with South Nation watershed respondents having the greatest degree of relationship between EFP participation, and recommending the program.

The second question was “I would recommend undertaking an on-farm project to a friend through the RWQP/CWP.” The Spearman’s test for overall responses noted a significance of 0.01 with a correlation value of -.25 with N = 109 (46%), and for Grand River responses a significance of 0.02 with a correlation value of -.3 with N = 63 (46%). These results also show that there is a positive correlation between recommending the RWQP or the CWP and actual participation in either program, however the low number of survey respondents to this question is noted and reduces the reliability of these results. A more logical conclusion is that farmers who have simply not participated in either the RWQP or the CWP would have not answered this question. In South Nation watershed there was no statistical significance.
During interviews, farmers were asked if they would recommend the EFP, the RWQP or the CWP program, and any advice they would give to a friend. A common response variation was “get informed and plan wisely,” and “don’t go into debt through the project!” Responses also included “the EFP helps farmers to think about things they may not have thought about, and it is a reminder on how to do things.” An honest response by one South Nation dairyman emphasized “get as much money as you can, not what they think is right, but what you need to do,” while another South Nation farmer was reluctant to recommend the EFP because “smaller-scale farmers get hesitant to participate for fear of repercussions on [their] tight margins,” and “it is cheaper to do a project without government support for [something like] the EFP. It is better, faster, and cheaper without grant money.” Additionally, a farmer also from South Nation noted “only the big guys get project consultants. The family farm is going to die.”

Farm Organization Social Networks
Questions were developed to ask farmers about their organizational affiliations with the assumption that greater social involvement in a broader spectrum of groups would lead to greater participation in the agri-environmental programs. The question was “What farm organization are you affiliated with?”. The chi-square tests of association for the three groupings were not tested because of insignificant cell counts.

Interviews and workshops provided greater insight into farm organization social networks. It became quickly evident as to the diversity of farm organizations beyond the options provided in the survey questionnaire. As mentioned in Chapter 5, localized groups in both watersheds are prominent and influential. Separate from the larger general farm organizations, local groups provide regular meetings for specific insights. For example, a dairyman noted in an interview that there is a dairy organization committed only to large herds. The Progressive Dairy Operators (previously known as
the Large Herd Operators) has membership from some of the largest dairy farms in the province. Another group in eastern Ontario meeting bi-monthly, one member noted ‘As a member of this group, I get budgeting, management, environmental, financial and planning advice. We meet regularly to see where good management is going, and we have about 50 members now. Our idea was modeled on those in Quebec.’

Non-dairy specific organizations provide important social networking as well. In eastern Ontario, cooperatives are more common. Several dairy farmers in South Nation watershed indicated membership within a milk pool, for their own food supply, or for cheese production, as in the case of the St. Albert cheese cooperative. In South Nation watershed interviews, many compared the structure of farm organizations in Ontario to those in Quebec. A dairyman from Prescott-Russell added “compared to Quebec, where they have one powerhouse organization, the UPA (Union of Agricultural Producers), here in Ontario we fight against each other.” Another interviewee mentioned “Quebec farmers receive more support.” In the Grand River watershed, Mennonite farmers are apparently exempted from a provincial requirement to indicate affiliation with one of the three main farm groups (the OFA, CFFO or the NFU). However, many Mennonite farmers still seem to gravitate toward the CFFO.

A few interviewees expressed concern with the role of farm organizations in serving dairy farmers in the province. A particularly vocal South Nation farmer stating,

“…the difficulty with organizations is that they don't work on farmers' sides. It is difficult to get information back. The president of the organization said things would be fixed, farmers are concerned with new regulations, and the organization should not just accept government plans. Local research should be supported by head office, where they have greater time and resources rather than leaving it to local branches.”

Another dairyman from South Nation echoed this statement, “from the mothership they thought, 'We shouldn't get too out of line, be too boisterous.' Deadlines
for action pass.” A third farmer, also from the same workshop said “the problem with
these umbrella organizations is that a good amount of their staff members are not
farmers. They look at an issue from a completely different perspective than any of us
would. On Friday at 4pm, they go home, and we are still working.” Critical perspectives
on farm organizations were often counter balanced with recognition of the virtue in farm
organization membership. Interviews emphasized that farming events are opportunities
for learning new ideas. Apart from one dairy farmer’s own participation with groups, he
emphasized that his wife “is active with forage clubs, church groups, and school
councils,” and that “participation is key even with your education because you still need
to stay informed.” The role of awareness through group association was put clearly by a
Grand River watershed dairyman based in Wellington County, “I have learned a great
deal about wide-based problems out there since being on the EFP peer review
committee through OSCIA.”

Communications Technology Use
A communications technology question was “Do you use the internet and email regularly
(at least 3-4 times a week) on your farm?” The assumption was that greater use of
communication technology would lead to greater awareness about environmental
management and in turn lead to greater agri-environmental program participation. The
chi-square tests of association indicate that there is no statistically significant
relationship between internet use frequency and degree of program participation.

The number of “No” responses from participants and Super-Participants made the
variable of internet communication use a weak determinant of program participation.
Internet use is too variable from these tests to make a strong statement of its use as a
determining factor in program participation.
c. Farmer Perception of Program Value

This section aims to analyze the various perspectives that dairy farmers have toward the agri-environmental programs in question. Questions were developed to scan a broad overview of farmer perception of program value, including overall value, financing, communication, and planning and outreach.

Opinions ranged broadly from concerns with regulations that have “taken away freedoms” to the perceived trend in Canada toward European style environmental legislation and regulation. As mentioned above, there were often location specific concerns in the relationship between the agri-environmental programs in question and some urban-rural tensions. Also noted, a major concern arising from farmers’ comments in the South Nation watershed was about sewage releases from the City of Ottawa into the Ottawa River, with the perception that regulations on non-point source pollution from agricultural lands are stricter than those required from urbanites.

Farmers offered their opinions on agri-environmental program conditions, clearly contextualizing regulations as a major concern with present farm conditions. Many emphasized that with busy schedules, growing environmental regulations, farmers’ involvement with agri-environmental programs are tempered by the need for economic viability.

This section of questions were the most personal from the farmers’ point of view, and to this effect, the following objective was developed.
Objective 3: To analyze farmers’ perceptions of how program improvements could lead to greater participation.

Hypothesis: There is a positive association between farmers’ perception of program value (value, financial incentives, communication quality, and planning and outreach effectiveness) and their degree of participation in those programs.

As with previous tables for this chapter, table 6.4 presents the data results from various tests of correlation and association analysing distinct variables assessing farmer perception factors in relation to program participation.

Table 6.4: Survey responses to farmer perception factors testing for Degree of Program Participation

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Overall</th>
<th>Grand River</th>
<th>South Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># (%)</td>
<td>Sig.</td>
<td>p</td>
</tr>
<tr>
<td>Program Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFP Program Value</td>
<td>149 (62)</td>
<td>0.02*</td>
<td>-0.26</td>
</tr>
<tr>
<td>RWQP-CWP Program Value</td>
<td>99 (41)</td>
<td>0.08</td>
<td>-0.18</td>
</tr>
<tr>
<td>Program Financing</td>
<td>0.00***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding</td>
<td>189 (79)</td>
<td>*</td>
<td>-0.20</td>
</tr>
<tr>
<td>Funding Small Farms</td>
<td>164 (69)</td>
<td>0.78</td>
<td>-0.02</td>
</tr>
<tr>
<td>Program Communication</td>
<td>0.00**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFP Communication</td>
<td>167 (70)</td>
<td>*</td>
<td>-0.25</td>
</tr>
<tr>
<td>RWQP-CWP Communication</td>
<td>118 (49)</td>
<td>0.02*</td>
<td>-0.22</td>
</tr>
<tr>
<td>Program Planning and Outreach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFP Planning and Outreach</td>
<td>168 (70)</td>
<td>0.03*</td>
<td>-0.17</td>
</tr>
<tr>
<td>RWQP-CWP Plan Outreach</td>
<td>121 (50)</td>
<td>0.37</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

Overall N = 239, Grand River N = 138, South Nation N = 101, Sig. = Significance at 5%, ρ = Spearman’s rho correlation, all tests in this table are Spearman’s rho correlation.
Program Value

A question was asked of survey participants to provide their opinion on the perceived value of the agri-environmental programs in general, and how they thought farmers in the area felt about the programs.

Specific to the Environmental Farm Plan, survey respondents were asked to respond to the statement: “In general, dairy farmers in the local area feel the EFP is a valuable program.” The assumption behind this question was that if the respondent felt the EFP is a valuable program to area farmers, then that same farmer would more likely be a participant. Statistically, overall responses had significance of 0.02 with a correlation value of -.26 and an N = 149 (62%), Grand River responses had significance of 0.03, with a correlation value of -.24 and an N = 83 (60%), and South Nation responses had significance of 0.03, with a correlation value of -.27 and an N = 66 (65%). These results indicate that there is a positive correlation between perception of the EFP’s value and actual participation in the EFP.

The qualitative responses to this question added further insight. There was emphasis placed on the financing and economics of on-farm projects related to the agri-environmental programs overall value. Farmers often plan for specific projects, but concern over “paper work” and “funding lag time” can deter further action. There were farmers who questioned the dependency and lack of “self-sufficiency” that can result from receiving agri-environmental program funding. More than a few farmers noted that taking personal initiative to undertake a specific BMP project on-farm can often be less expensive and more efficient than going through the official process of receiving program support. A dairy farmer in South Nation watershed emphasized that “with a $3 million dollar project, what will $200,000 in program support help with, especially when a lot of farmers are already in debt? To this effect, the EFP is good for someone starting
up or expanding, but established farmers are not interested.” Still another farmer from South Nation watershed placed emphasis on concern over privacy of information and a sense of infringement.

“I would be concerned with an evaluation of my land, especially close to city wells. Also, there is concern with taking land out of production, and the devaluation of land close to water sources without sufficient compensation. Our land is flooding more now, so we are growing more hay in other parts of our land to compensate, and we would lose feed crop if we grew anything else.”

A more explicit opinion on the EFP also included by a South Nation farmer, “I refuse to take the EFP. I don’t want meddling with my information.” Alternate to these concerns with the EFP were optimistic viewpoints to its value. A farmer from central South Nation watershed noted “The EFP helps farmers to think about things they may not have thought about and it serves as a reminder of how, you sit down to know your farm. Every farmer is an environmentalist in a way.” Alterations in the EFP education and its accompanied application programs were noted for improvements as well, “The EFP is getting easier to understand,” and “I think the EFP action plans are getting a lot shorter. This is also because farmers know where to apply for money, and it is people coming back for a second project, so less time is needed.”

Specific to the agri-environmental programs in the Grand River and South Nation watersheds, a question was “In general, dairy farmers in the local area feel that the RWQP-CWP is a valuable program.” The question assumed that farmers valuing the watershed programs would more likely be participants and promoters. The Spearman’s rho tests between dairy farmer perception of their watershed-specific program and degree of program participation were not statistically significant for overall responses. There was no statistical significance from the test results for Grand River and South Nation watershed responses.
Qualitatively, interviews and workshops provide further insight. A farmer from South Nation expressed his concern about how he perceived that “South Nation Conservation (SNC) is [financially] tied up with employees and spending.” While another farmer also from South Nation emphasized a common perception regarding regulations,

“The SNC bothers guys for \textit{cleaning ditches} [italics own]. What does this country want, farming or nature? Who pays the difference for these regulations? Here wildlife is being protected through the Species-at-Risk Act but in the EU these actions are paid for by the government. In the past, farmers were paid to drain lands for food production, and now we are being asked to restore those same habitats. That’s a contradiction!”

These comments were combined with a similar sentiment as noted above that some farmers feel participation in the Clean Water Program, given the time and paperwork process, is more costly than if a farmer were to undertake a project on his own time. In contrast, a farmer from the first Grand River workshop noted how his experience with Grand River Conservation authority staff is positive, “they have been great people to deal with. I have never had a problem.” A neighbouring farmer also in Grand River adding, “the GRCA have knowledgeable staff”, slightly different from concern by a Grand River dairy farmer who was ineligible for RWQP because of the location of his farm, “…the distance between your farm and the river makes a difference for RWQP funding, you have to be in a creek zone”.

**Program Finance**

The question of agri-environmental program finance was a central concern in the initial phase of exploratory interviews conducted for this research. Farmers have very strong opinions on agri-environmental program financing. There were several dairy farmers in both watersheds who questioned the allocation of EFP and watershed program funds for administration, engineering and government management costs. The tension between simplicity and complexity in program finance structure was a constant concern. Some emphasized the need to get the majority of program budgets directly to farmers to
increase participation. Farmers noted their awareness of how provincial and federal politics can determine the realities of agri-environmental programming budgets. One South Nation farmer emphasized the connection between project financing from banks (who still provide the majority of loans for project realization) and how banks also see the potential environmental liability with mismanaged farms. In this context, to better analyze the relationship between social perception of agri-environmental program financing and participation rates with research participants, two specific questions were asked.

Funding and Participation

Survey participants were asked to respond to the statement: “The funding that assists with on-farm projects through the EFP and the CWP-RWQP is key to participation.” The Spearman’s test results relationship between survey respondents perception of program funding and their degree of program participation with a significance of 0.00 for overall responses, and a correlation value of -.20 and an N = 189 (79%) for overall respondents, a significance of 0.02 with a correlation value of -.22, and an N = 112 (81%) for Grand River watershed respondents. Results for South Nation respondents were not statistically significant. The results for overall and Grand River responses indicate that there is a positive correlation between participation and perception of the value of funding in support of farmer program participation.

Somewhat in contrast to survey results, qualitative responses to this question included statements by farmers that the educational value of agri-environmental programs is greater than its financial value. Farmers are also aware of their own personal circumstances toward agri-environmental program financing, and have strong opinions on where to direct their financial resources. One statement by a farmer from South Nation relates to the results from the survey, “The money is not enough to get
people interested. They would have to be interested before the grants become available.”

Some interview responses considered the pragmatics of agri-environmental program financing in the minds of farmers. A participant in the first Grand River workshop revealed an interesting insight,

“You have to look at what the government wants in terms of projects on-farm (in terms of what is funded more or less), and then work backwards. You start to structure your project to make sure it meets all their parameters, even if it is totally backwards. The best is to stay under the radar and conform to what they want. We make them think it was their idea.”

While another participant in the same workshop, added “financing should be available prior to projects beginning rather than after to reduce the strain on farmer’s finances.” As a notable final point on this tested variable, in interviews and workshops in both watersheds, comment after comment would repeat and emphasize concern such as ‘the EFP money is gone too fast!’, ‘more funding for programs!’, ‘there is no more grant money, and it is gone to quick’, ‘Growing Forward [the federal agricultural funding program] is sadly underfunded’.

**Funding for smaller-scale farms**

The second question regarding agri-environmental program finance addressed the inequity in capacity to participate because of limited farm financial capacity. To this effect, a question was “Programs such as the EFP and the CWP/RWQP should provide additional funding to smaller farms that are unable to finance their own on-farm projects.” The Spearman’s rho tests of correlation indicate that there is no statistically significant relationship between survey respondents placing value on additional funding for smaller farms and their degree of program participation.
Qualitative responses included concern as one farmer from South Nation watershed put it, “funding structures favour larger farm size investments.” A dairyman from the first Grand River workshop explicitly noted “the reality is that the people that need the money the most do not get it”, and “the EFP is size biased”. This was countered however by another farmer at the same meeting, “If smaller farms want to do it, they will find a way. The biggest barrier is I don’t care, regardless of what size they are.”

Program Communication
Questions were also asked to better understand how farmers perceive the communications quality of these agri-environmental programs. Interviewed farmers mentioned the importance of communicating program financing timelines and time lags to better prepare the paper work required for grant monies.

Importance was also placed on the role of agri-environmental program agents and extensionists as communicators. While some farmers (possibly of an older generation), lamented the loss of government extension agents, others noted that if program consultants did not provide adequate communication, farmers would turn to private crop and livestock consultants because, as one South Nation watershed farmer put it, “there are too many [advisors] these days.” This however was in contrast to the concern that some farmers have with the “secondary motives of private companies.”

To this effect, farmers were asked to respond to the statement “The EFP is effective in its communication of how dairy farmers can benefit from taking part in on-farm project.” The statement assumed that participants and super participants would agree with the effectiveness of EFP program communication compared to Non-Participants. The Spearman’s tests for overall responses and the Grand River watershed respondents between survey respondents perception on the effectiveness of EFP
program communication and their degree of program participation indicated a significance of 0.00 with a correlation value of -.25 and an N = 167 (70%) for overall responses and a significance of 0.00 and a correlation value of -.32 and an N = 101 (73%) for Grand River watershed respondents. The results indicate that there is a positive correlation between perception of EFP program communication and actual participation in the program for overall and Grand River response groupings. South Nation watershed responses were statistically insignificant.

A second agri-environmental program communication statement was asked, "The RWQP/CWP is effective in its communication of how dairy farmers can benefit from taking part in on-farm projects." The statement assumed that program participants would see the communication value of the RWQP or the CWP more favourably. The Spearman's rho tests similarly reveal overall and Grand River watershed responses have a statistically significant relationship between perception of the watershed-specific program’s communication effectiveness and their degree of program participation with a significance level of 0.02, with a correlation value of -.22 with an N = 118 (49%) for overall responses, and significance level of 0.02, with a correlation value of -.28 with an N = 68(49%) for Grand River watershed responses. As with the EFP program, there is a positive correlation between perception of the effectiveness of RWQP communication and participation rates. South Nation watershed responses were statistically insignificant.

Qualitatively, responses about agri-environmental program communication questions included a concern regarding the purpose of EFP written forms. Farmers commented that documents should be easier “to fill out.” On a few occasions, farmers suggested that agri-environmental programs should be consolidated to reduce
confusion. One South Nation farmer’s simple response to this question regarding the EFP was “communication is good, the money isn’t!”.

**Program Planning and Outreach**

Analyzing the context of farmer’s perception of agri-environmental program value effectiveness with respect toward planning and outreach was the focus of these two statements. The first statement posed to farmers was “The planning and outreach for the EFP program helps in making on-farm project choices.” The Spearman’s rho tests of correlation reveal overall and Grand River responses have a statistically significant relationship between perception of the planning and outreach of the EFP program and their degree of program participation with overall responses having significance level of 0.03, with a correlation value of -.17 with an N =167(70%), and a significance level of 0.06, with a correlation value of -.19 with an N = 101 (73%) for the Grand River watershed responses. The results indicate a positive correlation between perception of planning and outreach value of the EFP, and actual participation in the program at the overall and Grand River groupings level. The low correlation value indicates only a weak relationship between participation and Grand River respondent support for EFP planning and outreach. South Nation watershed responses were statistically insignificant.

It is important to note as well that agreement with the statement by survey respondents did not necessarily relate to participation. This would support some qualitative observations that farmers might be learning from the EFP workshop, but not actually implementing projects with program finances. Several interviews noted the positive experience with OSCIA staff and extensionists, including “OSCIA know what to do and what is available”, “I know the EFP representative very well, and it has been a good experience”, “OSCIA has good administration”, and “OSCIA staff giving the EFP workshop have it as their job to be in your face”. More critical perspectives on the EFP
planning and outreach included comments such as; “If EFP grant money is there, give it to farmers rather than spending too much on administration”, “it is a waste of time telling farmers about their options, most guys know what their problem with the environment is, but that is part of the EFP”, “the 2nd time around with the EFP is a waste of time”, and from a farmer at the second Grand River workshop “people are afraid of admitting how bad their farm can be, I know it is confidential, but does everybody believe it?”. Several farmers in interviews also lamented the loss of OMAFRA government extensionists in the 1990s, whose role of planning and outreach was more impartial, one South Nation farmer pointing out “we wish there were more extensionists out there, without secondary motives from private interests”.

A second statement posed to farmers was “The planning and outreach for the RWQP/CWP program helps in making on-farm project choices.” The Spearman’s rho tests of correlation indicate that there is no statistically significant relationship between valuing the planning and outreach of the watershed-specific programs and degree of program participation.

Qualitative responses to the planning and outreach question included a desire for more direct contact between farmers and RWQP and CWP programmers. In planning around county-level peer reviews, one Grand River watershed farmer noted “you often end up knowing who [the applicant] is” because proximity and profile are more obvious with immediate neighbours. A farmer recommended that peer reviews should be conducted of neighbouring county farms. Arguments were made for simplifying project application forms and reducing paper to enhance farmer experience.

Regression Analysis
As noted and outlined in the methodology chapter, in addition to the chi-square tests of association and Spearman’s rho tests of correlation completed above, a binary logistic
regression test was run to further analyse specifically identified independent variables together in relationship to program participation. The dependent variable Participation was modified to have a 0 or 1 value to represent participation as a low/high option.

Table 6.5: EFP-focused variables tested in binary regression in relation to program participation

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variables</th>
<th>β</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Watershed</td>
<td>.534</td>
<td>.607</td>
<td>.775</td>
<td>1</td>
<td>.379</td>
<td>1.706</td>
</tr>
<tr>
<td></td>
<td>InternetUse</td>
<td>.333</td>
<td>.653</td>
<td>.260</td>
<td>1</td>
<td>.610</td>
<td>1.395</td>
</tr>
<tr>
<td></td>
<td>Land Managed (Agg’d)</td>
<td>-1.117</td>
<td>.470</td>
<td>5.653</td>
<td>1</td>
<td>.017*</td>
<td>.327</td>
</tr>
<tr>
<td></td>
<td>Income Raw Data</td>
<td>.000</td>
<td>.000</td>
<td>2.269</td>
<td>1</td>
<td>.132</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Farmers Value EFP</td>
<td>-.967</td>
<td>.511</td>
<td>3.573</td>
<td>1</td>
<td>.059*</td>
<td>.380</td>
</tr>
<tr>
<td></td>
<td>EFP Communication</td>
<td>-.354</td>
<td>.461</td>
<td>.588</td>
<td>1</td>
<td>.443</td>
<td>.702</td>
</tr>
<tr>
<td></td>
<td>EFP Planning and Outreach</td>
<td>.463</td>
<td>.523</td>
<td>.784</td>
<td>1</td>
<td>.376</td>
<td>1.589</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>2.813</td>
<td>1.942</td>
<td>2.099</td>
<td>1</td>
<td>.147</td>
<td>16.666</td>
</tr>
</tbody>
</table>

N                        | 80                      |
Nagelkerke R²            | .281                    |

Table 6.5 illustrates a binary logistic regression aimed at testing variables deemed significant predictors of participation from quantitative and qualitative variables outlined in the methodology chapter. The table illustrates the test examined variables including; Internet Use, Land Managed (Aggregated), Income Raw Data, EFP Program Value, EFP Communication, and EFP Planning and Outreach, plus Watershed to test for distinction between the two regional programs. The result of this regression test resulted in Land Managed (Aggregated) significance at .017 and with a β value of -1.117 serving as an indicator that as land size increases, the likelihood of participation decreases. In addition, ‘Farmers’ Value EFP’ resulted in a significance of .059, with a β value of -.967 serving as an indicator that at Participation increases, so too does perception of the program’s value.
The second regression test identified variables with significance specifically related to the RWQP or the CWP. Table 6.6 illustrates that the independent variables tested were; Internet Use, Land Managed (Aggregated), Income (Raw Data), Farmers Value (RWQP-CWP), RWQP-CWP Communication, RWQP-CWP Planning and Outreach plus Watershed to test for distinction between the two regional programs. This test aimed to distinguish predictors of participation with a greater focus on the two specific watershed-based programs.

Table 6.6: RWQP-CWP-focused variables tested in binary regression in relation to program participation

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variables</th>
<th>β</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td>Watershed</td>
<td>.847</td>
<td>.924</td>
<td>.839</td>
<td>1</td>
<td>.360</td>
<td>2.332</td>
</tr>
<tr>
<td></td>
<td>Internet Use</td>
<td>-.190</td>
<td>1.010</td>
<td>3.549</td>
<td>1</td>
<td>.060*</td>
<td>.149</td>
</tr>
<tr>
<td></td>
<td>Land Managed (Agg’d)</td>
<td>-.705</td>
<td>.580</td>
<td>1.477</td>
<td>1</td>
<td>.224</td>
<td>.494</td>
</tr>
<tr>
<td></td>
<td>Income Raw Data</td>
<td>.000</td>
<td>.000</td>
<td>.534</td>
<td>1</td>
<td>.465</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Farmers’ Value RWQP-CWP</td>
<td>-.472</td>
<td>.736</td>
<td>.411</td>
<td>1</td>
<td>.521</td>
<td>.624</td>
</tr>
<tr>
<td></td>
<td>RWQP-CWP Communication</td>
<td>-.751</td>
<td>.487</td>
<td>2.381</td>
<td>1</td>
<td>.123</td>
<td>.472</td>
</tr>
<tr>
<td></td>
<td>RWQP-CWP Planning and Outreach</td>
<td>1.835</td>
<td>.918</td>
<td>3.991</td>
<td>1</td>
<td>.046*</td>
<td>6.262</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>3.457</td>
<td>2.407</td>
<td>2.063</td>
<td>1</td>
<td>.151</td>
<td>31.717</td>
</tr>
</tbody>
</table>

N: 51
Nagelkerke R²: .379

The results of the binary regression test in Table 6.6 indicate that Internet Use p=.060, and perception of the planning and outreach of the RWQP-CWP p=.046 are indicators of participation. The more frequently respondents used the internet, and the greater their perception of the value of RWQP-CWP planning and outreach, the greater the likelihood of their participation.
Summary

Socio-economic Factors

This section had the objective to “analyze specific socio-economic factors that can lead to greater program participation.” To this effect the hypothesis developed was “Degrees of Participation are positively related to: education, age, sex, farm size and farm income.” The following is a summary of data findings.

Education was not significantly related to agri-environmental program participation. The substantial number of Mennonites participating in the survey might have influenced this factor, where formal education in this community is less of an emphasis as compared to strong social networks including, increasingly, participation in EFP projects.

Age was not statistically significant, but middle-aged farmers tended to have greater involvement even though substantial numbers of younger farmers altered the trend. Tensions also were noted between agri-environmental planning on farms between generations.

While not statistically significant, tests of association and correlation noted distinct survey response differences between the two watersheds. In the Grand River, larger farms are still inclined to participate in the RWQP as much as the EFP, while in South Nation smaller farms are more often CWP participants, and larger farms tend to stop at EFP participation. In the regression tests, land size managed became especially significant. Large dairy farms across Ontario, especially since the introduction of the Nutrient Management Act have been regulated towards more cautious relationship to their water supply and water impact. The collection of observations from the qualitative
data regarding farm size and the difficulty for smaller farms to implement on-farm projects through the EFP would be in line with this regression analysis observation.

Farm income was not a significant determinant of participation from the simple correlation and association test results. However, like the scale of farmland managed, smaller farms in the South Nation watershed are more inclined toward super participation, and larger farms more likely not participating past the EFP. Farm indebtedness was a notable concern with all levels of farm income as a deterrent toward greater participation.

**Social Influence Factors**

This section had the objective to “identify and analyze the relational dynamics of social influence factors that leads to greater program participation,” with a hypothesis that “farmers who are Super-Participants have significantly higher degrees of social network connectivity.” The following is a summary of data findings.

Farm location was statistically insignificant in relation to participation. Central regions in both watersheds do have higher degrees of participation, very likely as a result of watershed programming outreach and resources.

The number of generations that a farmer has been on their particular farm provided counter intuitive results from the initial assumption. Farmers with less history (less generations on-farm) were more likely to be participants.

The variable test correlating farm succession plans and agri-environmental program participation had a low response rate. Variable tests on social knowledge sourcing in relation to participation rates were statistically insignificant.
Variable tests on the social influence of a farmer’s immediate vicinity (as distinct from general location in the watershed), as determinant of participation rates in agri-environmental programs were statistically insignificant. Response rates to the questions were low. Personalized networks being developed and managed by individual farmers emerged as an alternative source of influence. An important observation from responses to questions regarding social influence factors is that changes in farming practice take place in a far greater and more complex context than practices related to environmental sustainability alone. While tests results suggest Super-Participants learn from broader social networks of farm organizations and associations, there is also an individualized framework of farmer social networks that seem to increasingly be disconnected from a particular place. Factors of immediate surrounding seem less important (in the majority of cases). Indeed, while farmers continue to value the importance and evolution of social learning, an ethos in the farming culture suggests a fostering of independent thinking and the value of this for their specific, on-farm problem solving. There are however, important variations on the value placed on social relations depending on groups and sub-groups. Examples include the distinct social networks of Mennonite farmers in the Grand River watershed or more specifically, CWP participants in South Nation watershed.

The variable test of participation correlated with farm social event attendance was insignificant. While there is a slightly greater socializing and participation, farmers learn and network far above and beyond “farming related events” alone. Variables tested for the actual social event and organizational intensity and variety within which farmers are imbedded. As noted above, and as became increasingly clear, there is a tremendous amount of diversity in the types of farm events and farm organizations that exist. Many of these are specifically local, or not even agricultural, but which serve to re-enforce the
value of “personalized networks” that different farmers utilize for their particular circumstances. As an example noted above, a self-organized group of approximately 50 farmers in eastern Ontario (primarily dairy), combine their resources and group problem solving to continuously obtain the latest in financial and environmental planning advice through the contracting of consultants on a regular basis. This group was also very specific to a locality and did not have an “official” farm status. These social influence insights on the flexible nature of farmer social learning processes, and the qualitative point that farmers consider the EFP in light of a cautious “learning” process (because of time commitment and financial risk) suggest that policy makers and agri-environmental programmers increasingly require a nimble awareness of the learning ecosystem within and between farming communities.

Variable tests on social referencing agri-environmental programs and participation rates were significant in some cases. The EFP in particular remains a source of education for many Ontario farmers, even though many implement projects without EFP program funding.

Qualitative insight reasserted that farmer social networks are localized and diversified for specific personal and regional needs beyond that of official and traditional farm organizations. Farmers are learning about production processes far above and beyond any specific environmentally inclined agricultural practice.

*Program Value Perception*

This section had the objective to “analyze farmers’ (as program participants) perceptions of how program improvements could lead to greater participation.” The hypothesis stated was “there is a positive relationship between farmers’ perception of program value and their degree of participation in those programs.”
The variable test of EFP program value correlated with participation was significant for all three response groupings. In addition, the variable test of perceived value of the RWQP and CWP program also had significant correlation between participation and perception of the program in the overall test grouping, but not at the Grand River or South Nation watershed level. The results from the regression tests also noted significance in farmer perception of the EFP in relation to program participation at the overall level.

Variable tests correlated perceptions that agri-environmental program funding is important and participation rates produce statistically significant results for overall and Grand River groupings.

Variable tests correlating farmer perception of the quality of agri-environmental program communication and participation rates were statistically significant for overall and Grand River watershed responses focused on both the EFP and the RWQP.

Variable tests correlating farmer perception of the quality of EFP planning and outreach in relation to participation rates were statistically significant for overall and Grand River watershed responses. Interestingly as well, in the RWQP-focused binary regression test run, planning and outreach perception was significant as a predictor of participation.

Qualitative insights did note the loss of government extensionists, who have now been replaced largely by private sector consultants. Agri-environmental program communication, whether with the EFP, RWQP or the CWP remains vitally important as a starting point. Farmers remain aware of the broader forces at play in the reductions in government extension, and the “situated” interests of environmental organizational outreach and that of private sector consultants and contractors. In pockets of both
watersheds there remain varied degrees of broader level caution with agri-environmental farm practice change initiatives. Specific to eastern Ontario, a regulatory backlash in the past decade significantly influenced the perception and reception of farmers to conservation practices.

In the next chapter, the findings within the context of the theoretical framework are reviewed and the contributions to advancing our understanding of agri-environmental management and programming are considered.
VII. DISCUSSION

Introduction
This chapter provides a review of how the theoretical framework introduced in Chapter 2 has been useful in analyzing data findings pertaining to the research goal and objectives.

The overall theory-specific intention of this research has been to gain greater understanding of social structures within social networks as factors in agri-environmental program participation.

The research findings and the discussion points raised in this chapter remain conscious of the audiences for whom this thesis aims to be relevant. The first and foremost recipients of this research are dairy farmers and agri-environmental program managers. Conservation Authorities across Ontario and watershed program managers in other jurisdictions will find value in the research. The academic community will be an obvious audience, and different levels of government officials and policy makers from regional municipalities to provincial and state level legislators up to federal agri-environmental programmers and planners can find insights from the analysis.

This chapter follows a format of juxtaposing new insights from the findings with the three core theoretical streams. The main theories are considered in light of the observations made from the data results. The conclusion examines new insights within the context of the theoretical framework, research goal and objectives of the thesis.

Contributions and Considerations for Section A:
Social Structures in Social Networks
The first aspect of social structures in social networks to be analyzed for this research was to focus on individuals within their social structural decision-making processes.
Namely, the argument being considered (and balanced between competing visions), is that individuals both shape and are shaped by social structures, including how free one is to shape their society, and how much one is determined by it. To provide further theoretical context to this, Bourdieu’s concept of “habitus” was introduced to consider how guiding social norms within human societies at once shape and are being shaped by individuals. Specifically, how are farmers shaped by their social context into making specific choices and decisions?

Habitus is the internalized social structure of what is considered acceptable, realistic or manageable by individuals. Additionally, habitus becomes the external expression of internal social conditioning. When social changes are introduced (or imposed) from outside an individual’s social field (as in the case of agri-environmental programs such as the EFP), then patterns of reaction can develop. This research looked at, through quantitative and qualitative indicators, habitus in the social structure of farmers to consider how this influences participation.58

The use of the term “field” in this research, paired specifically with habitus, considers the collective space in which individual habits (thoughts and actions) are manifested. Farmers hold positions among peers with an aim to accomplish their goals. Field becomes the “working space” in which individuals interact and consider how changes can and are realized socially. The combined use of habitus and field, applied in what Bourdieu called “practice theory” is used here to consider what individuals think

58 The common habit of choosing an on-farm “beneficial management practice” such as manure lagoons could be considered a socially acceptable choice of project. Manure lagoons are also in accordance with a development trajectory congruent with a pattern of larger, and increasingly more technologically efficient dairy operations. As a result, manure lagoons do not require a significant reconsideration of the ‘habitus’ of intensive, industrial confinement dairy processing systems.
about, and actually do, in their formal and informal social networks, which leads to the use of Social Network Analysis (SNA).

As outlined in Chapter 2, SNA is interested in the ties between people rather than individual characteristics. Research findings related to, for example social knowledge sourcing and immediate neighbour influence are more concerned with networks rather than individual habits. SNA is paired here with social structural thinking through habitus and field to consider how ideas, perceptions, possibilities and networks shape social action and change from an individual to the group.

Sociologist Harrison White focused on the links between people as an important part of forming social habits and opinions. Asking how the relationship between two farmers might influence their participation rates (separate from our understanding of either individual farmer’s socio-economic characteristics), is of interest here (White, 2008). Sociologist Mark Granovetter provides nuance to the SNA question by considering the influence of social networks beyond those that are immediate and meaningful (such as with family and friends). “Weak [social] ties” according to Granovetter often lead to greater insights and new knowledge for an individual (Granovetter, 1973; 2004). Sociologist Barry Wellman further considered how social networks are increasingly less influenced by the constraints of location in a world of advanced media technologies (Wellman, 2001).

The framework developed here around social structure (habitus and field) and social networks (social network analysis) considers the capacity of individuals in social relationships to make decisions in their farming practice. The following series of variable test reviews considers how the data findings contribute new insights to the theoretical stream outlined in chapter 2.
Socio-economic Factors: Education, Farm Size, Farm Income

There was no statistical linkage between education and participation. One of the central theories of Bourdieu’s is that higher levels of education bring greater cultural capital and, in turn, a different habitus orientation. The assumption behind this hypothetical correlation was that education would also create a greater linkage among an educated “field” of farmers who would have a more environmental orientation; however, there was no evidence of this linkage. What is notable, especially in the Grand River watershed response group, was the social network power of ties between farmers irrespective of education. For example, within the Mennonite community, formal education is not a distinguishing characteristic as much as strong community connectivity. This therefore indicates that participation is not necessarily related to education but more so networks between individuals, reasserting White’s (2008) argument.

Farmland was important to consider because of the thousands of acres of land managed by dairy farmers across the province. Regression tests revealed that farmland size managed is an important determining factor in program participation rates when looking at the overall data sample. At the watershed level, greater nuances emerged. In South Nation watershed, smaller farms participate more as Super-Participants, but larger farms would more often stop at EFP participation. Since the Nutrient Management Act was introduced in Ontario in the early 2000s, larger livestock farms have been required to have a Nutrient Management Plan. While this led to significant collective habitus change in the field of larger dairy operations, there were also adaptations to maintain persistence in practice beyond bare requirements. We can see the concept of “habitus persistence” of larger farms in South Nation stopping at further environmental participation beyond the EFP, very often in the form of a manure lagoon, while Super-Participants in South Nation watershed as a sub-group maintain a distinct habitus
through the CWP. In the Grand River watershed, the strong environmentally-conscious “field” created by the RWQP among the farming community gives further strength to White’s (2008) claim of the importance around relationships between individuals. The EFP-focused regression test, Table 6.5, and the related ‘step-wise’ regression test, table 6.6 indicates greater linkage between farmland managed and program participation. Qualitatively, some farmers in South Nation interviews noted that the EFP is ‘large-farm biased’ would add further context to Wacquant (2002), that social structures tend to have persistence.

Initially considered a core socio-economic variable in determining likelihood of agri-environmental program participation, off-farm income from the quantitative data was not a significant determinant of participation rates in either watershed population with tests of grouped and ungrouped data.

At the watershed level, in South Nation, smaller income farmers are more likely to be super-participants, and that as farmers’ incomes rise there is less likelihood of super participation. This is more evident in South Nation watershed than in the Grand River watershed. This observation could be made in context of the habitus or culture of larger farms compared to smaller farms. Possibly, if regulatory requirements are met with the EFP, farmers are less motivated to engage in greater participation. This also emphasizes the value of watershed programs in both South Nation and the Grand River in providing an essential service of top-up funding through their respective programs once an EFP workshop has been completed. This re-emphasizes the value of dairying farming “fields” where educational and financing programs provide the context for environmental security against a market-oriented milk production system (Bourdieu, 1988; Thomson, 2008).
Social Influence Factors: Farm Continuity (Generations on-farm and Farm Succession)

Statistical test results for generations on farm related to agri-environmental program participation overall indicated a surprising finding. The fewer generations that a farmer has been on a particular piece of land, the more likely he or she is to be a participant. Perhaps new farmers are more inclined to conform with existing management practices or to please regulatory authorities. Responses to the question on farm succession related to participation was low, however a couple of notable observations are worth mentioning. In the Grand River watershed, the results indicated greater succession planning connected to participation. This might reinforce qualitative observation on the particular strength of Mennonite community continuity between generations. In addition, succession planning and participation may be as straightforward as one farmer noted in a workshop “if you have kids, yes, invest more.” However, there was just as much qualitative insight noting how intergenerational farm planning can contain conflict over finances and strategic direction.

This leads to consideration of the role that habitus and field might influence in the social dynamics of productivist oriented dairying in Ontario. As Ryan (1999) suggests, socially well connected and established farms with strong links to the farming community will be more inclined toward practices that are conventional and productivist oriented, and less environmentally inclined. The broader cultural “field” of dairy farming might not be as environmentally oriented as initially hypothesized. After a couple generations on a farm, new comers might be absorbing the standard habitus of their surroundings, and this might disincline them toward agri-environmental program participation (Shucksmith, 1993; Glenna, 1996).
**Distance of Network Influence: Social Knowledge Sourcing, Immediate Knowledge Sourcing, Social Referencing**

Statistical tests for social knowledge sourcing did not indicate significance at any of the three levels from the survey data.

Qualitatively, eastern Ontario’s unique network of farmer groups manifests in many forms, such as through the Lanark Landowners Association, an anti-government regulation initiative. Franco-Ontarians in eastern Ontario learn new farming techniques to a great extent from their counterparts in Quebec. The habitus and field of farming in eastern Ontario is notable for the conditions that set the stage of knowledge development, including networks of organization and learning by acquaintances or as Granovetter (1973) described “weak ties.”

Immediate knowledge sources matter (in the context of this research) only in as much as the location of farms in respect to each watershed. Most immediate neighbours are not as influential as one’s “personalized networks” (Wellman, 1988, 2001). Connections, as noted by White (2008), are shaped by an individual’s “field and habitus” of (consultants, contractors, vets, etc.). The rural farmlands are changing to include more urbanizing, commuting, non-farming rural neighbours who change the field of networks in dairy farming spheres. These changes are altering network learning. One Grand River watershed farmer noted how this is reducing the amount of interaction with immediate neighbours. However, the field habitus in the Grand River watershed Mennonite community suggest that immediate social networks of friends and family continue to have a specific place-based influence on knowledge development, something which White (2008) was aware of as well.

Social referencing of the EFP and the RWQP in relation to participation was statistically significant in tests of correlation conducted. The referencing of the program
to friends, as asked in the question, including the value of additional recommendations and advice on how to best manage and navigate through the program and program financing process adds to the understanding of relationships in ‘fields’ and the roles that individual farmers take in those fields to share within their social networks (Samuelson, 1979; Coase, 1990; Steiny, 2007).

**Broader Social Influence: Farmer Social Relationships, Social Event Attendance, Farm Organization Social Networks, Communication Technology Use**

Statistical tests did not identify significant differences between farmers who placed different values on; a. social relations for success in their dairy operations or b. greater program participation. Participants and especially Super-Participants in this data sample emphasized the value of good social relations. The overall impression related to these two questions is a strong sense of independent spirit and “being your own boss” as a general habitus within the field of dairying. Equally important to note is that good social networks, as outlined by White (2008), do not translate necessarily into greater environmental thinking within “mainstream” dairy production thinking (Ryan, 1999).

These findings also add perspective to Raedeke et al (2003) in that the objectives of dairy farming as a field can be quite different than the field of environmental programming.

Testing for social event attendance resulted in statistically insignificant results for the various groupings. The qualitative observations, however, emphasize that social event attendance (and learning) are far broader than official “farm related” events alone, and even more so, far beyond environmentally-related events. For example, in both watersheds, farmers revealed that attending informal events such as birthday parties and Sunday church were equally an opportunity to build networks and in this context, habitus. Time constraints are a serious consideration in this context for any type of
knowledge dissemination program such as with the EFP, RWQP or CWP. The habitus of “informal” time and event themes in the development of networks and the learning taking place between closer (immediate) and weaker (broad-based) dairy network connections is notable for this research and for Social Network Analysis (White, 2008; Granovetter, 2004; Wellman, 2001).

Qualitative observations of social event attendance and participation notably highlight the extent of social organizational diversity in both watersheds. Personalized networks emerge as a particularly strong contemporary phenomenon, contributing to claim of new media, information systems and organizational structure change altering how knowledge and learning in social networks (and fields) are evolving (Wellman, 2001; Samuelson, 1979; Coase, 1990; Steiny, 2007). In both watersheds, local-specific farm groups, (informally such as the Mennonite groups), or more formally established (such as a financial and environmental management group discovered through interviews in South Nation watershed) are changing the shape of farming social structures. Habitus and the field of dairy farming specific to local needs, circumstances and resources are shaped somewhat separately from the objectives of provincial wide farm organizations such as the OFA and CFFO. Qualitative observations in this respect suggest that province-wide farm groups are only part of the relevance of dairy farming habitus and new structural systems are making more traditional groups less influential.

Correlation between participation and internet communication technology was insignificant at the .05 level but significant at the .06 level in table 6.6 It is also important to reiterate that there were only N=51 valid cases from a total of N=239 determining these two regression tests. This is an anomaly that may require more future research, because qualitative observation noted that dairy farmers in both watersheds are seem to be learning far and beyond the internet in relation to greater ecological thinking,
especially in a habitus of dairying that is not necessarily leading to greater environmental practice. The mixed methods data findings that many other factors in the social structure apart from internet connectivity are leading to a tipping point in environmental thinking, however, in future research, the formatting of questions around this topic could be altered to provide deeper analysis of this issue.

**Program Perception: Value, Financing, Communication, Planning and Outreach**

Perceptions of agri-environmental program value were statistically significant for both the EFP and the RWQP. Regression tests comparing participation to EFP program value was also significant. From both survey and interview data, insights reveal that EFP and RWQP support is stronger than that for the CWP. The habitus of regulatory pressure for larger farms to complete the EFP as an educational tool might also be evident, while Super-Participants value the EFP as well, especially in the context of financial support. The EFP is valued for educational purpose, evident from the test results, even if, arguably the EFP has become closely coupled to expectations of financial incentives as noted in the qualitative findings and emphasized by Morrison and Fitzgibbon.\(^\text{59}\)

The differences between participation in relation to positive appreciation of agri-environmental program financing were statistically significant in overall and Grand River groupings. Qualitative insight suggests that farmers are adapting their on-farm project goals in line with program financing, while some interviews suggest a perception that agri-environmental programs are oriented toward the needs and projects of large farms, and on top of which, are seen to be underfunded, especially in the context of major differences in funding cycles between the Agricultural Policy Framework federal program (2003-2008), and the Growing Forward federal program (2009-2013). Additionally,

\(^{59}\) Forthcoming article in Land and Policy Journal.
funding was not seen as much as a tipping point, but rather as an additional incentive. This poses the question of whether agri-environmental program financing allotments can shift resources to encourage certain types of practices over others by shifting funding allocations. This is an important element of Bourdieu’s thinking about shifting fields and how habitus within subcultures changes in turn (Maton, 2008; Thomson, 2008).

Participation and perceptions about the value of agri-environmental program communication as helpful were significantly correlated for overall responses and those in the Grand River watershed response group.

Qualitative interviews indicates that while some farmers lamented the reduction in government extensionists in both watersheds, a new system of knowledge is being created by farmers into more personalized networks as noted and as theorized by Wellman (2001). Communication with contractors forms a different perspective in relationships between specialists, farmers and programmers and brings to light the points brought forward by White (2008) and Granovetter (2001). Additionally it is important to note the subtle and distinct differences between communication systems and communication response in the two watersheds. From the limited perspective of the qualitative interviews with CWP participants in the data sample, there is suggestion that the message of the SNC is overly focused on environmental conservation and restoration initiatives to the detriment of agricultural productivity in the South Nation watershed. Within a *habitus* analytical context, this highlights the contrast in orientations, practices, attitudes and priority of effort between Ontario Conservation Authorities and dairy farmers in the South Nation watershed (Ryan, 1999; Raedeke et al, 2003).

Finally, an observation regarding the planning and outreach of agri-environmental programs is the persistent influence of immediate social networks. For
example, in the Grand River watershed, one farmer noted being aware of which farmer’s property was being evaluated through the EFP peer review process simply because of its landscape details. This highlights the power of immediate social network knowledge (not necessarily including immediate neighbours per se) and the potential shortcomings of immediate social networks in developing unbiased evaluations in the EFP.

**Contribution and Considerations for Section B:**

**Adoption and Diffusion of Innovations**

This section will examine new insights into adoption and diffusion of innovations (ADI) theory in light of the results of specific variable tests conducted on the data sample for this thesis research.

This research conducted a variety of measurements in comparison with program participation to build a greater understanding of determinants of agri-environmental innovation. More recent studies have looked at the technological innovation or farming practice itself as much as the people behind it. Gladwell (2001) has considered the feasibility, characteristics and life cycle of an innovation in gauging potential relevance and durability for a population. In this research for example, data findings note a dominant prevalence of manure lagoons as a common innovation project with dairy farmers realized through participation in any of the three programs in question. This is notable for the significant installation costs associated with the lagoons, but also the well-established expertise infrastructure and funding available through the three agri-environmental programs in question. Innovations in farming practice, such as installing manure lagoons, require logistical capacity, specialists, and a community of practitioners, contractors and educators. Important as well, is the type of production intensive, confinement dairying model that facilitates the types of innovation that manure lagoons are practical for. In the context of this example, and in the emphasis of this
research, the questions asked analyze beyond the rational choice model of innovation. Adoption is seen as motivated beyond profit alone as part of a complex exchange of policies, social structures, social networks and agricultural communication environments based in a specific context (Roling and Wagemakers, 1998). It is in this context that this research aims to contribute new insights in the field of ADI.

**Farm Scale: Farmland Managed and Farm Income**

Farming scale, including the amount of farmland managed and the income generated by a farm has been considered an important determinant of innovation leadership (Rogers, 1995). More specific to agri-environmental innovative practices, farm scale as a leading factor has mixed results. Studies by Aiken (1984), Swanson (1986), and Beus & Dunlap (1990) have all looked at the relationship between large farms and environmental practice, and have suggested that as farms grow in size, their sustainability and conservation priorities and capacity, are reduced or are increasingly incompatible. Research by Napier (1984) placed emphasis not on farm size but rather on the complexity and type of farm operation as an important determining indicator of agri-environmental innovation. Serman & Filson (1999) and Filson et al (2011) conducted research on predictors of the adoption of best management practices (BMP) with farms across southern Ontario. In the EFP-focused binary regression test, table 6.5, farm size (land managed – aggregated) was a predictor of participation, both supporting and refuting some of the literature noted above.

In this research, variable tests comparing farmland managed with participation in the three agri-environmental programs was considered valuable because dairy farmers in both watersheds (and across the province) manage and influence tens of thousands of acres of farmland in crop cultivation and manure storage and dispersal. Qualitative observations made by several farmers regardless of their farm income noted that
indebtedness often constrains their capacity to participate more extensively in the agri-environmental programs. This reasserts the work of Hooks (1983) in that financial incapacity limits greater environmental practice regardless of willingness. However, the qualitative observation from this research remains conscious of the different motivations behind different farm practice beyond indebtedness alone. Authors such as Carlson & Dillman (1986) and Lee (1983) wrote that farms are strongly motivated by economic rather than environment determinants. In addition, Gerber & Hoffman (1998) added that environmental practices not only incur costs (as interviewed farmers noted in both watersheds), but also carry social risks. In this context, farmers may resist agri-environmental program participation. Under this perspective, programmers with the EFP, RWQP and the CWP could further consider how much indebtedness and farm income levels either encourage or discourage greater openness to participation.

Motivation in this research however, was also to examine the context of farming practice adoption factors that measure beyond economic and financial explanations alone (Nowak, 1987; Ragin, 1994; Genskow & Prokopy, 2010; Prokopy et al, 2011a; Kaiser et al, 1999; Napier, 2001; Burton, 2004; Ahnstrom et al, 2008; Reimer et al, 2012).

**Social Dynamics: Social Knowledge Sourcing, Immediate Vicinity Social Knowledge, Social Events, Social Referencing**

In this research, the social dynamics within dairy farming is considered an important influence in the adoption and diffusion of innovations. As noted above, Gerber & Hoffman (1998), writing in the German context, have emphasized the extent to which social dynamics influence change.

Social knowledge sourcing and water quality awareness did not vary significantly between the two watershed groups. The assumption was that more socially connected
farmers would be more likely to participate in the agri-environmental programs. Observations about the tendencies that emerged from the data sample are that, overall, EFP participants lay claim to learning most from their immediate social contacts (family, friends and fellow dairy farmers), while Super-Participants have a slightly broader range of social network. At the watershed level, in the Grand River, Super-Participants recognize the value of learning from their broader spheres of influence, including news media, farm organizations and farm extensionists. Given the close community dynamics of the Mennonite farmers who were a part of the Grand River survey, this is notable. McCallum (2003) also notes the extent to which the RWQP has worked to develop and build trust with farmers in the region. Access to information about agri-environmental programs is a growing focus of study, and the data findings from these two variables on program knowledge and knowledge about water quality were considered in this context (Morris & Potter, 1995; Loftus & Kraft, 2003; Fairweather & Campbell, 2003; Prokopy et al, 2008; Napier, 2009; Baumgart-Getz et al, 2012; Reimer et al, 2013).

In South Nation watershed, the value of immediate sources of social knowledge about the programs was noted by EFP participants. The emphasis on social trust leading to greater environmental practice as outlined by Warrimer & Moul (1992), Pretty & Ward (2001) and Agnew & Filson (2011) is partially true of the results from the data sample in South Nation. While immediate networks within the watershed with family, friends and fellow dairy farmers lead to participation, these dense networks did not always lead to super participation. Additionally, South Nation watershed is striking for the complexity from which social knowledge sources originate. In the mid-2000s, the Lanark Landowners Association in eastern Ontario set the stage for a reactionary response to agri-environmental policy. In addition, social knowledge sourcing about agri-environmental practice among Franco-Ontarian was notably distinct. As a sub-group
within the watershed, many obtain knowledge and farm management practices not from immediate social networks alone, but with those cultivated in the province of Quebec (Floress et al, 2011).

Variable tests aimed to determine how influential immediate neighbours were to participation. Results were statistically insignificant and had relatively low item response rates. Qualitative observations noted that personalized networks rather than immediacy have greater social influence. Innovation that is taking place through networks of practicality and trust reasserts Warrimer & Moul (1992), Agnew & Filson (2011) and Pretty & Ward (2001).

No statistically significant relationship was found between social event attendance and greater openness to change and participation in the agri-environmental programs. While Smit & Smithers (1992) and Swinton (2000) note that greater social membership in organizations builds positive adoption tendencies, the observations from this data set are that social events for farmers are far above and beyond environmentally focused social events alone. In hind-sight, the question was defined too narrowly to suggest or imply agriculturally related social events. There are many demanding issues and possibilities for farmers’ time. Environmentally related events comprise a small part of the overall social constellation. Informal social events, especially those around birthday parties and church meetings suggest an especially diverse meeting space for learning about innovation in practice and where social networks are reinforced.

Variable tests of socially referencing a friend were considered statistically significant in all three groupings if the survey respondent was a participant. Test results were also significant for the link between participation and recommending the RWQP but not the CWP. From an innovation diffusion point of view, McCallum (2003) recognized
the uniquely strong extension efforts of the RWQP, and how this manifests in greater social trust in recommending the program to friends. In turn, this reasserts the positions of authors who link greater environmental practice innovation in conditions of social capital and trust (Warriner & Moul, 1992; Smith & Smithers, 1992; Swinton, 2000; Pretty & Ward, 2001; Knowler & Bradshaw, 2007; Agnew & Filson, 2011).

Testing the variable of farm organization social network compared to participation rates was not statistically significant however qualitative observation is notable regarding the innovations taking place above and beyond farm groups. Beyond the structures of immediate social dynamics of innovation within groups such as the Mennonite community in the Grand River, and also beyond that of the OFA, CFFO and the DFO, greater innovations in learning emerged from qualitative observation of Franco-Ontarian management networks, linked with their counterparts in Quebec. The main observation is that increasingly in an information-rich context, farmers are able to learn more rapidly through the immediacy of innovations they created in their specific social settings rather than through the bureaucratic logic of more traditional farm organizations.

**Program Perception: Value, Finance, Communication, Planning and Outreach**

In the series of variable tests investigating the linkage between agri-environmental program participation and perception of the value of those programs, four groups of specific questions were asked.

The first variable test in this section asked respondents about how they perceive the value of the EFP and the watershed programs. Correlation between participation and support for the EFP was statistically significant with Grand River respondents. As noted, the regression tests also noted perception of EFP program value as a predictor of participation. Statistical significant between participation and valuing the Grand River
RWQP was also notable. Innovation with the RWQP and the emphasis on effective program promotion focus (Ryan, 1999; McCallum, 2003) has translated into the dynamic character of the program.

Remarkable as well is the contrast with the CWP in South Nation watershed. Qualitative observations noted the distinct reaction in dairy farmers’ responses. Some interviews noted the perceived sense of lack in innovative flexibility of CWP programmers in balancing farm and ecology priorities in program design.

Participation was statistically significant in correlation with perceived value of program financing, however as noted, some qualitative responses emphasized that the financing did not serve as a tipping point toward action but rather as an additional incentive. Several interviews and workshop comments also raised serious concern about the limitations of financial incentives and adoption payment structures for the EFP in particular. In this context, these findings add insight to contributions on the importance of financing in conservation adoption and participation (Gale, 1992; Kraft et al, 1996; Gerber & Hoffman, 1998; Franks, 2003; Marshall, 2004; Maybery et al, 2005; Lambert et al, 2006; DuPont, 2010; Filson et al, 2011; Reimer et al, 2012a).60

Several variable tests were conducted on perceptions on agri-environmental program communication, planning and outreach. Farmer perception of program communication was significantly correlated with participation in both the EFP and the RWQP. There were also relationships between perception of planning and outreach for the EFP in the overall results as well as in the Grand River watershed.

60 The study by Morrison and Fitzgibbon, forthcoming in Land and Policy Journal makes the argument that the EFP program is facing limitations in its current effectiveness because of the close connection that has evolved between farmer participation, government-led planning and expectations of financing for on-farm projects through the program.
Specific to the South Nation, responses from the data sample consistently rated the program value of the CWP lower than the RWQP, however the CWP makes specific and conscious effort to use a farmer-to-farmer approach in promoting the program and encouraging on-farm projects.

From qualitative observation, in both watersheds, RWQP and CWP programmers continue to vie for the attention of farmers, with private consultants, contractors, crop specialists, fellow farmers, and veterinarians. From a perspective of “de-centred” knowledge systems and communication, this growing diversity of opinions and complexity in farm management decision making is that which Roling and Wagemakers (1998) emphasize about the changing nature of agri-environmental innovation. Farmers are becoming much more empowered to learn about and make choices in terms of what works best for their budgets and priorities. This diversity of choices, however, may not translate into greater program participation within the structure of this research. Jürgen Habermas’ theory of communicative action (1984, 1987) reiterates the point behind the importance of consensus and collaborative learning that seems to be directly and indirectly taking place with farmers in the two watersheds studied. Finally, we need to consider the specific regional and watershed conditions that are the RWQP and the CWP in relation to the EFP. Knowler & Bradshaw (2007) emphasize the importance with which agri-environmental programs can obtain a targeted focus; through communication, extension, planning and funding, to work with local communities and individual farms in meeting their specific requirements. We see this becoming both a reality in certain respects, especially in the case of the RWQP, but also facing some ongoing challenges, as in the case of the CWP.
Contributions and Considerations for Section C:

Adaptive Management

The use of theories and principles of adaptive management (AM) are based on a focused emphasis on complex systems thinking, methodology and application. AM theory confronted methodological shortcomings that reduced analysis to isolated variables rather than study the interconnectedness of multiple variables. Alternately, AM addresses the complexity of multiple variables in applied research. While originally based in ecology, AM has broadened out to understand environmental management as requiring understanding of complex, interconnected environmental, human and social systems.

Canadian ecologist C.S. Holling and colleagues moved their research beyond limited and controlled single variable analysis toward study of resilience within socioecological systems. The social side of AM, most relevant to this research, requires analysis of agri-environmental policy and programming processes, the social structures motivating actions, and the possibilities and capacity to consider, negotiate and develop new alternatives (Holing, 1995; Berkes & Folke, 1998). This management process requires continual adjustments in flexible policy, regulation and law while providing monitoring, feedback, and responsiveness. AM remains aware of current limits to knowledge and feasibility in relation to the conditions of constant change in specific socioecological systems. Using the methodological and theoretical thinking tools of AM has been relevant to consider the capacity and future potential of the three agri-environmental programs in focus with this research.

In the context of the quantitative and qualitative data sample, agri-environmental programmers could monitor slower or faster changes in social preferences between
generations in participation patterns (Holling, 1978; Walters, 1986; Neudoerffer & Waltner-Toews, 2007).

Qualitative observations from this research noted a greater diversity of farmer-related groups that are less formal and have specific local and regional emphasis and value. Church groups, informal gatherings and birthday parties, ethnic linkages such as French-Canadians in eastern Ontario (and their extended networks in Quebec), Mennonite farming families, or locally developed farm management groups in Prescott-Russell are all notable in having a strong motivating influence over knowledge development and mobilization about agri-environmental program opinion, and potentially, participation. In the context of AM, the insights of Brunner & Steelman (2005) add that agri-environmental programs not only need to know the complexity of social systems and their applications in communities; but also how learning, knowledge and information are being shared best to adaptive needs for local farmers as potential program participants. This serves as a valuable feedback to remain relevant to the farm community (Berkes & Folke, 1998).

Qualitative observation noted that farmers first and foremost value farm visits and face-to-face interaction to learn about new management techniques and applications. Within this context as well, programs are working with reduced provincial extensionists, and an increase in private sector consultants. Event and information fatigue are real deterrents. These observations relate to the central monitoring themes of adaptive management; monitoring for program stability-change-breakdown, understanding knowledge evolution, and adapting to changing needs through introduction of alternative processes in an ongoing “experimental” learning process (Holling, 1978).
Conclusion: In Context of the Theoretical Framework

The most significant observations from the data analyzed in this research will be outlined here regarding social structure, social networks, the adoption and diffusion of innovations, and adaptive management.

It is also important to reiterate that the data findings in this research remain conscious of the representativeness of interview, workshop and survey participants. As noted in the methodology chapter, qualitative and quantitative responses by farmers in this sample were on average those who are more male (20% higher than the provincial average), 7 years younger on average than the provincial average, having farms that were on average nearly twice as large as the provincial average, and with incomes equally larger than average as well. These factors all have implications in the impact and meaning of research findings and conclusions.

As a theoretical framework outlined in the theory chapter (chapter 2), the driving conceptual tool has been to use practice theory as a means by which to describe why some farmers do or do not consider certain actions and practices on their farm while others view those actions as a priority or required for the greater good (Bourdieu, 1991). Practice theory for this research was to provide the mobilizing force to understand how social structure moves along and evolves through the attitudes and behaviours of individuals in their groups and social networks (Postill, 2010). Perception forms the habitus of daily life (Lui, 2013). Social influences shapes perception as an ‘officializing strategy’ of habits in a collective practice of dairy farming (Acciaioli, 1981). Practice theory was the testing ground in this study on the complexity of social dynamics in structural and institutional change. Farm practices, manifest here as behaviour specifically in program participation, is an expression of collective knowledge based on
shared social, structural understandings, know-how and standards of practice (Warde, 2004). Ultimately, the theoretical framework of practice theory was operationalized methodologically within a naturalistic-constructivist project stressing focus on degrees of agency of individual dairy farmers in a structuralist framework (Guba & Lincoln, 1985, 1989; Lau, 2004).

As introduced above, habitus and field (as outlined by Bourdieu) in this research would focus on characterizing the social dynamics of dairying farming in the two case study watersheds. This social dynamic characterization after analysis of data findings in context of the conceptual framework containing the three distinct theoretical streams of inquiry argues that there is an important shift continuing to evolve from centralized knowledge and information toward a decentralized system of innovation (Roling and Wagemakers, 1998).

Sub-groups or specialty groups of dairy farmers are organizing, innovating, and applying new knowledge into practices through what can be termed “personalized” social networks. Within the political economic context of a neoliberal shift in Ontario and Canada in recent decades, information has diversified and specialized to the needs and character of a broad range of farmer demographics. Farmer groups are orienting their needs and farming innovation in different context settings along ethnic lines (Dutch-Canadians, French-Canadians); along religious lines (Mennonites); or regional sociopolitical lines (Lanark Landowners Association). With newer forms of innovation in farming practice, personalized networks are more attuned to immediate needs. Knowledge, information and application obtained from immediate family and friends, local officials, government agencies, private consultants and contractors, or organizations and media sources all combine. The source of that information matters
less. The unifying factor suggests that innovation is highly catered to the needs of specific groups and their particular requirements.

One of the central motivating questions for this research has been how agri-environmental management can advanced and manage in this context. The insights are equally telling. General innovation in dairy farm practice is separate (or more importantly, not necessarily connected to) environmentally-oriented innovation practices. Ryan has argued (1999) that the culture of dairy farming or farming in Ontario does not necessarily have more inclination toward greater environmental practice simply because of greater sociability and social connectivity between farmers (as was one of the initial hypotheses of this research). In any competitive sector such as dairy farming (even under supply management), economic survival does not necessarily equate into greater environmental practice. Regulatory compliance is met by a significant percentage of the dairy farm population through participation in the EFP, going above and beyond that is questionable from the data findings. Agri-environmental innovation, whether expressed through farm practice choices, or through super participation in one of the watershed specific programs seems strongly connected to a social network connectivity that is above, beyond or distinct from connectivity and engagement with the “mainstream” of dairying culture in the province.

Agri-environmental programs need to become aware of the diversity of sources with which farmers are learning about new practices. The environmental implications of those practices, and what financial options they have to meet regulatory requirements while still operating profitable businesses, will be vitally important to program design. Agri-environmental programs have the balanced need and pressure to remain attuned to feedback about their communications, planning and outreach strategies in light of what
become trends in changing farm practice. How programs shape their goals and objectives with farmers will be essential to remain relevant and durable.
This final chapter brings together all the insights and perspectives developed throughout the thesis research project. There are four sections to this chapter: the first section provides a summary of the different chapters of the thesis; the second section provides a conclusion to the research and considers the contributions to the advancement on concepts and theories related to the findings; the third section is recommendations for policy enhancements within the context of this research, specifically how agri-environmental policy might be improved with consideration of this research; and the fourth section proposes a set of future research prospects in light of the research completed here.

**Summary: Overview of Thesis**

As the goal statement of this thesis has outlined, “to advance agri-environmental management through greater awareness of program participation as influenced and motivated by the social dynamics of farming,” a series of objectives were developed to help guide the research. Systematic analysis of a quantitative survey and qualitative interviews and workshops were described to build an understanding of social factors influencing environmental practice in dairy farming. Participation in one of three focused agri-environmental programs was analyzed in relation to socio-economic factors such as education, age, sex, and farming scale. Social influences through various measures of farmer social connectivity were measured in relationship to greater participation inclination. Farmer perception of program value, quality and effectiveness were analyzed and considered in light of related participation rates.
To organize the analysis of this research goal and its objectives a theoretical-conceptual framework was developed to guide the process. The theories would need to provide a flexible, interdisciplinary dynamic that would allow for considering the inter-relationships between social structures, social networks, processes of innovation and changing management styles.

The first theoretical stream developed around the conceptual tools of “habitus” and “field” as advanced by Pierre Bourdieu, is an analytical and thinking tool for understanding social dynamics and phenomena. These two concepts have been particularly useful in building a foundation around the culture and practice of dairy farming. They consider how every habit and assumption evolves in a social setting that can be understood as a field. In addition, the first theoretical core has framed social networks through the use of Social Network Analysis (SNA). Primarily developed by Harrison White, Mark Granovetter and Barry Wellman, SNA was crucial in terms of framing an analysis of the importance of farming practices developed seemingly by individuals, but more so as associational relationships between people. These social relationships could be close family relations, or distance contacts; the key factor for this research was the degree of influence on perceptions and persuasion toward potential changes in practice.

The second theoretical stream of this research intended to frame understanding of changing farming practices of social networks within a spirit and force of innovation. The literature of how practices change and evolve is very broad, including that in agricultural research, but what has been of particular focus in this theoretical framework is to utilize the work advanced around the adoption and diffusion of agri-environmental innovation. Utilizing the collection of authors who have developed frameworks in considering what leads to environmental change this research contributes to the
literature by focusing on social network influence on innovation in agri-environmental practice.

The third theoretical stream that formed the overall conceptual framework for this research was the applications and ideas behind adaptive management. While some of the most critical foundations to AM emerged out of experiences in ecological science, the use of social systems research within AM was most valuable to this research. AM authors considered how agri-environmental programs, policies and management practices can develop and retain the conditions that might best facilitate greater sustainability and environmental health.

Chapter 3 (Methodology) provided the methodological outline as to how research was completed from beginning to end. Initial conceptualization of the focus area developed through an interest in a comparative study of different programs and policy initiatives to consider how local and regional context, natural resources and cultural difference could influence farming practice results. The EFP was chosen as one of the three agri-environmental programs in question because of its well established history in Ontario agriculture. The RWQP in Grand River watershed was chosen because of its notable experience in working with farmers in a proactive, collaborative process. The CWP in South Nation watershed was chosen for its similarities to the RWQP in its focus on water quality within an ecosystem-based approach, but also because of some notable differences in program outreach, and local cultural characteristics (proximity to Quebec and the federal capital).

Dairy farming as a commodity group was chosen because of its extensiveness as a farming practice that is heavily engaged with ecosystems in terms of land use in growing feedstock, as well as the management of nutrient effluent from cattle manure. In
addition, dairy farmers figure prominently in the region of southwestern Ontario where the Grand River watershed is located, and in eastern Ontario where the South Nation watershed is located. Dairy farming, in addition is significantly entwined with the political and economic policy structure of Ontario and Canada through supply management. This is an important consideration in relation to insights about evolving agri-environmental management and governance coming from this research.

Preliminary interviews were conducted in both watersheds to field the broad research questions being advanced under the thesis goal and objectives. These initial interviews formed the foundation of the qualitative interview and workshop format, as well as the survey questionnaire. Active fieldwork in both watersheds compiled the data that was used for the analysis.

Chapter 4 (Program and Watershed Description) provides the reader with an overview of the relevance and importance of the specific context, history and farming characteristic of the two watersheds within their place in southern Ontario. Important recognition is made of the particular conditions that lead these two watersheds to emerging as places for the agri-environmental programs in question. The EFP is introduced in full detail in this chapter within the broader contextual experience with farming in the province, and the environmental impacts of industrial farming that lead to the emergence of the Environmental Farm Plan within the policy climate of the early 1990s in Ontario. The two watershed programs, the Rural Water Quality Program, and the Clean Water Program, are introduced in their context of communication, planning and outreach methodology, and the particular relevance of these programs to regional ecosystems.
Chapter 5 (Descriptive Profile of Research Participants) is a descriptive overview of the data findings provided by research participants in the completed fieldwork. The emphasis of the chapter is directed toward fulfilling the first objective of describing social factors that influence farming practice. Significant attention is focused on the importance of understanding variation in different degrees of participation among research participants. General practices and social network relationships are outlined to provide a more complete foundation. Distinction is outlined as well between practices and projects that farmers conduct on their properties.

Chapter 6 (Data Analysis and Findings) involves the most extensive and in-depth investigation of the data. This chapter is organized into three sections of analysis: (a.) socio-economic factors, (b.) social influence factors, and (c.) farmer perception of agri-environmental program value. A systematic review of quantitative responses to each variable test is reviewed, as well as the corresponding counterpart responses from qualitative interviews and workshops.

Chapter 7 (Discussion) juxtaposes the theoretical and conceptual framework introduced in Chapter 2., with the data analysis to consider the spectrum of insights and findings that contributes to the literatures outlined for consideration in this thesis.

Conclusion
Some of the particularly notable findings and insights for this thesis research are reviewed here.

One of the most notable observations relates to the social dynamics of farming as analyzed through the lens of social structures in social networks. Variable tests in the questionnaire and interviews focused primary attention on the more formal organizations and groups available to farmers, such as the Dairy Farmers of Ontario, the Ontario
Federation of Agriculture, and the Christian Farmers Federation of Ontario. Through the data analysis conducted, and especially in relation to the test results, it seems quite evident that social networks of learning and innovation are far more dynamic and complex than was initially outlined in the nature of questions asked. The questions that were posed to farmers assumed that the more involved farmers are in their community, the more social events they attend and the greater the density of their social contacts, would lead to greater environmental practice. The findings strongly indicate that this is not the case.

Second, innovation in terms of dairy farming practice was focused on what leads to greater environmental practice. The findings from the data analysis emphasize that innovation needs to be carefully understood in the context of which types of applications and practices, whether technical or in management decisions. Separate categories of innovation in farming practice can be distinguished here as a result of the findings, and these include market-led innovation practices, which would involve changes in farming motivated by potential increases in farm revenues. Market led innovation can be closely tied to a profit oriented change in farming, such as seed selection. These two innovation categories are distinct from the context of environmentally led changes in farming practice. Practices such as conservation tillage, crop rotations, or tree windbreaks might have a more explicitly ecosystem benefit, and it is helpful to consider these adopted practices as a result of what contributing factors exist in the farmer’s knowledge repertoire. Was the innovation supported by a public policy or agri-environmental program, or did the innovation have a clear productive benefit to the farmer as well, such
as the case of manure lagoons. Lagoons meet management, storage and regulatory requirements all in one project adoption.\textsuperscript{61}

This research considers that the implications of these findings can have important value for an ongoing recognition of sustainability in agriculture and in public policy development, especially as manifest through agri-environmental program management. Societies are increasingly utilizing the immense capacities of the information revolution that is facilitated by internet based knowledge. Farmers in southern Ontario are finding and making decisions through mobilization of resources, collectives and information that are particularly useful and relevant to their particular settings. Government programmers, extensionists and project managers need to remain aware of this new reality to remain relevant and practical for their farm clients.

From the perspective of rural planning, the rural sector continues to raise concern over the development of policies, directives, and initiatives that seem out of place, onerous or burdensome on rural landowners. Provincial initiatives such as the Ontario Greenbelt and the more recent Ontario Green Energy Act, in principle can be seen to promote broad public benefit values for the environment, but equally important to note, is the significant backlash, localized and province wide, to what are seen as regulatory and incentive environments simplifying rural decision-making.

Alternately, rural planning and development could be vitalized by attuned understanding of participatory processes, incentives for strong linkages and dual benefit for urban and rural communities through restoration and revitalization initiatives. A solid grasp of the applicability of multifunctional landscape uses that involves profitable farm

\textsuperscript{61} Different types of manure lagoons range from clay-lined to cement-lined, with different costs and degrees of effectiveness.
businesses along with vibrant rural communities and a healthy ecosystem are completely possible.

This research set out to make a contribution to the field of rural sociology, environmental sociology and the agricultural sociology. By utilizing a theoretical framework motivated by sociological theory, this thesis situates itself within an emphasis on agri-environmental innovation within social networks.

Limitations

Given the range of objectives that this research has set out to accomplish, particular attention should return to three important elements of this study, these are; the theoretical framework, the data sample, and representativeness of the data sample.

The theoretical framework developed around the concept of practice theory as outlined by Bourdieu. Within this framework there was analysis of habitus and field as manifest in three theoretical streams of; social structures in social networks, adoption and diffusion of innovations, and adaptive management. The framework was also made as complex as is because of the principle advocated by adaptive management of considering social (and ecological) complexity in research design. However in future studies, focus on any one element of these three streams would still provide significant depth of analysis.

The data sample was limited to 239 survey responses (138 from Grand River watershed, and 101 from South Nation watershed). This is a limitation in statistical representativeness and is an important consideration for policy recommendations. To compensate for survey data limitation, multiple sources of information were used in a mixed-method approach of: qualitative interviews and workshops, and statistical tests of correlation, association and regression. The representativeness of the data sample in
relation to dairy farming in the province at-large is also noted, and clarified in Appendix I: Figure 4.

Finally, a series of policy recommendations and prospective future research projects are outlined here.

**Policy Recommendations**

1. *Greater Policy and Program Design: Awareness of Formal-Informal Innovation Network Dynamics*

A particular observation from this thesis research is the notably decentralized, personalized, local-regional focus of farmers’ groups existing in contrast to more traditional farmer organizations such as the OFA, CFFO and the DFO. These newer groups organize along ethnic, religious, financial, or specific interest motives. Examples include the Mennonite farming community in Waterloo Region, the Lanark Landowners Association in Eastern Ontario, the Franco-Ontarian Producers Association, and the St. Albert Cheese Cooperative in Prescott-Russell. The source of information and knowledge of these groups can be limitless. They obtain insights from web-based management and practice techniques, to local farm level conditions focused on specific issues to the region. In this sense, advancing farm management is less formal in the tradition of central farm organization; however, groups such as the OFA, CFFO and DFO still retain their value in specific context.

From the perspective of agri-environmental policy and program design, greater awareness can be attuned to the necessary pragmatics with which farmers are evolving their knowledge networks. Through a combination of market and policy led changes, new practices need to meet the competition circumstances in which farmers find themselves. Agri-environmental program assistance and knowledge transfer might only
expect to be relevant for specific conditions and for a specific amount of time. In turn, program designs can "stay fit" through evaluation of their outreach and education processes, considering how their representatives are selected, and how local, regional and international farming factors are understood in the region (Juhasz, 2009).

2. Agri-environmental Innovation Understood as a Matrix of Factors and Motivation

Agri-environmental policy and program developers can consider how the adoption and diffusion of innovations in agri-environmental practice involves a matrix of factors that include: group and inter-group relationships, land costs, local politics and economics, program outreach and financial commitment, program timelines, and information completion for different forms of action on behalf of the farmers.

Program outreach for changes to agri-environmental practice can benefit from a combination of “old” techniques including farm visits and demonstration tours, and “new” information networks and communication to provide information on project options, regulatory context and financial incentives. Programs will benefit from moving away from simplistic profiling of farmers “most likely to adopt.” Incentives for program participation need to be clear, and from a survey conducted by Juhasz (2011), dairy farmers indicated the following factors, as the most important in adopting a new environmental technology or practice: (a.) cost saving/efficiency of operation; (b.) ease of application; (c.) environmental sustainability; (d.) government assistance; and (e.) regulatory compliance.

Agri-environmental programs such as the EFP, RWQP and CWP, working closely with farmers can remain aware of the constellation of related programs that exert their influence on farmers’ attention. Agri-environmental innovations will be adopted by farmers if they accept them as having value. Farmers are most receptive to new practices that can impact input costs, reduce time requirements, have clear farm benefit,
and are compatible with the specific farm and needs of producer. Program-policy
financial support for on-farm trials of certain practices is an effective option.
Programmers in collaboration with farmers should stress the benefits, necessity and
compatibility of these environmental practices with farm productivity (Prokopy &
Weinkauf, 2009). In addition, programs can build frameworks to track indicators of
individual farmer change including knowledge, capacity, constraints and behaviour
modification (Prokopy & Genskow, 2009).

Agri-environmental innovation can also be understood in context beyond farmers
influence and adoption. Some researchers are aiming agri-environmental policy and
program considerations beyond stakeholders immediate to dairy farming. Research
models aggregate policy preferences of public stakeholders using a goal programming
approach. In more densely populated regions like southern Ontario, the methodology
recognizes that non-farmers will be impacted by decisions made in the dairy sector.
These approaches to program design add further depth of perspective to the broader
policy making implications of sustainability indicators in dairy sector research (van
Calker, 2006; van Calker et al., 2008).

Future Research
The following examples of prospective future research possibilities and projects have
emerged from the insights and findings of this research project.

1. \textit{Examine Characteristics of Non-participation Factors in Greater Detail}

A particular future research project should consider in greater detail the reasons and
conditions that lead farmers to being Non-Participants in agri-environmental programs.
In part the results of this research can add perspective to the launch of a study on non-
participation. Further exploration could be directed toward the complexity of factors that
lead to a “threshold” of participation/non-participation, including elements such as indebtedness, lack of sufficient information or social pressure.

A recent study emphasized that education and cost share matter to farmers, and that attendance at EFP workshops is equally for learning and the opportunity to receive cost-share funds (PRA Inc., 2011). While there is the claim that farmers change their farming practice priorities as a result of workshop attendance, this change process is still only vaguely understood. Access to credit and barriers to participation and project implementation needs greater research since as many as one quarter of projects are not being implemented due to lack of sufficient funds (PRA Inc., 2011). Specializing service needs for different farms could lead to a better understanding of tipping points toward action.

Agri-environmental programs such as the EFP, CWP and RWQP could also monitor their influence by tracking farmers’ reasons for attending workshops, time committed action plans, the percentages of action plans completed, and actions completed or implemented outside the program frameworks (if available). This last point is important to consider since this research identified how significant numbers of farmers might be making changes to their farming practice without accessing available program funds. However, having programs research and monitor these farmer change processes, and sharing that information would add value to understanding positive agri-environmental change.

2. Compare Different Commodity Sectors with Dairy

One future research project could involve an extensive comparative examination of different commodity sectors and their responsiveness to agri-environmental programs, projects and practices in comparison to the dairy sector. The emphasis would be to
discern the degree of marked difference between dairy farmer responses and inclinations, under supply management, with non-supply managed farmer choices. A secondary consideration in this research could also compare farmers under different supply managed commodities, such as chicken, egg, and turkey producers.

3. Examine On-Farm Practice and Project Choices in relation to Program Policy and Emphasis

As noted in this research, there are notably popular project options that farmers choose to adopt in terms of beneficial management practices on their farms. Projects for dairy farmers such as installing manure lagoons, or milkhouse waste water systems are particularly popular. Farmers in this research commented on the bias of programs toward certain types of practices and projects over others. Tracking these trends provides valuable insight into the impact of project choice on broader ecosystem health outcomes. In addition, there are dozens of project choices that farmers can choose from with the EFP, RWQP and the CWP, but that are consistently not implemented.

In the context of various agri-environmental programs in the province that have different aims and goals, such as the Species at Risk Act (and its related program financing), or the Alternate Land Use Services Initiative, farmers have no shortage of options before them. A broader goal of international dairy organizations and researchers concerned with animal and ecosystem health is management intensive rotational grazing (MIRG). The FAO’s document “Livestock’s Long Shadow” emphasized how policy and programs could “reorient toward intensive grazing through incentives for the provision of environmental services” (Steinfeld et al, 2006:80). Given the competing pressures between intensive, confinement dairy production and grazing systems that some consider have lifestyle, gender, labour and quality of life benefits, a project that would
scan which changes are being implemented on Ontario dairy farms would provide a clearer picture for future policy discussion on agri-environmental management (Main, Juhasz, Martin, 2012:16; Mariola et al, 2005).

4. Content Analysis of Interviews, Newspapers, Media Discussion on Farmer Motive (using qualitative analysis software)

This type of research could provide greater insight to the qualitative trends in key concepts and motivating factors leading farmer innovation. The power of software such as NVivo to scan documents, news articles, interviews and a broad range of written content is used to detect trends and illuminate potentially powerful indicators such as farmer social relations, community pressure, opinions on water, forestry, soil or biodiversity in decision-making.

5. Meta-analysis of Agri-environmental Programs and Policy Constellation

The value of this sort of future research would be to contextualize the past, present, and potential future of agri-environmental program effectiveness in relation to each other. Leading objectives could include: what are the perceptions of farmers to the goals and value of the EFP compared to previous or existing programs? What are underlying assumptions and the epistemology of the EFP or Source Water Protection planning frameworks? What are the perceptions of program managers in terms of their objectives in comparing related environmental programs such as the EFP, ALUS, and Species at Risk regulation, Source Protection Planning, and Conservation Authorities?

For example, the EFP, based around risk analysis of a whole farming system through education and awareness processes attunes the farmer to the effects of their practices and operation on the broader ecosystem. The program provides a “precautionary” approach to agri-environmental management based on a systematic and
practice-based analysis. However, information remains incomplete as to what the EFP offers in relation to other existing and emergent programs, and farmers might be increasingly left with a bewildering choice of project, practice and program options on how, when, why and where to implement farm environmental innovation.

Through a meta-analysis of programs, greater communication between programmers, farmers and non-farming publics would be facilitated. This is especially important in farmland areas facing growing pressure for sustainable land use and in commuter, peri-urban and metropolitan influenced areas (Juhasz & Cummings, 2010:4).

A meta-analysis would focus on comparing program specific benefits, and what farmers know about and/or learn about from attending workshops and information sessions. This research could get at the effectiveness and efficiency of any program given its context, input, process and outcomes (Juhasz, 2011). This type of meta-analysis of different environmental programs falls in line with the growth of modeling systems of sustainability in farming practice. In the European Union and North America, researchers are developing systems to measure a range of biological, social and technical indicators in program effectiveness (Prado & Scholefield, 2008). The GAMEDE is a whole dairy farm model initiative introduced by the National Institute for Agricultural Research (INRA) in France. The model takes into account the complexity of cropping and livestock systems and how different programs can and do influence overall ecosystems. The model assesses interactions between farmer decisions and overall structural and environmental impact (Vayssieres et al, 2009). By showing the impact of program decisions made, future scenario planning can potentially improve. Scanning the interaction of different programs in their relationship with the agri-environment in Ontario would be valuable.
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APPENDICES

Appendix A. - INTERVIEW, WORKSHOP AND SURVEY QUESTIONS FOR FIELDWORK RESEARCH

Preliminary Interview Guide – Winter 2009

University of Guelph – Rural Studies PhD Program
PhD Candidate: Mark Juhasz

Doctoral Thesis Research –
Agri-Environmental Policy and Dairy Farmer Decision-making:
Advancing Innovative Governance

Preliminary Interview Guide – Winter 2009

Estimated duration of interview: 1 hour

Start ~ general interest, set context and cooperation.

At-Large Questions

- I thought we could start out by talking about your thoughts on farming and your farming background. How long have you and your family been farming on this farm?
- Why do you farm rather than make a living another way? What’s the main reason you farm?
- Do you have any non-dairy operations on your farm?
- What do you see as the priority for dairy farm success today? Has this changed from previous years?
- What would you say are the most significant natural features of your farm?

Objective # 1: To measure farmers’ perceptions of the impact of agri-environmental programs?

- What would you say are the most important environmentally related issues on dairy farms?
- Do program offerings match these issues?
- Do you have any experience with any of these programs?
- EFP, NMFAP, CWP, GCP, ALUS
- If so, what and what is your response/impression/experience/memory of these program(s)?
- Were they/Have they been introduced effectively? How so?
- Do you see any strengths or shortcomings with these agri-environmental programs?
- Do you think any of these programs had more success than others? If so how?
- Are there any other programs you would care to add/mention?
- What do you think an improved version of agri-environmental programs would or could look like?
Objective # 2: Describe/Evaluate how the method of program design and development affected dairy farmer acceptance of the program principles?

- Regarding the programs that we have discussed;
- Are there distinct features about how these programs were introduced or run that you would like to share?
- Did you have any assistance or influence in relation to learning about and acting on these programs? How so?
- Do you know of or remember a distinction in the shape and/or delivery of any of these programs that you would like to share?

Objective # 3: Describe/Evaluate if actual implementation of projects was because of the method or way in which financial incentives were outlined in a program?

- Have you undertaken any specific projects on your farm related to these programs?
- If so, what and why? If not, why not?
- Was the financial incentive element of this the deciding factor?
- Was it outlined clearly? Could it be done differently?
- Are there additional actions that you would take? If so, what and why?
- What would be required for you to do so?
- Have you undertaken environmental related actions on your property not related to these programs?

Objective # 4: To evaluate how various forms of social capital-networks within dairy farmer organization, and within inter-organizational structures, influence decision-making regarding these programs?

- Who influences your decisions?
- What degree of access do you have to advisors, extensionists, information?
- Has this changed in recent years, how so? In relation to specific programs?
- Do you attend meetings with other dairy farmers?
- With the DFO? With area dairy farmers? Do you attend meetings with non-dairy farmers?

Objective # 5: Describe how organizational structures inform and influence individual dairy farmer decision-making in relation to these programs?

- Are you a member of a farming organization or general non-farming organization?
- How might they influence decisions/your decisions in relation to these programs?
- Do the organization(s) that you are a part of work well with other and related organizations?
- If so what are they and what have they accomplished in relation to these programs?
- Do they influence decision-making and your own choices and options?
- Do you think the organization(s) you are a member of could interact differently with these environmental programs? How so?
- Did you or an organization you are a part of have influence on the shaping/reform of any of these programs?
South Nation and Grand River Interview Guides – Summer 2009/Winter 2010

- How long have you and your family been farming on this land?
- What is it that you most enjoy about farming? What are some things you find difficult about farming?
- Are there any non-dairy operations on your farm?
- What are some of the most important things to make dairy farming successful/enjoyable today? Is it different now than a generation ago?
- What is the reason you farm rather than make a living another way? (Qualitative hypothesis?)
- What is a priority for dairy farm success today? Has it changed?
- What would you say are the most significant natural features on your farm?
- Do you have any natural features on your farm that you think are environmentally important? If so what makes them important?
- What about significant environmentally-related issues on your farm? In dairy?
- Do you know of any environmental issues on your property that might have been caused by farming? Are you aware of any environmental issues that the dairy sector in general is facing?
- Do you have any experience with the EFP or CWP?
1. Section A

- Are you aware of the EFP or CWP?
- If so, how did you find out? hear about it?
- If not, do you know other ‘like’ programs?
- Did/Do THESE have success? Your impression?
- What caught your attention about these projects in particular?
- Have you participated in the EFP and/or the CWP?
- If so, which project?
- Why this/these projects?
- Did you consider others?
- Do project options match a sense of need/priority?
- With thinking about options, what did you consider?
- Did you consult with this project?

2. Section B

- Did you seek advice before starting this project?
- Did you consider other projects? Are the options/information relevant to you?
- With thinking about options, what do you consider?
- Would you consider a buffer strip project?
- If you would consider a buffer strip project, what sort of things would you think about in making a decision for a buffer strip project?
- What influences your decision on this?
- Was the EFP/CWP layout an aid to make your project choice?
- Is how the EFP/CWP program is run help you in making a project choice?
- What part of the EFP/CWP development is of value to you?
- What part of these programs is most useful to you? What have you done differently since participating?
- What are your criteria for which project to do?
- Have neighbours/friends participated in the EFP/CWP
• Have your neighbours/friends participated? Did this influence your decision to participate?

• What are the conversations amongst farmers about the EFP/CWP? Does it encourage taking part?

• What are other farmers saying about the EFP/CWP? Does it make someone want to take part?

• Are the $$ incentives key to your participation?

• Would you recommend the EFP/CWP to a friend? What advice?

• Is a farmers’ social network their most important factor in success?

• Do you think having strong relationships with family/friends/associates is key to successful dairy farming?

• Is this true for farmers’ taking part with the EFP/CWP?

3. Section C

• Ideally, would you like to do other eco projects on-farm?

• Ideally, would you like to do another conservation project on your farm?

• What would be required for you to do so?

• Are you an active member of a farm organization?

• How does this group help with your decision-making?

• Do you seek advice from members of this group(s) when making a decision?

• How is this help any different from your every day circle of colleagues?

• Is the advice you get from this group(s) different than from other people you get advice from? If so, how is it different?

• Do you think this group helps shape programs such as the EFP/CWP?

• How so?

• Do you think EFP/CWP express the value of projects well?

• Do you think the EFP/CWP programs express the process of undertaking on-farm projects well enough? How so?

• What do you base this perspective from?

• To what degree was this project from your own set of decisions?

• How might the CWPs field rep. have helped with your decision to do a project?
• What about the EFP rep?
• How might the EFP/CWP get greater participation from farmers?
• What do you think could be done by the EFP/CWP to encourage more farmers to do projects?

4. Section D
• Year of Birth?
• Sex?
• Herd Size (milking cows)
• Farm land (acres that you own)?
• Farm land (rented)
• What is the highest level of formal education you completed?
• Do you have a son or daughter who intends to take over the farm when you retire?
• Apart from dairy, what other farm products do you produce, if any?
• What % of your farm revenue is from dairy?
• To what extent, if any, does non-farm/off-farm revenue contribute to your total family income?
• What were your gross farm sales for 2008?

WORKSHOP QUESTIONS

1st Workshop Questions – South Nation (Sept. 1, 2009)
- Can you please share what you learned about these programs that gave you enough reason to do a project on your farm?
- Do you think the projects available for funding are the right programs available for funding? Are they in the right place?
- Is there any conceivable way that any more money can go into the project of the farmer to get these projects done?
- Can you please share your experience with any of the program field representatives, and how this may have contributed to your participation?
- As a dairy farmer, what purpose, need or concern is being addressed through your participation in these programs?
- Are there elements that are missing from the program’s design that you wish were there?
- Is there any particular aspect to the application and funding process that you would like to mention?
- From your experience, is there sufficient understanding between various financial institutions for projects to get underway?
- To what degree do you see different farm sizes participating in these projects with the incentives offered?
- Is there an element to the EFP that is of educational value to the farmer? Or is it more a guilt trip?
- What is your general sense of the role that farmer organizations play in helping to shape these programs?
- Some of you have mentioned in Quebec there is a different organizational model. They have the one organization. If these are some of the concerns being raised, what is it that the farmer organizations from your experience are doing?
- From the experience with the Source Protection planning that is being developed across the watershed…..is there anything that you would like to see improving the Clean Water Program at the local level, anything the local farm organizations could push for?
- What are some of the main aspects to/ issues with these programs that you would like to see changed or improved for the future?

2nd South Nation Workshop Questions – July, 19, 2010

- The communication, structure and organization of the EFP. And the CWP, the role, training, involvement of the EFP/CWP.
- There is a shift in awareness of programs from government to advisors. Does this matter and affect how farmers get information on programs?
- When there was more OMAFRA staff, did that make a difference?
- Is it best to share ideas and get advice on projects from your immediate neighbours or a farmer close by? Or is it best to learn about programs and funding at a meeting?
- How many farmers are within a 10 minute drive of you?
- Do you talk once a month - at farmers meeting? Is it important to share ideas
- Do you find a conflict between agriculture and municipal regulations? For example, releases in water versus farming regulations?
- Do you have thoughts on the communications of the programs? Do you have hesitation about the programs re: strings attached, paperwork, results on farm operations? Or do you feel it would be of benefit?
- There are new, emerging farmers who are aware of the regulations that exist. For example, they may hire a consultant to help them be aware of the EFP. Is there a way for farmers to organize to become more aware of the regulations?
- Is there a better way for farmers to organize to have their voice heard?
- What about in Eastern Ontario? Is there a better farmers voice at the local level?
- The granting structure and the way financing is made available may not be in line with what you want to do (note: under the EFP?) Is this an issue?
- Do you wish there would be other things funded?
- In my research, there is a big difference between farmers regarding timing and amount of money available.
- Would programs be better if instead of a fixed set of money, they were offered on a case by case basis by visiting the farm?
- Regarding information on the programs with dairy farmers - those more involved in peer reviews may have more education. How can we share information between farmers?
- Can municipal regulations translate to the regional level? Or are they best at the local, municipal level?
- If money is one of the big questions, how is it compared to Quebec?
- As dairy farmers, do you have concerns about too much municipal involvement and municipal staff coming onto your property?
- Is there a way to use a farm organization to help? (note: question went unanswered)
- Are land values in South Nation, especially around the City of Ottawa, making operations and projects more expensive?
- What about if you’re paid to keep the land in forest
- Do you have other concerns? For example, confidentiality, public extension, etc.
- Would there be less reason to go to private person if there was better public information?
- What is your vision for programs in the next 5 -10 years?
- Are there lessons from these programs over time? For example, the source water program has been revised.
- Are there any more elements to discuss? For example, communication, the people/positions, how cost shared is involved, and how to make programs work better.
- Are there more opportunities for on-farm processing, cheese, etc?
- What about getting younger people to help?
- Can you join a co-op in Ontario like Gay-Lee
1st Workshop Grand River – Questions – May 13, 2010

- What is the experience you have had with the EFP field reps and how has this contributed to your participation or experience with the EFP?

- Can you please share any experiences you have had with GRCA (RWQP) field representatives and how this may have contributed to your participation or experience with this program?

- What amount of knowledge about the program was enough for you to make a decision to undertake a project? (In either program)

- As a dairy farmer, what purpose, needs or concerns are being addressed through your participation in these programs? Are there elements that are missing that you wish were there?

- Are there aspects to how the funding of projects on farms work that you would like to mention? Any improvements?

- From your experience, is there sufficient coordination/understanding between various programs/banks/financial/consultants of the funding/financing required for projects to get underway? Is this all lined up with programs? Is there a readiness form the banks?

- To what degree do you see different farm sizes participating in these projects with the incentives offered? If smaller farms can't participate, should there be incentive for smaller farms? Under what conditions? Should there be a bucket of money made available for smaller farms?

- What is your general sense of the role that farmer organizations play in helping to shape programs such as the EFP and the CWP? How do you think the Christian Federation is doing?

- Looking at the last 2 decades, how do you think the emphasis or priorities of farm groups have changed? Any improvements?

- Would you say that the farmers who are the most socially active go to the meetings the most? Why or why not?

- Farm groups are effective in getting governments to change programs to adjust policies to benefit dairy farmers?

- To what extent do you feel that your county is promoting the agricultural voice and viability for dairy farmers?

- Do you think your county is promoting environmental sustainability in your area?

- What is some of the main aspects to/issues with these programs that you would like to see changed or improved for the future?
2nd Grand River Workshop Questions – July 21, 2010

- Do you have a sense that there has been a negative drift from the value of government farm advisors to the current mix of private sector farm consultants (vets, animal nutritionists, crop consultants, etc.)?

- How would you describe the degree of concern for farmers with programs? What are the main issues they have?

- Farmers: Grant structures shape farmer project decisions, (may not be compatible with their desired goals).

- Holes/Inequalities exist in a.) farmer knowledge of programs, b.) action required to apply for funding, and c.) to win approval. There are information gaps in program knowledge across the farming population. Those on peer-reviews know most.

- Should there be a way to address information gaps from farmer to farmer in the awareness about program and project options?

- Programs should know more about farm-level specifics for suggesting financing options?

- What is your sense of differences (if any) between agricultural & municipal regulations on the environment. How could it be better addressed?

- Granting structures for programs pre-empt project options…..would you suggest another scenario…

- There seems to be a certain degree of contradictory knowledge about the requirements for on-farm project processes?

- Should the peer-review process be changed? How so….

- Do you sense that there can be hesitation amongst farmers to share knowledge about programs with immediate neighbours?

- How would you describe the character of local farmers groups in relation to environmental programs in the area.

- To what extent would you say you keep up on farming news through media rather than through farm events and meetings?

- How does your degree of attendance at social gatherings change your sense of changes of where dairy farming and land stewardship is today?

- Should the programs connect with well connected farmers?

- Would you agree that competition leads many to indebtedness? (skipped)

- To what extent do you sense that rising land values make the costs of hired help more difficult? (skipped)
• What do you think of the statement: Group participation lead to more on-farm projects? (skipped)

• Would you say the age of a farmer shapes ones opinions about these programs?

• What about the stage in life where they are? If they have children? If they are retiring? If they have someone taking over the farm? Do you know of exceptions to the general trend?

• From your experience, to what degree does one’s cultural background influence their taking part in these on-farm projects? What is your sense of this with;

• What is your sense of the role of women in influencing taking part in these programs? Do you see the role of women as unique to how a family takes part in these programs? Do you have a specific story to share?
APPENDIX B: SURVEY QUESTIONNAIRE

Thank you very much for participating in this research. Please answer each question by checking the response most appropriate to you.
PART A: General (Please check the box that most applies)

1. For how many generations has your family been farming this land?

: ___________________

2. What is it that you most enjoy about dairy farming?

☐ Own Boss ☐ Close to Nature ☐ Freedom
☐ Financial Security ☐ Working with Animals

Other: ___________________

3. What is it that you find most difficult about dairy farming?

☐ Financial Uncertainty / Costs of Operating
☐ Regulatory Concerns ☐ Concern over the next generation/Succession Planning
☐ Changing/Unpredictable Weather Patterns

Other: ___________________

4. What is the most important thing a dairy farmer requires today to be successful?

☐ Good business sense ☐ Good people person ☐ Family Participation and Help
☐ Good Technology ☐ Supply Management

Other: ___________________

5. What would you say is the most important emerging issue in the dairy sector today?

☐ Manure Management ☐ Agro-chemicals ☐ Water Quality
☐ Animal Health/Welfare ☐ Rising costs of energy

Other: ___________________
6. Could you please rank the three most important sources of water pollution within a 10 mile radius of your home (from one to three)?

- Home septic tanks
- Livestock waste
- Industrial waste
- Cropland/farm chemical runoff
- Municipal discharge
- Litter/garbage

If other, please specify: _____________________________________________

PART B: Agri-Environmental Programs

7. Have you participated in either of the following programs?

- Ontario Environmental Farm Plan (EFP)
- South Nation Conservation Clean Water Program (CWP)/Rural Water Quality Program (RWQP)

Other: ______________

8. If you participated in the EFP, which editions have you been involved in? (check as many that apply);

- 2nd edition, 1996-2004
- 3rd edition, 2004 - present

9. If you have participated in the CWP/RWQP, what year was it? ______________

10. IF you completed an ACTUAL ON-FARM PROJECT through either the EFP or the CWP/RWQP, please indicate which of the following PROJECTS (check as many that apply)?

- Manure Storage Facility
- Septic Storage Repair, Upgrade, Replacement
- Livestock Access Restriction from Water
- Well Decommissioning
- Milkhouse Wastewater System
- Erosion Protection
- Cropping Systems Technology
- Buffer Strip
- Tree Planting

Other (Please specify): _________________________
11. The funded project options listed above are relevant to you? (please check one box below):

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree

12. Would you have considered a DIFFERENT on-farm project if funding for it had been available? (please check one box below):

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree

13. For what type of on-farm projects through these programs, if any, would you like to see funding provided?

: ____________________________________________

14. Do you have a buffer along the open watercourses on your land?

☐ Yes  ☐ No

15. If no, would you consider doing a buffer strip project?

☐ Yes  ☐ No

If Yes, under what conditions?

: __________________________________________________________________________

16. In the case where you DID NOT adopt an environmental management practice on your farm, what is the main reason?

☐ Cost of labour / supplies  ☐ Time to make improvements  ☐ Loss of revenue from retired land
☐ Cost-share arrangement not worth it

If other, please specify:

: __________________________________________________________________________
PART C: Social and Decision-making Dynamics

17. If you have completed an on-farm project, why did you? (Please rank the top 3, with 1 being the most important reason)

- Environmental Responsibility
- Change of management/product structure
- More efficient/economical for operation
- Financial incentives provided
- Regulatory Compliance

Other (please specify): ________________________________

18. Do you think that, if you have completed an on-farm project, that this project had a positive benefit to environmental improvement and better water quality? (Please check a box below):

- Strongly Agree
- Agree
- Don’t Know
- Disagree
- Strongly Disagree

19. How did you find out about these programs? (Please rank the top 3, with 1 being the most important reason)

- Newspapers/Media
- Friends/Fellow Dairy Farmers
- Public/Farm Events
- Farm Group/Farm Organization
- Contractor/Consultant
- Government Representative
- Veterinarian/Animal Nutritionist

Other: ________________________________

20. Has your closest farming neighbor participated in either the EFP or the CWP/RWQP?

- Yes
- No
- Unsure

21. Did their participation help you in making a decision about undertaking a project on your farm?

- Yes
- No
- Not applicable
22. If you have participated in either the EFP or the CWP/RWQP, from whom (if any) do you seek advice from before making a decision? (Please rank the top 3, with 1 being the most important):

☐ Family  ☐ Friends  ☐ Fellow Dairy Farmers
☐ Contractors  ☐ Crop Consultants  ☐ Veterinarians

Other: _______________________

23. How many times a month would you say you attend a farming related event?
: ____________________________

24. Having strong social relationships (with friends, family, associates) is an essential key to successful dairy farming today (please check one box below).

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree

25. Having strong social relationships is more characteristic of those farmers who take part in the EFP and the CWP/RWQP:

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree

PART D: Program Design

26. To what extent do you agree that the communication, planning process and staff outreach for these two programs helps you in making an on-farm project choice? (Please check one box below).

EFP

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree

CWP

☐ Strongly Agree  ☐ Agree  ☐ Don’t Know
☐ Disagree  ☐ Strongly Disagree
27. In general, Dairy Farmers in the local area feel the EFP is a valuable program (please check one box below).

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

28. In general, Dairy Farmers in the local area feel the CWP/RWQP is a valuable program (please check one box below).

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

29. The financial incentives / funding that assists with on-farm projects are key to participation? (Please check one box below).

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

30. I would recommend undertaking an on-farm project to a friend through the EFP (Please check one box below):

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

31. I would recommend undertaking an on-farm project to a friend through the CWP/RWQP (Please check one box below):

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

32. The EFP is effective in their communication (farm visits, advertising, promotion, project option explanations, etc) of how dairy farmers can benefit from taking part in on-farm projects (Please check one box below):

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree

33. The CWP/RWQP is effective in their communication (farm visits, advertising, promotion, project option explanations, etc) of how dairy farmers can benefit from taking part in on-farm projects (Please check one box below):

☐ Strongly Agree    ☐ Agree    ☐ Don’t Know
☐ Disagree    ☐ Strongly Disagree
34. Programs such as the EFP and the CWP/RWQP should provide additional funding to those smaller farms that are unable to finance their own on-farm projects (Please check one box below):

- □ Strongly Agree
- □ Agree
- □ Don’t Know
- □ Disagree
- □ Strongly Disagree

35. I would be willing to receive financing (up to 60%) to undertake a project on my dairy farm that improved water quality in the South Nation/Grand River watershed, but did not directly benefit my dairy farm operation. (Please check one box below):

- □ Strongly Agree
- □ Agree
- □ Don’t Know
- □ Disagree
- □ Strongly Disagree

36. On a scale from 1 to 5, with 5 being the strongest, what would you rate the quality of advice / understanding of the following program representatives / farm advisors?

- EFP
  - □ 5
  - □ 4
  - □ 3
  - □ 2
  - □ 1

- CWP/RWQP
  - □ 5
  - □ 4
  - □ 3
  - □ 2
  - □ 1

37. Please rank, from 1 to 5, what you feel could be undertaken by either the EFP or the CWP/RWQP to encourage more dairy farmers to participate in on-farm projects:

- □ Information Nights
- □ Media/Newspaper Notices
- □ Farm Visits / Tours
- □ Financial Planning
- □ Environmental Education

Other: _____________________________
PART E: Farm Organizations/Regional Dynamics

On a scale of 1 to 5, with 5 being strongly agree, to what extent do you agree with the following statement?

38. Farm groups are effective in getting governments and programs to adjust and/or alter their programs for the benefit of dairy farmers:

☐ Strongly Agree ☐ Agree ☐ Don’t Know
☐ Disagree ☐ Strongly Disagree

39. Farm groups (and specifically dairy groups), are effective at promoting improvements in environmental and water related programs that relate to the success of dairy farming in Ontario:

☐ Strongly Agree ☐ Agree ☐ Don’t Know
☐ Disagree ☐ Strongly Disagree

40. My regional municipality/county is promoting agricultural viability for dairy farmers in our area.

☐ Strongly Agree ☐ Agree ☐ Don’t Know
☐ Disagree ☐ Strongly Disagree

41. My regional municipality/county is promoting environmental sustainability in our area.

☐ Strongly Agree ☐ Agree ☐ Don’t Know
☐ Disagree ☐ Strongly Disagree

42. Financial institutions/banks are ready and willing to finance on-farm projects as outlined in either the EFP or the CWP

☐ Strongly Agree ☐ Agree ☐ Don’t Know
☐ Disagree ☐ Strongly Disagree

PART D: Farm Level Specifics

*The following questions are used to compile summary statistics. They will not be used with respect to your personal information.*

1. Which township and county are you located in?
   :______________________________________________________________

2. Year of Birth: ________________
3. Sex:

- [ ] Male
- [ ] Female

4. Herd Size (Milking Cows): ____________

5. Farm Land Owned: ________________

6. Farm Land Rented: ________________

7. What is the highest level of formal education you completed?

<table>
<thead>
<tr>
<th>[ ] Primary school</th>
<th>[ ] Secondary School</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Post-secondary Apprenticeship or College</td>
<td>[ ] University</td>
</tr>
</tbody>
</table>

8. Do you have a child who intends to take over the farm when you retire?

- [ ] Yes
- [ ] No

Comments: _____________________

9. Apart from dairy, what other farm products do you produce, if any? ________________

10. What % of your farm revenue is from dairy: ____________

11. To what extent, if any, does non-farm/off-farm revenue contribute to your total family income?

- [ ] Not at all
- [ ] Slightly
- [ ] Somewhat
- [ ] Significantly

12. What is the operating arrangement for your agricultural operation?

- [ ] Sole Proprietorship
- [ ] Partnership without written agreement
- [ ] Partnership with written agreement
- [ ] Family Corporation
- [ ] Non-family Corporation

13. Please check the following practices that you use on your land:

- [ ] Crop rotation
- [ ] Pasturing milking cows
- [ ] No tillage
- [ ] Winter cover crops
- [ ] Buffer zones around water bodies
- [ ] Minimum Tillage
- [ ] Rotational grazing
- [ ] Windbreaks or shelterbelts (natural or planted)
14. For the manure produced on your operation, what is the method of application on your land base?

☐ Composted manure  ☐ Solid manure applied  ☐ Liquid manure applied

15. Do you use a computer regularly (daily) on your farm?

☐ Yes  ☐ No

16. Do you use the internet and email regularly (daily) on your farm?

☐ Yes  ☐ No

Comment: __________________________________________

17. What farm organizations are you affiliated with?

☐ OFA  ☐ CFFO  ☐ NFU - Ontario
☐ Holstein Ontario  ☐ Jersey Ontario  ☐ Ayrshire Ontario
☐ Local Producer Committee of DFO  ☐ OSCIA (active member)

Other (Please specify): __________________________

18. What were your gross farm sales for 2008?

: __________________________________________

Please feel free to include comments that may not have been addressed above:

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Thank you for your time and assistance in completing this survey!!

You can enter for a draw to win one of three prizes from Canadian Tire!

Please leave an address if we can contact you for follow-up regarding your responses?
Appendix C. – Consent to Participate Form

UNIVERSITY OF GUELPH
PhD Program in Rural Studies
School of Environmental Design and Rural Development

CONSENT TO PARTICIPATE IN SOCIAL RESEARCH

With this letter we are requesting your participation in a research study on dairy farmers’ attitudes to, and involvement in, agri-environmental programs over the past two decades (since 1989). Mark Juhasz, a PhD Candidate will be doing the research under the supervision of Dr. Harry Cummings, from the School of Environmental Design and Rural Development at the University of Guelph.

The purpose of this research is to understand the successes and challenges of dairy farmers in responding to specific agri-environmental programs. In turn, this research aims to describe how program development might be further improved through better methods, themes and approaches relevant to dairy farmers. This study is sponsored by the School of Environmental Design and Rural Development, Ontario Agricultural College, University of Guelph.

If you would volunteer to participate in this study, we would ask you to:

- Provide the principal researcher, Mark Juhasz, the time of 1 hour in person, to share a set of ideas related to the following;
  - What are your experiences with and responses to various agri-environmental programs?
  - What are your experiences with the design and development of these programs?
  - What, if any, initiatives have you taken related to these or related programs, and did the financial incentive aspect of these programs influence those initiatives?
  - What role do other farmers and farm organizations have in influencing your response to these programs?

It is required by the University of Guelph to alert participants of their rights and to any risks that may be associated with the research. In this regard;

1. There are **no reasonably foreseeable risks** or discomforts associated with participating in this research. The goal of this project is to share with you experiences and ideas on farming and environmental programs and nothing more.

2. Strict measures are in place to **ensure confidentiality** of any identifying information that is obtained in connection with the study. You have the right to edit any information collected. At no time will the data collected be discussed using your name or farm name in order to ensure confidentiality. Confidentiality will be maintained during both the conduct of the research and in the release of the findings (unless you wish to have your farm identified).
3. Your participation in this is entirely voluntary. While we hope that you will find this project interesting, at any stage you feel that you wish to stop or skip a section of involvement, you may do so without any consequences whatsoever. You have the right to omit any questions you do not feel comfortable in answering.

4. This study has been reviewed and received ethics clearance from the University of Guelph Ethics Board. If you have any questions regarding your rights as a research participant, please contact;

Research Ethics Coordinator
Telephone: (519) 824-4120, ext. 56606
University of Guelph E-mail: sauld@uoguelph.ca
437 University Centre Fax: (519) 821-5236
Guelph, ON N1G 2W1

If you have any questions or concerns about this research, please feel free to contact me, Mark Juhasz, PhD Candidate, by email: mjuhasz@uoguelph.ca or by telephone; 519-546-8171, or my Faculty Supervisor, Dr. Harry Cummings, Professor and Graduate Coordinator, Rural Planning and Development, School of Environmental Design and Rural Development, University of Guelph, by email: cummingssharry@hotmail.com or by Telephone; 519-824-4120 ext. 53637.

Sincerely, Mark Juhasz

I have read the information above and/or have been informed in detail about the research project "Agri-environmental Policy and Dairy Farmer decision-making: Advancing Innovative Governance." I have also been asked if it is acceptable for the researcher to record and/or take notes of our conversation in order to have a more complete record of our discussion. My questions have been answered to my satisfaction and I agree to participate in this study. I have been given a copy of this consent form.

I am willing to participate in this research project (please check mark)

____________________

*** If you would like to receive a summary of the research findings please provide your full address:

Name:

House Number and Road:

Town:

Postal Code:

____________________________________  ____________
Signature of Participant Date
Appendix D. – Socio-economic Factor Survey Questions Formatted for SPSS Analysis

**Section A: Socio-economic Factors**

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Question</th>
<th>Variable Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>What is your highest degree of education?</td>
<td>1=Primary School, 2=Secondary School, 3=Post-secondary Apprentice or College</td>
</tr>
<tr>
<td>Age</td>
<td>Year of Birth</td>
<td>1=before 1940, 2=1941-1950, 3=1951=1960, 4=1961-1970, 5=1971 and after</td>
</tr>
<tr>
<td>Land Managed</td>
<td>Land Managed in Acres (Aggregate)</td>
<td>1=less than 200, 2=201 to 600, 3=601 and up</td>
</tr>
<tr>
<td>Sex</td>
<td>Sex</td>
<td>1=Male, 2=Female</td>
</tr>
<tr>
<td>Off Farm Revenue</td>
<td>Does off-farm income contribute to your overall revenue?</td>
<td>1=Not at All, 2=Slightly, 3=Somewhat, 4=Significantly</td>
</tr>
<tr>
<td>Income</td>
<td>What were your gross farm sales for 2008?</td>
<td>1=250K or less, 2=251K to 1M, 3=1M and up</td>
</tr>
</tbody>
</table>
## Appendix E. Social Influence Factor Survey Questions Formatted for SPSS Analysis

### Section B: Social Influence Factors

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Question</th>
<th>Variable Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locality(County)</td>
<td>Which county?</td>
<td>1=Brant, 2=Dufferin, 3=Haldimand, 4=Leeds-Grenville, 5=Ottawa, 6=Oxford, 7=Perth, 8=Prescott-Russell, 9=Stormont-Dundas-Glengarry, 10=Waterloo, 11=Wellington, 12=Wentworth</td>
</tr>
<tr>
<td>GenerationsOnFarm</td>
<td>How many generations have you been on this farm?</td>
<td>1= 2 or less, 2=3 to 4, 3=5 or more</td>
</tr>
<tr>
<td>FarmSuccession</td>
<td>Do you have a son or daughter who plans to take over the farm when you retire?</td>
<td>1=Yes, 2=No</td>
</tr>
<tr>
<td>SocialKnowledgeSource (Programs)</td>
<td>How did you learn about the EFP or the CWP/RWQP?</td>
<td>1=media dominant, 2=immediate network dominant, 3=broader social network dominant</td>
</tr>
<tr>
<td>SocialKnowledgeSource (WaterQuality)</td>
<td>From where do you get information when forming an opinion about water quality in your watershed?</td>
<td>1=media dominant, 2=immediate network dominant, 3=broader social network dominant</td>
</tr>
<tr>
<td>ImmediateSocialInfluence(Neighbour'sParticipation)</td>
<td>Has your closest neighbour participated in EFP or CWP/RWQP?</td>
<td>1=Yes, 2=No</td>
</tr>
<tr>
<td>ImmediateSocialInfluence (Neighbour's Influence)</td>
<td>Did your neighbour's help deciding to undertake a project?</td>
<td>1=Yes, 2=No</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>FarmerSocialRelations (Relations for Dairy)</td>
<td>Having strong social relationships (with friends, family, associates) is an essential key to successful dairy farming today.</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>FarmerSocialRelations (Relations for Programs)</td>
<td>Having strong social relations is more charac. of those farmers who take part in the EFP and the CWP/RWQP?</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>SocialEventAttendance</td>
<td>How many times a month do you attend a farming-related event?</td>
<td>1=up to 2 times, 2=3 to 4 times, 3=more than 5 times</td>
</tr>
<tr>
<td>SocialReferencing (EFP)</td>
<td>I would recommend undertaking an on-farm project to a friend through the EFP</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>SocialReferencing (CWP/RWQP)</td>
<td>I would recommend an on-farm project to a friend through the CWP/RWQP</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>FarmOrganizationSocialNetworks</td>
<td>What farm organization are you affiliated with?</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>CommunicationsTechnologyUse</td>
<td>Do you use the internet (at least 3-4 times a week) on your farm?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1=Yes, 2=No</td>
<td></td>
</tr>
</tbody>
</table>

1=OFA, 2=CFFO, 3=NFU-Ont, 9=OFA+LocalProdComm, 10=OFA+OSCIA, 11=OFA+LocalProdComm+OSCIA, 12=CFFO+LocalProdComm, 13=CFFO+OSCIA, 14=CFFO+LocalProdComm+OSCIA, 15=NFU+LocalProdComm, 16=NFU+OSCIA, 17=NFU+LocalProdComm+OSCIA
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Question</th>
<th>Variable Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Value (EFP)</td>
<td>In general, dairy farmers in the local area feel the EFP is a valuable program</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Value (CWP/RWQP)</td>
<td>In general, dairy farmers in the local area feel the CWP/RWQP is a valuable program</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Finance (Funding and Participation)</td>
<td>The funding that assists with on-farm projects through the EFP and the CWP/RWQP is key to participation</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Finance (Funding for smaller-scale farms)</td>
<td>Programs such as the EFP and the CWP/RWQP should provide additional funding to those smaller-scale farms that are unable to finance their own on-farm projects</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Communication (EFP)</td>
<td>The EFP is effective in its communication of how dairy farmers can benefit from taking part in on-farm projects</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Communication (CWP/RWQP)</td>
<td>The CWP/RWQP is effective in its communication of how dairy farmers can benefit from taking part in on-farm projects</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Planning Outreach (EFP)</td>
<td>The communication, planning, and outreach for the EFP program helps in making on-farm project choices?</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
<tr>
<td>Program Planning Outreach (CWP/RWQP)</td>
<td>The communication, planning, and outreach for the CWP/RWQP program helps in making on-farm project choices?</td>
<td>1=strongly agree, 2=agree, 4=disagree, 5=strongly disagree</td>
</tr>
</tbody>
</table>
## Appendix G. – Figure 1: SPSS Test Results – Socio-economic Factors

<table>
<thead>
<tr>
<th>Master Table</th>
<th>Overall Responses # = 239 (%)</th>
<th>GR Responses # = 138 (%)</th>
<th>SN Responses # = 101 (%)</th>
<th>Chi-Square (C)/Spearman’s rho (S) test results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Socioecon. Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary School</td>
<td>190(80)</td>
<td>116(84)</td>
<td>74(73)</td>
<td>S 0.731 0.444 0.452 0.025 0.072 -0.089</td>
</tr>
<tr>
<td>Secondary</td>
<td>11(25) 10(23) 13(30) 10(23)</td>
<td>9(23) 10(25) 11(28) 10(25)</td>
<td>2(50) 0(0) 2(50) 0(0)</td>
<td></td>
</tr>
<tr>
<td>Postsecondary/Apprentice</td>
<td>11(21) 8(15) 24(45) 10(19)</td>
<td>9(33) 9(3) 11(31) 10(28)</td>
<td>2(8) 5(19) 15(58) 4(15)</td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>22(32) 9(13) 24(35) 14(20) 12(33) 3(8) 11(31) 10(28)</td>
<td>10(30) 6(18) 13(39) 4(12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>187(78)</td>
<td>115(83)</td>
<td>72(71)</td>
<td>S 0.989 0.895 0.685 0.009 0.012 0.049</td>
</tr>
<tr>
<td>Test of ungrouped data (Year of Birth)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>before 1940</td>
<td>1(33) 1(33) 1(33) 0(0)</td>
<td>1(50) 0(0) 1(50) 0(0)</td>
<td>0(0) 1(100) 0(0) 0(0)</td>
<td></td>
</tr>
<tr>
<td>1941-1950</td>
<td>7(28) 4(16) 10(40) 4(16)</td>
<td>4(29) 1(7) 5(36) 4(29)</td>
<td>3(27) 3(27) 5(45) 0(0)</td>
<td></td>
</tr>
<tr>
<td>1951-1960</td>
<td>12(20) 13(22) 22(37) 13(22)</td>
<td>8(22) 9(25) 13(26) 6(17)</td>
<td>4(17) 4(17) 9(38) 7(29)</td>
<td>*</td>
</tr>
<tr>
<td>1961-1970</td>
<td>11(21) 8(15) 21(40) 12(23)</td>
<td>5(19) 3(11) 9(33) 10(28)</td>
<td>6(24) 5(20) 12(48) 2(8)</td>
<td>*</td>
</tr>
<tr>
<td>1971 and after</td>
<td>15(32) 6(13) 16(34) 10(21)</td>
<td>13(36) 6(17) 7(19) 10(28)</td>
<td>2(18) 0(0) 9(82) 0(0)</td>
<td>*</td>
</tr>
<tr>
<td>Land Managed</td>
<td>189(79)</td>
<td>99(73)</td>
<td>90(89)</td>
<td>S 0.227 0.827 0.204 0.079 0.022 0.135</td>
</tr>
<tr>
<td>Test of ungrouped data (Land M'ged in Acres)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 200</td>
<td>18(33) 2(4) 20(36) 15(27)</td>
<td>12(36) 1(3) 7(21) 13(39)</td>
<td>6(27) 1(5) 13(59) 2(9)</td>
<td>*</td>
</tr>
<tr>
<td>201 to 600</td>
<td>31(30) 14(14) 37(36) 20(20)</td>
<td>18(32) 8(14) 15(27) 15(27)</td>
<td>13(28) 6(13) 22(48) 5(11)</td>
<td>*</td>
</tr>
<tr>
<td>600 and up</td>
<td>10(29) 10(29) 6(18) 8(24)</td>
<td>3(25) 3(25) 1(8) 5(42)</td>
<td>7(32) 7(32) 5(23) 3(14)</td>
<td>*</td>
</tr>
<tr>
<td>Sex</td>
<td>188(78)</td>
<td>115(83)</td>
<td>72(71)</td>
<td>C not valid</td>
</tr>
<tr>
<td>Male</td>
<td>4(25) 29(17) 66(38) 36(21)</td>
<td>2(27) 18(17) 3(31) 28(26)</td>
<td>15(22) 1(16) 3(49) 8(12)</td>
<td>*</td>
</tr>
<tr>
<td>Female</td>
<td>3(23) 1(8) 5(38) 4(31)</td>
<td>2(29) 0(0) 2(29) 3(43)</td>
<td>1(17) 1(17) 3(50) 1(17)</td>
<td>*</td>
</tr>
<tr>
<td>Farm Income</td>
<td>189(80)</td>
<td>116(84)</td>
<td>73(72)</td>
<td>C not valid</td>
</tr>
<tr>
<td>Off-Farm Income</td>
<td>3(20) 5(33) 4(27) 3(20)</td>
<td>3(38) 2(25) 1(13) 2(25)</td>
<td>0(0) 3(43) 3(43) 1(14)</td>
<td>*</td>
</tr>
<tr>
<td>not at all</td>
<td>4(18) 1(5) 10(45) 7(32)</td>
<td>1(9) 1(9) 3(27) 6(55)</td>
<td>3(27) 0(0) 7(64) 1(9)</td>
<td></td>
</tr>
<tr>
<td>slightly</td>
<td>11(23) 8(17) 18(38) 10(21)</td>
<td>7(20) 6(17) 14(40) 8(33)</td>
<td>4(33) 2(17) 4(33) 2(17)</td>
<td>*</td>
</tr>
<tr>
<td>somewhat</td>
<td>29(28) 19(18) 38(36) 19(18)</td>
<td>20(32) 11(18) 17(27) 14(23)</td>
<td>9(21) 8(19) 21(49) 5(12)</td>
<td></td>
</tr>
<tr>
<td>significantly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Farm Sales</td>
<td>146(60)</td>
<td>89(64)</td>
<td>57(55)</td>
<td>S 0.402 0.175 0.549 -0.07 -0.145 0.082</td>
</tr>
<tr>
<td>Test of ungrouped data (Your gross farm sales for 2008)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250K or less</td>
<td>5(17) 6(21) 9(31) 9(31)</td>
<td>3(16) 3(16) 7(37) 6(32)</td>
<td>2(20) 3(30) 2(20) 3(30)</td>
<td>*</td>
</tr>
<tr>
<td>251K to 1M</td>
<td>28(27) 19(18) 38(37) 19(18)</td>
<td>20(31) 12(19) 16(25) 16(25)</td>
<td>8(20) 7(18) 22(55) 3(8)</td>
<td>*</td>
</tr>
<tr>
<td>1M &amp; up</td>
<td>2(17) 0(0) 10(83) 0(0)</td>
<td>2(33) 0(0) 4(67) 0(0)</td>
<td>0(0) 0(0) 6(100) 0(0)</td>
<td>*</td>
</tr>
</tbody>
</table>
### Appendix H. – Figure 2: SPSS Test Results – Social Influence Factors

<table>
<thead>
<tr>
<th>Master Table</th>
<th>Overall Responses #(%)</th>
<th>GR Responses #(%)</th>
<th>SN Responses #(%)</th>
<th>Chi-Square (C)/Spearman’s rho (S) test results</th>
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<tr>
<td>B. Social Influence Factors</td>
<td></td>
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<tr>
<td>Generations On-Farm</td>
<td></td>
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<tr>
<td>2 gens or less</td>
<td>229(95)</td>
<td>135(97)</td>
<td>94(93)</td>
<td></td>
</tr>
<tr>
<td>3 to 4 gens</td>
<td>34(43)</td>
<td>14(18)</td>
<td>9(11)</td>
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<tr>
<td>5 or more gens</td>
<td>7(24)</td>
<td>6(21)</td>
<td>5(17)</td>
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<td>Farm Succession</td>
<td>131(54)</td>
<td>74(54)</td>
<td>57(56)</td>
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<td>Yes</td>
<td>19(20)</td>
<td>10(18)</td>
<td>9(23)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>12(34)</td>
<td>8(44)</td>
<td>5(28)</td>
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<td>Social Knowledge Source</td>
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<td>Programs</td>
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<td>media dominant</td>
<td>4(15)</td>
<td>0(0)</td>
<td>4(25)</td>
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<tr>
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<td>9(24)</td>
<td>9(13)</td>
<td></td>
</tr>
<tr>
<td>broader social dominant</td>
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<td>3(16)</td>
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<td>Water Quality</td>
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<td>4(13)</td>
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<tr>
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<td>4(40)</td>
<td>1(20)</td>
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<tr>
<td>Immediate Social Influence</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Neighbour's Participation</td>
<td>132(55)</td>
<td>90(65)</td>
<td>42(41)</td>
<td></td>
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<tr>
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<td>17(20)</td>
<td>13(23)</td>
<td>4(14)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14(29)</td>
<td>11(32)</td>
<td>3(21)</td>
<td></td>
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<tr>
<td>Influence of Neighbour’s P</td>
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<td>85(61)</td>
<td>46(45)</td>
<td></td>
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<td>1(11)</td>
<td>0(0)</td>
<td>1(25)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>23(19)</td>
<td>16(20)</td>
<td>7(17)</td>
<td></td>
</tr>
</tbody>
</table>
### Master Table: Chi-Square (C)/Spearman's rho (S) test results – Social Influence Factors – continued

| Farmer Social Relationships | Overall Responses #(%) | GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br/>GR Responses #(%<br> FR 159(67) 109(46) 154(55) 191(80)
| **Rec’d the EFP to friends** | strongly agree | 15(15) | 3(6) | 5(38) | 6(15) |
| **Rec’d the RWOP/CWP to friends** | strongly agree | 22(22) | 0(0) | 7(26) | 14(52) |
| **Social Event Attendance** | up to 2 times per month | 29(19) | 3(20) | 58(38) | 34(23) |
| **Social Referencing** | 4(4) | 2(24) | 9(43) | 3(14) |
| **Comm. Tech. Use** | Yes | 30(23) | 2(16) | 51(40) | 27(21) |
| **Farm Org. Social Networks** | OFA | 23(33) | 9(13) | 26(38) | 11(16) | 14(37) | 5(13) | 11(29) | 8(21) |
| | CFFO | 4(24) | 3(18) | 5(29) | 5(29) | 3(25) | 2(17) | 3(25) | 4(33) |
| | OFA and Local Producer Committee | 5(19) | 2(18) | 11(42) | 8(31) | 1(10) | 0(0) | 3(30) | 6(60) |
| | OFA, OSCIA | 2(10) | 6(30) | 7(35) | 5(25) | 1(14) | 2(29) | 2(29) | 2(29) |
| | OAF, OSCIA | 2(17) | 1(8) | 8(67) | 1(8) | 2(40) | 0(0) | 2(40) | 1(20) |
| | CFFO, Local Producer Committee | 2(29) | 1(14) | 1(14) | 3(43) | 1(17) | 1(17) | 1(17) | 3(50) |
| | CFFO, OSCIA, Local Producer Committee | 4(0) | 0(0) | 1(100) | 0(0) | 0(0) | 0(0) | 1(100) | 0(0) |
| | NFU, OSCIA | 1(100) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |
| **Relationships for ‘P’ in Progs.** | Strongly Agree | 3(16) | 5(26) | 6(32) | 5(26) | 3(30) | 3(30) | 3(30) | 1(10) |
| | Agree | 13(19) | 1(16) | 20(42) | 15(22) | 7(21) | 7(21) | 8(24) | 11(33) |
| | Disagree | 8(32) | 2(8) | 10(40) | 5(20) | 5(26) | 2(11) | 7(37) | 5(26) |
| | Strongly Disagree | 2(22) | 4(44) | 1(11) | 2(22) | 1(17) | 3(50) | 0(0) | 2(33) |
| **CFFO, Local Producer Committee** | 10(10) | 10(10) | 10(10) | 10(10) |
| **Chi-Square (C)/Spearman’s rho (S) test results** | **Sig.** | 0.385 | 0.301 | 0.907 | 0.062 | 0.096 | -0.013 | 0.347 | 0.614 | 0.007 | -0.087 | 0.062 | -0.367 | 0.581 | 0.384 | 0.897 | -0.042 | -0.088 | 0.016 | 0.003 | 0.032 | 0.035 | -0.232 | -0.224 | -0.258 | 0.01 | 0.015 | 0.516 | -0.246 | -0.304 | -0.098 | not valid | 0.804 | 0.827 | 0.19 | 0.892 | 4.765

### Key Points
- **Overall Responses #(%):** The table summarizes the responses from participants regarding various social influence factors, categorized into different sections such as relationships, event attendance, social referencing, and communication technology use.
- **Chi-Square (C)/Spearman’s rho (S) test results:** These statistical tests are used to determine the significance of the relationships between the variables. The table documents the **Sig.** (significance) results for these tests, ranging from 0.003 to 0.892.
- **Social Event Attendance:** The attendance patterns vary, with 71(70) participants attending events up to 2 times per month.
- **Social Referencing:** The number of friends each participant referred to is documented, with 67(67) participants indicating 2 friends.
- **Comm. Tech. Use:** The table indicates 4.765 participants who use communication technology.
- **Significance Levels:** The significance levels for the tests reflect varied results, with the highest being 0.907 and the lowest 0.003.
Appendix I. – Figure 3: SPSS Test Results – Farmer Perception of Program Value

<table>
<thead>
<tr>
<th>Master Table</th>
<th>Overall Responses #(#%</th>
<th>GR Responses #(#%</th>
<th>SN Responses #(#%</th>
<th>Chi-Square (C)/Spearman’s rho (S) test results (C)/Over GR SN Overal GR SN</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sig.</td>
</tr>
<tr>
<td>C. Perceptions of Prog.Value</td>
<td>NP</td>
<td>WA</td>
<td>P</td>
<td>SP</td>
</tr>
<tr>
<td>EFP Program Value</td>
<td>140(62)</td>
<td>183(60)</td>
<td>66(65)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>strongly agree</td>
<td>5(13)</td>
<td>3(7)</td>
<td>15(40)</td>
</tr>
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<td></td>
<td>agree</td>
<td>18(18)</td>
<td>20(20)</td>
<td>46(46)</td>
</tr>
<tr>
<td></td>
<td>disagree</td>
<td>2(22)</td>
<td>4(44)</td>
<td>3(33)</td>
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<td></td>
<td>strongly disagree</td>
<td>0(0)</td>
<td>0(0)</td>
<td>1(100)</td>
</tr>
<tr>
<td>RWQP/CWP Program Value</td>
<td>99(41)</td>
<td>59(43)</td>
<td>40(40)</td>
<td>0.08</td>
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<td></td>
<td>strongly agree</td>
<td>3(21)</td>
<td>0(0)</td>
<td>3(21)</td>
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<tr>
<td></td>
<td>agree</td>
<td>16(23)</td>
<td>8(11)</td>
<td>25(36)</td>
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<td></td>
<td>disagree</td>
<td>2(14)</td>
<td>3(21)</td>
<td>8(57)</td>
</tr>
<tr>
<td></td>
<td>strongly disagree</td>
<td>0(0)</td>
<td>0(0)</td>
<td>2(100)</td>
</tr>
<tr>
<td>Program Financing</td>
<td>189(79)</td>
<td>112(81)</td>
<td>77(76)</td>
<td>0</td>
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<tr>
<td>Funding &amp; Participation</td>
<td>164(60)</td>
<td>96(70)</td>
<td>68(67)</td>
<td>0.78</td>
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<td>strongly agree</td>
<td>16(28)</td>
<td>8(14)</td>
<td>25(43)</td>
</tr>
<tr>
<td></td>
<td>agree</td>
<td>13(17)</td>
<td>13(17)</td>
<td>28(36)</td>
</tr>
<tr>
<td></td>
<td>disagree</td>
<td>7(30)</td>
<td>5(21)</td>
<td>9(37)</td>
</tr>
<tr>
<td></td>
<td>strongly disagree</td>
<td>0(0)</td>
<td>2(40)</td>
<td>3(60)</td>
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<tr>
<td>Fund. small farms</td>
<td>167(70)</td>
<td>101(73)</td>
<td>66(65)</td>
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<tr>
<td>Program Communication</td>
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<td>68(49)</td>
<td>50(49)</td>
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<td>2(9)</td>
<td>10(45)</td>
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<td>agree</td>
<td>19(16)</td>
<td>31(43)</td>
<td>24(20)</td>
</tr>
<tr>
<td></td>
<td>disagree</td>
<td>9(46)</td>
<td>6(24)</td>
<td>6(24)</td>
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<td></td>
<td>strongly disagree</td>
<td>1(50)</td>
<td>1(50)</td>
<td>0(0)</td>
</tr>
<tr>
<td>RWQP/CWP Prog. Comm.</td>
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<td>100(72)</td>
<td>68(67)</td>
<td>0.03</td>
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<td>Program Planning &amp; Outreach</td>
<td>121(50)</td>
<td>70(50)</td>
<td>51(50)</td>
<td>0.37</td>
</tr>
<tr>
<td>EFP Plan. &amp; Outreach</td>
<td>strongly agree</td>
<td>6(24)</td>
<td>1(6)</td>
<td>5(29)</td>
</tr>
<tr>
<td></td>
<td>agree</td>
<td>21(24)</td>
<td>10(11)</td>
<td>29(33)</td>
</tr>
<tr>
<td></td>
<td>disagree</td>
<td>8(20)</td>
<td>2(13)</td>
<td>8(53)</td>
</tr>
<tr>
<td></td>
<td>strongly disagree</td>
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<td>0(0)</td>
<td>2(100)</td>
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Appendix J: Figure 4: Ontario, Survey Sample and Regional Farmer Statistics\(^{62}\)

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<th>Variable</th>
<th>O-11</th>
<th>O-06</th>
<th>OS</th>
<th>S-GR</th>
<th>W(GR)</th>
<th>S-SN</th>
<th>PR(SN)</th>
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<tr>
<td>Total number of Farms reporting</td>
<td>51,950</td>
<td>57,211</td>
<td>2,511</td>
<td>987</td>
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<td>Dairy Farms reporting</td>
<td>4,036</td>
<td>4,937</td>
<td>239</td>
<td>138</td>
<td>480</td>
<td>101</td>
<td>276</td>
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<tr>
<td>Sex (Percentage Male/Female)</td>
<td>71% M, 29% F</td>
<td>71% M, 29% F</td>
<td>94% M, 6% F</td>
<td>92% M, 8% F</td>
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<tr>
<td>Average age of farm operators.</td>
<td>54.5</td>
<td>52.6</td>
<td>47</td>
<td>46</td>
<td>50.8</td>
<td>49</td>
<td>52.8</td>
</tr>
<tr>
<td>Dairy Cows (Number) - Farms Reporting</td>
<td>318,158</td>
<td>329,737</td>
<td>25,779</td>
<td>21,941</td>
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<tr>
<td>Average Herd Size - Farms Reporting</td>
<td>78</td>
<td>59 (S), 116 (I)</td>
<td>53</td>
<td>80 (S), 113 (I)</td>
<td>79</td>
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<tr>
<td>Average Farmland Managed (Owned and Rented)</td>
<td>244 acres</td>
<td>233 acres</td>
<td>528 acres</td>
<td>422 acres</td>
<td>205 acres</td>
<td>635 acres</td>
<td>309 acres</td>
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<tr>
<td>Average Gross Farm Receipt</td>
<td>$ 228,889</td>
<td>$ 180,769</td>
<td>$ 452,000</td>
<td>$ 260,291</td>
<td>$ 568,000</td>
<td>$ 285,936</td>
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<tr>
<td>Average using Internet for Farm Business</td>
<td>55%</td>
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<td>49%</td>
<td></td>
<td>59%</td>
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</tbody>
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Source: Statistics Canada, 2011 Census of Agriculture, Farm and Farm Operator Data, catalogue no. 95-640-XWE.

\(^{62}\) Legend: O-11 (Ontario, 2011), O-06 (Ontario, 2006), OS (Overall Sample), S-GR (Sample- Grand River), W(GR) (Wellington County, 2011), S-SN (Sample-South Nation), PR(SN) (Prescott-Russell, 2011), S (Survey), I (Interview).