HM, BSE, and Adaptation: A Canadian Prairie Perspective

by

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THESIS ABSTRACT

In May 2003, the first case of bovine spongiform encephalopathy (BSE) was identified in Alberta, and the impact was immediately devastating on farmers and rural communities across Canada. Not only were farmers faced by the impacts of BSE, they were also contending with record low farm incomes, changing commodity prices, and overall rural depopulation. One grassroots adaptation to this rural crisis is the adoption of Holistic Management (HM) by farmers in western Canada. Although growing in popularity, HM has yet to be systematically assessed in the literature. The overall objectives of this study were to characterize HM; to assess to what degree it simultaneously addresses environmental, economic, and social priorities; to examine the impacts caused by the BSE crisis on HM and non-HM producers; and to explore the potential of HM for adapting and dealing with future crises. This was carried out through a questionnaire that was mailed to 784 HM producers across western Canada. Qualitative and quantitative analysis of survey data showed that HM allowed producers to systematically address all three pillars of sustainability (environment, economic, and social). In particular, the social aspect emphasized in the practice of HM was unique compared to other approaches to agricultural sustainability that focus on economic and/or environmental priorities.

When comparing HM producers to non HM producers, the HM producers were less impacted by the BSE crisis. Indeed, holistic managers described how the occurrence of BSE and subsequent consequences to the entire industry actually made them more resilient. The key factors that helped HM producers adapt to the BSE crisis were community involvement, within the family and larger community, and farm management.

New farm practices, such as rotational grazing, and the HM clubs to support these new farm innovations/practices also aided producers in adapting to the BSE crisis. The results of this study demonstrate the value of alternative community based approaches that address agricultural challenges in a truly holistic and sustainable manner.

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LIST OF ABBREVIATIONS

BSE Bovine Spongiform Encephalopathy
EFP Environmental Farm Plan
GM Genetically Modified
HM Holistic Management
HT Herbicide Tolerant
OIE Office International des Epizooties
PA Precision Agriculture
PRA Participatory Rural Appraisal
RRA Rapid Rural Appraisal
TSE Transmissible Spongiform Encephalopathy

CHAPTER 1: General Introduction

Canada is amidst a rural crisis characterized by rapid transition and adversity (Senate, 2004), which is altering the rural landscape, social fabric, and economic livelihoods of farmers and rural communities across the country. Canadian farmers are quickly approaching retirement age and the depopulation of small and medium size towns is an imminent reality (Senate, 2006). Declining populations, in turn, have a direct impact on the remaining businesses and economic enterprises, and also result in the reduction or loss of essential public services such as schools and hospitals (Wiebe, 2004). To meet basic needs, producers and rural residents are forced to travel greater distances (Wilson and Tyrchniewicz, 1995). Record low Canadian farm incomes have been attributed to decreases in subsidies such as the Crow Rate, rises in the costs of farm inputs including fuel and pesticides, increases in the value of the Canadian dollar making exports more costly for buyers, and increases in the frequency and intensity of extreme weather events such as droughts and floods (Senate, 2006). For the last two years, the average net income of farmers in the prairies has been at its lowest level (Statistics Canada, 2007). In 2003, the pressure facing rural communities was elevated to a whole new level when a single cow on an Alberta ranch tested positive for bovine spongiform encephalopathy (BSE).

The impact of BSE (or Mad Cow Disease) has since put the livestock industry, and indeed most of rural Canada, into turmoil (Senate, 2004) as over 40 countries immediately imposed import restrictions (Leiss, 2003). The most significant impact was the immediate closure of the Canada/US border to movement of beef and live cattle from Canada, since about 90% of Canada's beef exports went to the US in 2002 (Poulin and

Boame, 2003). The effects of these trade restrictions were reflected by the immediate drop in farm cash receipts for cattle and calves from CAD 5.2 billion in 2002 to CAD 2.5 billion in 2003 (Mitura and Di Piétro, 2004), which by 2005 had resulted in direct and indirect costs to the economy that surpassed CAD 5 billion (Leiss and Nicol, 2006). Yet, the support of Canadian consumers was in direct contrast to the fear shown by consumers in other BSE-stricken countries, and domestic beef consumption actually rose by 5% over the subsequent year (Senate, 2004). Community barbeque events were held across Canada to show support to local producers and farmers affected by the crisis. Stickers, t-shirts, and aprons were also sold with the logo '*I ♥ Canadian Beef*.' Despite this support, many producers were simply unable to contend with the ensuing economic pressures and as a result bankruptcy and farm foreclosure was an imminent reality for some (Stozek and McLachlan, 2007). However, resilience and resourcefulness also characterized the responses of many producers (Anderson and McLachlan, 2007; LeRoy and Klein, 2005). Indeed, this is nothing new, as producers have long been operating and living in greatly varying social, economic and environmental climates (Milestad and Darnhoefer, 2002).

Although rural communities across the prairies are undergoing substantial change, these communities are generally characterized by great resilience. Recent initiatives undertaken across the prairies have included marketing cooperatives, direct marketing, and Community Supported Agriculture (CSA) (Anderson and McLachlan, 2007). When communities engage in proactive activities, they enhance their capacity to cope with changes taking place at the local, national, and international level (Harris et al., 2000). According to Shaffer (1990) "the greatest asset communities have in their struggle to maintain economic viability is not distance, natural resource base, or current economic

structure but their own creativity and insight". One such approach that encourages innovative problem-solving is Holistic Management (HM). HM is practiced on more than 30 million acres world over (Holistic Management International, 2007). In Western Canada alone, there are upwards of 1000 farm families that currently practice HM and this number is steadily increasing. Farmers use HM to evaluate the risks of trying new production methods and making decisions for their farm operation while simultaneously managing for any environmental, economic, and social impacts.

Developed by Alan Savory, HM "provides ways of more fully understanding a current crisis, its origin, and its relationship to other situations"(Sindelar, 1995). By applying a holistic approach to decision making, these risks can thus be mitigated to ensure that profits, good quality of life, and conservation of land can be achieved – the very foundation of sustainable agriculture. Despite the real and potential value that Holistic Management holds for farmers and rural communities, there has yet to be systematic and large scale assessment of those practicing this management approach. The overall goal of this study is to assess the role of HM as a grassroots adaptation to ongoing changes in rural landscapes. Specific objectives related to the following chapters are outlined below.

LIST OF OBJECTIVES

Objective one: To determine the role of Holistic Management in mitigating the impacts of rural decline across the Canadian Prairies (Chapter 3). In particular, to:

- Characterize the attitudes and experiences farmers and rural residents practicing HM; and

- Asses to what degree HM at once addresses the economic, social, and environmental pillars of sustainability in agriculture.

Objective two: To characterize HM as an adaptive response to stressors confronting producers, especially those associated with BSE (Chapter 4). In particular, to:

- Examine and contrast the impacts caused by the BSE crisis on HM and non-HM producers;
- Explore how adaptation occurs amongst HM producers to BSE at the farm level; and
- Investigate the potential of HM in future adaptations to unanticipated crisis events.

CHAPTER 2: Literature Review

INTRODUCTION

> "Never was the Canadian farmer so prosperous. Evidence of his thrift abound on every hand. The building of new fences, larger and better barns, more substantial and comfortable homes, has come to be the merest commonplace (Calgary Board of Trade, 1906)."

Farmers and rural communities are at the heart of Canada. More than just an emotional attachment (Senate, 2002), the environment, economic and social fabric of the Canadian prairies has been largely shaped by farming and ranching (Gertler, 1999). For the first half of the century, the agricultural industry fuelled western Canada's economy (Horner, 1980). Settlement took place as early as 1880, and by the 1930s over 300,000 farms occupied the southern prairies (Troughton, 1999). As the Calgary Board of Trade described in 1906, farming was a prosperous endeavor. By 1941, the number of farms in Canada peaked at 732,800 (Statistics Canada, 2003). However, the prosperity and opportunity of farming in Canada has since changed. By 2006, the number of census farms had radically decreased by 31% to 229,373 farms (Statistics Canada, 2007); net farm income reached record lows, falling 80.7% from 2001 (Statistics Canada, 2007); and farm debt reached an unprecedented high (NFU, 2005). Canada's farmers and rural communities are facing a rural crisis, and the future of Canada as "the land of golden wheat, fat steers, industrial opportunities and unequalled climate" (Calgary Board of Trade, 1906) is uncertain at best.

A RURAL CRISIS

While farm numbers decreased during the 20th century, the amount of land cultivated in Canada has grown by 392% (Statistics Canada, 2003). This increase in farm size and associated rural depopulation reflects a number of factors including technological innovations, economic efficiency, and government policy (Wilson and Tyrchniewicz, 1995), which ultimately changed the way people farm in Canada. Technological innovation has led to greater efficiency in agricultural production, thus requiring fewer people to produce larger amounts of goods. In 1921, for every tractor and combine in Canada there were 22 agricultural workers compared to the present were there is almost double the number of machines (i.e., 850,000 combine and tractors) as there are farmers (i.e., 329,000 workers) (Statistics Canada, 2003). Despite the adoption of new technologies and practices, net farm income remains at a record low, and farm debt has reached a record high (NFU, 2005). According to Qualman (2003), the adoption of new technology could contribute to increasing net farm income, but these benefits will likely never be realized as long as corporations selling these products continue to have greater market power relative to farmers. All the while, as farm technology and production costs have risen, producers continue to receive low prices for farm products. Indeed, over the past two decades, the prices for many farm products have not increased despite the continual increase in retail prices (Martz, 2006). A 2005 report commissioned by the Canadian Minister of Agriculture concluded that in order for farmers to overcome the farm income crisis, government policies would need to empower Canadian farmers in the marketplace (Easter, 2005). Although changes in government policies are necessary, a

much more substantial revisioning of agriculture is needed if the farm crisis is to be fully addressed.

A social perspective of the rural crisis

Although the economic conditions that have contributed to the rural crisis are well recognized, much less is known about the social implications of this decline. Agriculture has contributed to many of today's most eminent societal concerns including conservation and preservation of natural environments, biotechnology, and food safety (Lobao and Meyer, 2001). For example, the development of genetic engineering has caused much controversy among all stakeholders, and rural communities have not been exempt from this debate, causing ongoing tension among community members (Oguamanam, 2007) whereas food safety concerns have contributed to trade disputes among nations, exacerbating economic and political conflict (Charlebois and Labrecque, 2007).

Canadian farmers and rural communities have also been faced by the social and personal losses due to the farm income crisis that has decimated many rural communities (Qualman and Wiebe, 2002). Headlines from the farm press continue to question the long term existence of farmers: "Farmers: an endangered species" (The Western Producer, 2005), as the effects of fewer farms and increased farm size resonate across communities (Lobao and Meyer, 2001). Farmers and rural communities are interdependent as they rely on one another to exist. Declining farm populations lead to loss of essential services and business, resulting in fewer jobs, progressive outmigration, and ultimately the vicious cycle continues (Senate, 2003).

An environmental perspective of the rural crisis

In addition to the economic and social impacts of the rural crisis, farmers have the added challenge of contending with environmental change which has further pushed rural Canada into crisis. Climate variability and change is one of the most prominent environmental issues facing agriculture (Smithers and Blay-Palmer, 2001). From 1998 to 2004, the prairie provinces were devastated by drought stemming from a combination of low precipitation and warm weather (Schindler and Donahue, 2006). An increased incidence of drought in the prairies is anticipated, and the impacts of climate change will continue to put Canadian farmers at risk (Senate, 2003). If that was not enough, the presence of new animal diseases has further threatened farmers.

Animal disease has recently emerged as another issue in Canada with severe consequences. A 2003-2004 Canadian Food Inspection Agency report listed avian influenza and BSE as key challenges and risks faced by the agency (CFIA, 2004). In 2004, an outbreak of avian influenza was confirmed in a domestic poultry operation in British Columbia and resulted in the immediate culling of 19 million birds in the Fraser Valley (Tweed et al., 2004). One year earlier, in May of 2003, a BSE-infected cow was discovered in Alberta, the first for Canada. The impact was immediate – the borders of over 40 countries, and most importantly that of US, were closed to imports of Canadian beef and the livestock industry was left in 'havoc' (Canada Senate, 2004).

Yet the rural crisis facing Canadian farmers and rural communities is "more deeply rooted than drought, disease, the limitation of government, or even global subsidy wars" (Easter, 2005). Indeed, the mass exodus of farmers is a common trend in many countries. In the US, farm populations now represent 2%, compared to the 1900s where

35% of the population was farming (Lobao and Meyer, 2001). Similarly, the European Union has been affected by declining profitability, intensified competition, and rapidly changing consumer demands (Mepham, 2004) leaving farmers in a precarious position. The economic, social, and environmental issues that have contributed to the rural crisis, locally and globally are merely symptoms of a globalized agriculture, and a decline that is both systemic and long term in nature (Easter, 2005).

GLOBALIZATION AND AGRICULTURE

Over the last 15 years, globalization of the agri-food sector has occurred at an unprecedented scale and pace (Lang, 1998), where volatility and change are endemic characteristics (Pierce, 1994). In the livestock sector, globalization has manifested in new market opportunities from the removal of trade barriers (Caswell and Sparling, 2004). The global trade in meat has tripled in volume from 1990 to 2005 (Morgan and Prakash, 2006). With these increased flows of livestock and livestock products and the development and exchange of new technologies that facilitate this growth (FAO, 2005), meat consumption has also risen substantially. However, the potential for large scale disturbance in this sector is certainly real, especially related to the occurrence of animal disease. According to Kouba (2003), the increasing import of animals and animal products contributes directly to the spread of animal disease. Other factors that facilitate this spread relate to animal husbandry practices and the long incubation periods (Armelagos, 1998). While some of these diseases are epizootic (i.e., affect similar animals), many are zoonotic (i.e., communicable to humans), such as foot and mouth disease (FMD), avian influenza, and BSE. Of these zoonotics, the discovery of BSE has

caused a worldwide crisis in the livestock industry, and has been described as an "alarm signal" for the existing rural crisis in the agriculture (Oosterveer, 2002).

BSE: a global context

Bovine spongiform encephalopathy has had devastating economic impacts around the world, and, in many European countries, on human health. According to Charlebois and Labreque (2007), "the global spread of BSE stands as one of the most alarming socioeconomic and social welfare predicaments in modern time," and in the last fifteen years has been one of the "highest-profile issues in animal health and food safety" (Leiss and Nicol, 2006). BSE belongs to the family of transmissible spongiform encephalopathy (TSE), including chronic wasting disease (CWD) in deer and elk and scapie in sheep and goats. First discovered in 1986 in southern England, BSE resulted in the eventual infection of more than 185,000 cattle, the slaughter of 18 million cattle (USDA, 2003), and the infection 135 people with its human variant Creutzfeldt-Jacob disease (vCJD) (Hill et al., 1997). With the exception of Ireland and France, all cases of vCJD have occurred in the UK (Oosterveer, 2002). As a consequence, in 1996, domestic beef consumption in the UK dropped by 30% (Fox and Peterson, 2004), and an inquiry into BSE and CJD in the United Kingdom estimated the total net cost of the crisis at £ 3.7 billion (Phillips, 2000).

The primary means of BSE transmission to cattle is feed contaminated with rendered material from other BSE-infected cattle (USDA, 2003), and there is strong evidence that BSE-contaminated food is responsible for vCJD in humans (Knight, 1998). With only a small amount of BSE-infected material, described as the size of a peppercorn

(Phillips, 2000), required to spread the disease, the scale of the BSE crisis in the UK is not surprising. The initial denial and subsequent mismanagement of the disease by British authorities (Gerodimos, 2004) allowed for the continued transport of contaminated feed and diseased animals throughout Europe, the Americas and Asia (Langford, 2002). Infected cattle have now been found in 28 countries and the OIE (Organization Internationale des Epizooties) has developed science-based guidelines for managing the disease that have been approved by 167 countries (OIE, 2007).

BSE: a Canadian context

The discovery of BSE in Canada had severe and unanticipated consequences for its livestock industry (Leiss and Nicol, 2006). Over 40 countries immediately imposed import restrictions (Leiss, 2003). The most significant of which was the immediate closure of the Canada/US border to movement of beef products and live cattle from Canada (Poulin and Boame, 2003). Canada's domestic meat packing plants were unable to handle the resulting oversupply of live cattle over the next 18 months (Senate, 2004). In August 2003, the US lifted their ban on boneless meat from cattle less than 30 months old; however, it was not until July 2005 that live cattle less than 30 months of age could be imported to the US.

The impact of BSE put the livestock industry and indeed rural Canada into turmoil (Senate, 2004), especially those living in the prairies where two thirds of Canada's beef cattle farms are located (Mitura and Di Pietro, 2004). Many producers declared bankruptcy or simply exited farming all together (Anderson and McLachlan 2007; Charlebois and Labrecque, 2007), and those producers who remained were faced

with uncertainty about the future of the Canadian livestock industry. The stress on producers and rural communities was substantial, and during the first year following discovery of BSE in Canada over half of all farm calls to the Manitoba Farm and Rural Stress Line were BSE-related (MFRSL, 2005).

To help producers deal with the economic hardship caused by the BSE crisis, the Canadian government allocated CAD 312 million to create a BSE Recovery Program as a short-term solution. However, funding was directly tied to the number of cattle, and ironically, those having many cattle, including meat packers, benefited most from the program (LeRoy and Klein, 2005) whereas small and mid-size operations were left relatively vulnerable (Ashraful and McLachlan, 2006). Despite government support, 48.1% of beef operations were unable to cover their operating expenses three years after the first case of BSE was discovered (Statistics Canada, 2007), reflecting the long term impacts of the BSE crisis. Critics have argued that a fundamental error of the Canadian livestock industry was not fully accepting that BSE could be a domestic issue, and, as a result, the industry was not adequately prepared to handle the crisis (Loppachar et al., 2004). Indeed, the CFIA's risk estimation for the impact of discovering BSE in Canada failed to assess the extreme consequences of such an event, which ultimately led to the miscommunication of the severity of risk posed by BSE (Leiss and Nicol, 2006).

While the livelihoods of livestock producers and rural communities were placed at risk by the BSE crisis, the majority of efforts by the Canadian government have centered on science-based risk management approaches relating to the border and BSE surveillance, paying little attention to market-based risks. The Canadian government and CFIA are "developing a comprehensive suite of internationally recognized, science-based

measures to effectively minimize the likelihood of exposure, amplification and spread of BSE within the cattle population and to protect consumers from the associated human health risks." (CFIA, 2007) The focus on science-based management and unwillingness to accede to producer concerns has frustrated many: "*if cattle farmers had a nickel for every time the words "science-based" were used in last week's World Meat Congress, it wouldn't matter when the borders reopened to live animal trade*" (L. Rance, FIW, June 24 2004). Although they are most at risk, the voices and experiences of farmers and rural communities have been and continue to be marginalized.

AGRICULTURE, A RISKY BUSINESS

Risk is inherent in agricultural production, and in particular, farmers have been faced by risk for their entire existence (Hardaker et al., 2004). Whether it be animal diseases such as BSE, food safety scares like E-coli, changing commodity prices, or new environmental concerns such as climate change, agriculture is a risky business. The subject of risk has been widely examined, and is aggravated by media (Bernstein, 1996) and the social amplification of fear (Pidgeon et al., 2003). Approaches to risk differ substantially. Smith et al. (2001) define risk as an "exposure to uncertain and potentially unfavorable consequences," whereas Douglas (1992) advances that the meaning of risk has shifted from uncertainty to that of loss and danger. In the natural hazards literature, risk has been described in terms of probability and magnitude (IPCC, 2001; Downing et al., 2001; Stenchion, 1997) and dependent on hazard, exposure and vulnerability (Crichton, 1999).

Despite the numerous interpretations, 'risk' has generally been perceived as objective and science-based where as 'risk analysis' is normally used to determine the severity of the potential impact and the probability it will occur (Kammen and Hassenzahl, 1999). Risk analysis is an encompassing term that includes the processes of risk assessment, risk management, and risk communication. Risk assessment involves identifying risks based on the likelihood and consequences of a particular harm. Once these risks have been identified, the process of risk management is used to evaluate risks that require specific management and implement action on the identified areas, ultimately reducing risk to an 'acceptable level' (North, 1995). Risk communication, ideally occurring throughout the entire risk analysis process, entails the exchange of information concerning risk with interested and affected parties. Although normally expert driven, risk communication should be a multi-way process if the widely varied concerns of stakeholders are to be heard (North, 1995; Slovic 1987).

When the values of society are involved in risk-associated issues, the risk analysis process becomes complex (North, 1995). Some critics have argued that the process of science-based risk analysis is often lacking transparency and openness, often involves limited public consultation, and generally is too technical in nature (Pidgeon et al., 2003). As a result, the risks faced by marginalized communities are often left unaddressed. Yet, a growing field of literature recognizes that risk can also be viewed as "socially constructed" and subjective in nature (Coleman, 1993; Oosterveer, 2002; Slovic, 1987), thereby influenced by race, gender, culture, education, and social status (Smith et al., 2001; Douglas 1992). The study of risk perception has emerged within many disciplines

and has provided new insights into how individuals assess risk, especially risks related to extreme events and new technologies (Gregory, 2004)

Although there may be commonly held perceptions of risk among groups in society, conflicts often arise between experts and the lay community about what constitutes acceptable risk (Covello et al., 1984) as these two groups often perceive risk through differing lenses (Douglas,1992). Risk perception has been used to differentiate between these two groups (Coleman, 1993). Lay or non-expert perceptions of risk tend to be broader (Margolis, 1996), and are influenced by a growing mistrust of science, technical expertise, and indeed governments, as well as the potential impacts of the risk (Garvin 2001). According to Margolis (1996) "what is accounting for the stubborn conflicts is less what experts see that other people miss, but what ordinary people feel about risk that experts neglect." The feelings of risk described by Margolis can provide a boarder scope for the risk analysis process; however, Slovic (1987) emphasizes that both perspectives, lay and expert, must be respected. A third approach has emerged that speaks to a different type of expertise, one that is lived and experience based (Brook and McLachlan, 2006). Such a locally informed perspective (Sillitoe, 1998) known as local or traditional knowledge has generally been learned and communicated through family members and communities over generations (Fisher, 2000). Specifically, local farm knowledge is based on farm related insights and practices resulting from experimentation and adaptation to environmental and socioeconomic changes over time (Fisher, 2000). Thus, a more inclusive risk analysis process would involve meaningful public participation that aims to build trust all the while recognizing the subjective nature of risk

(Mauro and McLachlan, 2008). And in the case of agricultural risk, public participation of local farmers and communities is paramount.

Agricultural risk and adaptation

Agricultural risks, whether they are real or perceived, cannot be fully understood without examining the adaptive responses that serve to mitigate their impacts. The ability of individuals, groups, or institutions to adapt increases their capacity to endure, recover from, or adjust to adversity or change (Smit et al. 2000), and is largely influenced by perceived risk versus the actual probability of a risk occurring (Bryant et al., 2000). In particular, agricultural adaptation by farmers is dependent on the ability to maintain farm objectives such as profit, yield or sustainability (Risbey et al., 1999). Adaptation is both a process and condition (Smit and Pilifosova, 2001), whereby adaptive responses can be characterized as autonomous (i.e., ad hoc), reactive (i.e., occurring after the realization of impacts), or proactive (i.e., reflecting anticipation and planning) (Paavola and Adger, 2002). Adaptive responses can also vary in space and scale, in responsibility, and in duration (Carter, 1996; Smit and Skinner 2002).

Short-term responses to crises that threaten livelihoods often occur as immediate responses to abnormal situations at the individual or household level whereas longer-term adaptive strategies tend to emerge more slowly and modify local rules and institutions that secure livelihoods (Berkes and Jolly, 2001; Anderson and McLachlan, 2007). Rural communities are continuously adapting to diverse stressors (Reid et al., 2007), and the collective impacts of these stressors can result in multiple winners and multiple losers (O'Brien and Leichenko, 2000) that often differ in effect and degree from stressors that

are examined individually (Olmos, 2001). Much of this work has been global in scale and explored the combined impacts of climate change and globalization on nations (O'Brien et al., 2004; Kates 2000); however, analogous cases can also be made for marginalized rural regions and communities.

Although numerous studies have examined the agricultural impacts and subsequent adaptations to climatic variation and change on Canadian rural communities (e.g., Bradshaw et al., 2004; Bryant et al., 2000; Wall and Morzall, 2006; Belliveau et al., 2006; Reid et al., 2006; Smit et al., 1996), there has yet to be research that focuses on adaptation to zoonotic diseases such as BSE. As reflected in the climate change literature, the most frequently advocated strategy for agricultural adaptation is technological research and development (Smithers and Blay-Palmer, 2001). Indeed, the range of technological options available for adaptation has been described as a key determinant of adaptive capacity (Yohe and Tol, 2002). Responses to rural depopulation and overall decline have also been technological in nature. These responses have include the introduction of new and herbicide tolerant crops (e.g., canola, potatoes), new management practices (e.g., precision agriculture, conservation and zero till), and intensive livestock operations (e.g., pigs and poultry) (Gertler, 1999), most of which rely heavily on external inputs (Pretty, 1995b). In becoming consumers of technology, farmers often become more dependent upon external sources of expertise (Raedeke and Rikoon, 1997). Moreover, they become confronted by a 'treadmill of innovation' whereby only a small group of early adopters benefit from any new technology (Levins and Cochrane 1996; Roling and Jiggins, 1998) and, once government incentives and

regulations change, farmers often revert to previous practices (Pretty and Ward, 2001) or indeed exit agriculture altogether.

FARMERS, RURAL COMMUNITIES AND SOCIAL CAPITAL

Although many technologies and practices will continue to play an important role in the future of agriculture adaptation (Gertler, 2003), a more holistic approach is needed to contend with the diversity of agricultural risks faced by farmers and rural communities. The propensity of many studies to classify agricultural adaptations as either economic or physical in nature is problematic as the social dimension is simply underemphasized if not ignored completely (Risbey et al., 1999). According to Brodt et al. (2006), more attention should be placed on understanding the context in which farm management decisions are implemented rather than on the technical aspects of farming practices. The capacity of farm household's to absorb stresses ultimately determines its sustainability (Bessant, 2007), and local community groups and organizations play a valuable role in this process. Indeed, adaptation has been described as a dynamic social process where the ability of a society to adapt is in part determined by the capacity to act collectively (Adger, 2003). Collective acts contribute to social capital, which can determine the adaptive capacity of individuals or groups (Yohe and Tol, 2002).

The theory of social capital provides a foundation for understanding how individuals use relationships with other members of society for personal and collective good (Adger, 2003); and how these relationships can enhance cooperation for mutual benefit (Coleman,1990; Putnam, 2000). Pretty and Ward (2001) identified four central aspects of social capital: relations of trust; reciprocity and exchanges; common rules,

norms, and sanctions; and connectedness in networks and groups. A strong community is created when all four central aspects of this capital combine (Onyx and Bullen, 2000). Social capital that extends into the larger, non-farming community can also help rural communities and farmers (Brodt et al., 2006).

Pretty and Smith (2004) advance that social capital is an important factor in sustainability, and people living in rural communities can enhance their awareness of agroecological relationships and biodiversity though initiatives that foster social capital. Communities with local farming organizations that support sustainable agriculture have been linked with increased levels of social capital (Flora, 1995). In examining grazing networks among Wisconsin dairy farmers, Hassanein and Kloppenburg (1995) found that producers themselves were sharing and transmitting the knowledge needed to sustain their operations. Important to these grazing networks was cooperation, support, and shared learning (Hassanein and Kloppenburg, 1995) – the very components of social capital.

Community based adaptation and participatory research

In order to explore community-based and social adaptations to agricultural risks, participatory forms of research become important. Farmers can play an important role in agricultural development, research, and extension (van de Fliert and Braun, 2002), as they possess an intimate knowledge of their local environment, conditions, problems and priorities (Sumberg et al., 2003). Indeed, approaches to research that are participatory in nature can "link science to the knowledge and innovation of farmers" which not only benefits those involved in the process but also the environment (Goma et al., 2001).

Biggs (1988) described several ways in which farmers can participate with researchers; they can be contracted into a process, be consulted for input and opinions, be collaborators in research projects, or be genuine colleagues. Participatory methods of research have their roots in international rural development, and represent a response to the top down approach that dominated these initiatives until the 1970s (Kumar, 2002). One of the first participatory approaches to research, known as Rapid Rural Appraisal (RRA), emerged in the late 1970s and was mainly used by universities and aid agencies. These techniques involved semi-structured interviews and focus groups which were used to extract and document the local knowledge of participants (Chambers, 1994), and, as the name would imply, these techniques were often used in a 'rapid' or fast manner (Thrupp, 1994). By the 1980s, RRA evolved to include an increased level of participation and to reflect this change was referred to as Participatory Rural Appraisal (PRA). In PRA, researchers act as facilitators where farmers and community members participate in all steps of the research process including data collection, analyses, and interpretation (Devendra, 2007), with the main objective of empowering local people to develop long term sustainable solutions (Chambers, 1997).

From PRA developed a number of other participatory strategies including Farmer Participatory Research, Participatory Learning and Action, and Participatory Action Research. These new and emerging research methods have been subject to criticism. In theory, they appear to be very promising; however, in practice many of the main objectives have not been met. Other criticisms relate to the disconnect between research and institutional agendas versus those of the participants (Bentley, 1994). Despite the potential of participatory approaches, such as PRA, the reality remains that most research

in North America involves limited cooperation and contact between farmers and scientists (Hoffman et al., 2007). Nerbonne and Lentz (2003) stress that these types of collaborations need to move beyond struggles of proving legitimacy and into a space that is inclusive from the perspectives of both farmer and researcher.

Although a range of methods are being applied at the grassroots level to empower local citizens and groups (Thrupp et al., 1994), many innovative grassroots initiatives are taking place unnoticed by researchers, government, and society, in large part because of the top-down approaches to research that researchers and decision makers continue to employ. One such grassroots' response has been the adoption of Holistic Management (HM), and farmers are now applying HM to over 30 million acres of agricultural land around the world (Holistic Management International, 2007). For Canadian prairie producers, the adoption of HM represents an adaptive response that has grown in a grassroots manner that is almost entirely unnoticed.

HOLISTIC MANAGEMENT – A NEW APPROACH TO AGRICULTURE

Developed by Allan Savory, HM is based on his experiences and observations as a wildlife biologist in Zimbabwe. The premise behind HM is, by definition, one of holism. The use of the term holism was first conceived and articulated by J. Smut in his book Holism and Evolution (1926). It reflected Aristotle's philosophy that the whole is more than the sum of its parts. A key insight of Savory (1999) is that a holistic perspective is essential in management. Using this insight, Savory developed the HM decision-making model that emphasizes the connection between environmental, economic, and social well being.

The HM model is process-based approach that enables mangers to simultaneously consider financial, environmental, and social implications of decisions prior to implementation. The first step entails identifying the individuals, land base, and the finances available that will guide the development of a three-part goal. The first part of the goal is a statement about quality of life, and should reflect all of the manager's values, desires and aspirations. The second part of the goal is a statement of the forms of production, which involves determining the type of production necessary from land or other resource bases needed to support the quality of life desired. The third part of the holistic goal involves the future resource base needed to sustain production and quality of life and is a vision of what land or resource base will likely occur.

Once the three-part holistic goal has been established, the tools necessary to achieve this goal must be determined. A strength of the HM model is that "all tools and technologies are open to consideration as long as they have potential to advance the manager towards the quality of life, production, and landscape goals" (Sindelar et al., 1995). In order for managers to evaluate whether a particular action, such as the adoption of a new technology, has the potential to meet their holistic goal, seven guidelines are used to test against the three part goal (Savory, 1999):

1) Cause and Effect – Considers whether the selected action addresses the root cause of the problem, not the symptoms.
2) Weak Link – Tests whether the selected action addresses the weakest link (social, biological, or financial) of the operation.
3) Marginal Reaction – Used to determine what actions provide the best return based on money and time spent.

4) Gross Profit Analysis – Determines the enterprise which contributes the greatest in covering the expenses of the business.
5) Energy/Money Source and Use – Assesses whether the energy/money used for a specific action reflect or help achieve their holistic goal
6) Sustainability – Determines if action will enhance or deplete the future resource base included in holistic goal.
7) Society and Culture – Examines the proposed action for its effect on quality of life and the community.

If any of these tests fail, there is no need to proceed with others. Although the process may be burdensome at the beginning, once managers become familiar with the tests, the process can become routine. Managers are also encouraged to continually monitor decisions made to ensure that the desired outcome is realized, and if necessary to adjust their plans and operations accordingly. Complementary planning procedures, including financial and grazing plans, have also been developed to help mangers achieve their desired goals.

HM in practice

The holistic approach to decision making in the HM model contrasts strongly with the reductionist approach that dominates and has given rise to conventional agriculture (Stinner et al., 1997). The number of those practicing HM continues to grow, especially in the US where rural organizations, agencies, and universities have played an important role in its promotion (Francis, 1999, Nerbonne and Lentz, 2002). Internationally, World Vision Australia recently provided funding to bring the practice of HM to 1,500 families

in Kenya (HMI, 2007). In Canada, the role of agencies and universities has been substantially smaller, yet, rural communities have played an important role in communicating the benefits of HM and thus its adoption continues to grow. Over the last 20 years, Canadian producers have been organizing field days and other events to promote HM. In February 2007, the first Western Canadian Holistic Management Conference was held in Brandon, Manitoba and organized largely by local producers. The sold out conference featured producer panels, a motivational speaker, and board members from Holistic Management International and attracted over 300 attendees.

Despite the widespread popularity of HM, very little research has been conducted on this topic and there has yet to be a comprehensive study of the movement - anywhere. Studies that do exist have focused on specific economic and environmental benefits, the latter including changes such as increases in biodiversity (Stinner et al., 1997; Nerbonne & Lentz, 2002), as well as the role of HM along with organic farming in promoting proactive behaviors (Duram, 1997). Although these issues are important, they focus on the proximate benefits associated with HM. It is my contention that HM represents a viable solution for adapting to and dealing with the many ongoing crises that are plaguing agriculture in Canada and beyond, whether they are social, economic, or biophysical in nature. Most recently, the BSE crisis is an opportunity to evaluate HM in this context.

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CHAPTER 3: Holistic Management: Addressing the Three Pillars of Sustainability

3.1 ABSTRACT

Canadian farmers are contending with a rural crisis characterized by record low farm incomes, declining rural populations, and environmental challenges including BSE and climate change. Sustainability in agriculture has emerged as a systemic response to these challenges and has largely taken the form of technology-centered agronomic practices (e.g., precision farming and zero tillage) and regulation and policies (e.g., environmental farm plans and conservation easements). Although important, these responses all fail to address the social pillars of sustainability. Holistic Management (HM) represents a community-based, grassroots response that is practiced on 30 million ha around the world, but has yet to be systematically evaluated in the literature. The goal of this study is to characterize HM and to assess to what degree it simultaneously addresses environmental, economic, and social priorities. In 2005, questionnaires were mailed to 784 HM producers across western Canada. The role of goal setting was central to the HM framework playing an integral part in facilitating decision-making among family farm operators, it helped ensure that environmental, economic, and social impacts of decisions were all considered. Reflecting the holistic nature of HM, almost two-thirds (64.1%) of respondents indicated that at least two of these three priorities had changed for the better since practicing HM. Notably, social sustainability relating to the practice of HM stemmed from the formation of management clubs and larger HM networks that provided an opportunity for exchange of ideas and mutual support. Respondents were optimistic about their futures and those of their communities and environments.

3.2 INTRODUCTION

Canada's rural crisis

Canada is amidst a rural crisis that is fundamentally and perhaps unalterably changing the environmental, social, and economic landscapes of farmers and rural communities across the country. Between 1996 and 2006, the numbers of farms across Canada declined by 16% while the average farm size increased by 21% (Statistics Canada, 2007). Those that remain farming are approaching retirement age, averaging 52 years of age (Statistics Canada, 2007), and the depopulation of small and medium size towns is an imminent reality (Senate, 2006). Declining populations have an adverse impact on the remaining businesses, and also contribute to the loss of essential public services such as schools and hospitals (Wiebe, 2004). Farm incomes have been further compromised by increases in farm input costs such as fuel, pesticides, and fertilizers; a recent soaring Canadian dollar; extreme weather variability causing droughts and floods (Senate, 2006); and the onset of the BSE crisis in 2003. The stress associated with all these pressures has led to increased rates of suicide, family and substance abuse, and, ultimately, a mass exodus of prairie farmers (Gertler, 2003).

The environmental, economic and social issues faced by Canadian farmers and rural communities are complex and intertwined, and sustainable agriculture has emerged as an influential response to these challenges. Over the last decade, the concept of sustainability has been recognized by governments, environmental organizations, and society world over (Van Calker et al., 2003). Initially proposed with great impact by the World Commission on Environment and Development (WCED) as "development that meets that needs of the present without compromising the ability of future generations to

meet their own needs" (Bruntland, 1987), sustainability has since been promoted and implemented around the world. Yet, equivalent definitions for sustainable agriculture have been 'problematic' and been met with debate and even controversy (Rigby and Caceres, 2001).

Defining sustainable agriculture

Although some approaches to sustainable agriculture focus on sustained productivity in the face of disturbance (e.g., Conway, 1985, Pearce et al. 1990), most reflect the WCED approach and emphasize the interdependent need for environmental health, economic viability, and social well-being (e.g., Schaller, 1993; Hansen, 1996; Raedeke and Rikoon, 1997), and the ability to farm in the present without compromising opportunities for future generations (Hansen and Jones, 1996; Gafsi et al., 2006). Implicit in all these approaches is the importance of adaptation in coping with change, where sustainability enhances capacity to adapt in the face of uncertainty (Pretty, 1998).

The major challenge in agricultural sustainability is ensuring that all three pillars (environment, economics, and the social) are adequately represented. Most approaches have emphasized environmental and economic priorities, in large part because agriculture is widely recognized as having such adverse impacts on the environment (Korol, 2004). These responses have either focused on agronomic or on regulatory solutions to environmental decline.

Environmental dimensions of sustainability

Influential agronomic approaches focusing on the environment in western Canada include precision agriculture (PA), zero-till, and the use of herbicide tolerant (HT) crops.

PA makes use of information technology (e.g., global positioning systems and satellite imagery) to increase the efficiency of inputs, especially in low-yielding areas in fields. This allows practitioners to increase economic profitability while reducing their environmental impacts (Zhang et al., 2001; Fountas and Blackmore, 2005). Zero-tillage has also become popular across western Canada, now representing 41%, and with conservation or reduced tillage, 67% of all tillage practices (Statistics Canada 2007). It replaces conventional tillage by using herbicides to control weeds thereby reducing soil erosion, moisture loss and management costs (Gertler, 1999). Herbicide tolerant (HT) crops represent another widely adopted technology and now represents over 90% of the canola grown in western Canada (Statistics Canada, 2007). Their use promotes easier and more effective weed control (Mauro and McLachlan, 2008) and play a central role in zero-till operations (Canola Council of Canada, 2001). Despite their many successes, all these initiatives have a common shortcoming: their failure to address the social pillar sustainability. Even the practice of organic agriculture, which for many is synonymous with sustainability (Vogl et al., 2005) is increasingly recognized as unable to provide for farmers, farm workers, and rural communities (Getz and Shreck, 2006; Rigby and Caceres, 2001).

Indeed, these technology-dependent responses are criticized as disempowering farmers (Pretty and Ward, 2004). Thus, precision agriculture, zero-tillage, and at least some HT varieties have been plagued by uncertainty (Zhang et al., 2001; Mauro et al. 2005) and require advanced formal education and technical skills (Founts and Blackmore, 2005), even placing farmers at legal risk (Mauro and McLachlan, 2008). In becoming consumers of technology, farmers often become more dependent upon external sources of

expertise (Raedeke and Rikoon, 1997). Moreover, they are confronted by a 'treadmill of innovation' whereby only a small group of early adopters benefit from any new technology (Levins and Cochrane 1996; Roling and Jiggins, 1998), and, once government incentives and regulations change, revert to their previous practices (Pretty and Ward, 2001) or indeed exit agriculture altogether.

These agronomic approaches have been complemented by regulatory and program-based responses promoting sustainability in agriculture. The federal government in Canada recently initiated a National Environmental Farm Planning program, to encourage farmers to develop and implement environmental farm plans (EFP). The EFP allows farmers to voluntarily identify management practices and farm conditions that might affect the environment (Yiridoe, 2001). Once completed, participants can offset some of the costs of adopting the resulting best management practices (AAFC, 2007), many of which are technology-centered and, at least in western Canada, focus on precision farming (McLachan, unpubl. data). A common regulatory approach has landowners signing conservation easement agreements that set aside land for conservation, and often are associated with incentives such as tax credits (NRTEE, 2007). Although both of these have been promoted as ways for farmers to improve their local environments, they generally benefit the larger public at a cost to farmers (Easter, 2005) and are usually prescribed solutions initiated and promoted from outside the communities themselves. Like the technology-centered agronomic responses, these initiatives generally fail to address the social pillar of agricultural sustainability.

Addressing the three pillars of sustainability

Grassroots approaches to sustainable agriculture offer alternatives to the expert-driven and technology-centered responses that have hereto dominated agriculture in Canada. Their success depends on the individual farmer and farm family, but also on the collective action taken by larger groups and rural communities (Pretty, 1995). These relationships are predicated on trust, reciprocity, and exchange (Pretty and Smith, 2004), are often community-based, and give rise to socioeconomic initiatives that simultaneously bring economic and social benefits to those involved and the surrounding communities (Flora, 1995). Few of the initiatives that focus on agricultural sustainability incorporate all three pillars, even fewer are driven by farmers themselves. One such planning-based approach that transcends any one technological or regulatory response is that of Holistic Management (HM).

Holistic Management

Holistic Management has grown in popularity over the last 30 years and is now practiced on more than 30 million acres around the world (HMI, 2007). It represents a decision-making framework that emphasizes the importance of holistic perspectives in management, and explicitly facilitates innovation that is socially sustainable within and outside the farm (Savory, 1999). The three-part goal that shapes all decisions is based on the desired quality of life, what needs to be produced to attain this quality of life, and how the land should be managed in order to sustain future production – these representing social, economic, and environmental priorities, respectively. Managers can then select

any combination of tools and technology that enables them to better achieve their goals (Sindelar et al., 1995).

Although HM, and particularly rotational grazing, is associated with increases in biodiversity (Stinner et al., 1997; Nerbornne & Lentz 2002), proactive behavior characteristics (Duram, 1997), and alternative management (Sindelar et al., 1995), HM has yet to be systematically characterized and evaluated in the literature. The overall goal of this research was to characterize HM as practiced by farmers in western Canada, and assess to what degree HM fulfills the economic, environmental, and social pillars of agricultural sustainability.

3.3 METHODS

Study Area

The study is located in western Canada and includes the provinces of Manitoba, Saskatchewan, and Alberta, an area generally referred to as the Prairies. This region comprises three main Ecozones: the Prairie Ecozone, Boreal Plains Ecozone, and the Boreal Shield. The sub-humid to semi-arid Prairie Ecozone is dominated by cold winters with mean temperatures ranging from -13°C to -8°C and short warm summers with mean temperatures from 14°C to 16°C. Precipitation is highly variable, ranging from a low of 250 mm per year in southeastern Alberta to 700 mm per year in the Lake Manitoba Plains (Environment Canada, 2005).

The Prairies comprise 49.2% of all farms in Canada. Yet, from 2001 to 2006 there was a 10.0% decline in the number of farms in this region (Statistics Canada, 2007). The greatest decrease in farm numbers was in Saskatchewan (12%), followed by Manitoba

(10%), and then Alberta (8%) (Statistics Canada, 2007). Most (64.5%) of the farms have cattle, as mixed farms, ranches, and feedlots. Indeed, this region alone represents 72% of Canada's cattle and calves, most of these located in AB (221 head/cattle farm) and then SK (160 head/cattle farm) and MB (154 head/cattle farm) (Statistics Canada 2007).

Data collection

A mixed methods approach (Creswell, 2003) incorporating both quantitative and qualitative data analysis was used to explore the importance of HM. Five individual interviews and one group interview were conducted with HM producers and other stakeholders in 2005, in part to inform the subsequent design of a questionnaire. This instrument incorporated both Likert-scaled and open ended questions. Themes that were explored included the environmental, social and economic implications of practicing HM, the role of management clubs and networking in achieving these ends, and, as the focus on another study (Yestrau, 2008; C5), the role of HM as an adaptive response to BSE.

The questionnaire was pre-tested with ten HM producers in Alberta, Saskatchewan, and Manitoba and the feedback was used to construct a final survey instrument. Addresses were compiled using mailing lists obtained from certified Canadian Holistic Management educators who generate revenue by teaching HM courses. Questionnaires were only sent to those who were known to practice HM at some point and/or those who had taken a HM course. Study design was approved under the Joint-Faculty Human Subject Research Ethics Board Protocol at the University of Manitoba (No. J2005:059). To increase response rates, envelopes were hand-addressed, a cover letter was signed by the researchers; postage stamps were used instead of bulk mail

stamps; and an incentive coupon from a national coffee chain were included in each envelope (Dillman, 2000). On February 13 2006, 784 of the 12-page questionnaires were sent to HM producers across western Canada and followed by reminder postcards at one and two-week intervals, respectively.

Data analyses

Qualitative data were first transcribed, and then emerging themes identified and coded using ATLAS.ti (Atlas, 1999). Responses to an open-ended question that assessed the environmental, social, and economic implications of HM were used to create a Venn diagram showing the relationships of these different dimensions of sustainability (Figure 3.1). Descriptive analysis was conducted on the quantitative data (including percentage and mean scores with standard error (SE)) for the Likert scale questions and demographic variables (SAS, Version 9.2, SAS Institute, USA)

Gender was approached in a unique manner that recognized the whole-family planning philosophy emphasized by HM. If two respondents had completed the survey, each was given the opportunity to respond to the demographic questions independently and were asked to indicate what percentage of the survey each had completed. Any two people completing 30% to 70% of the survey as a team were classified in an intermediate gender category. The "both" category included female/male, male/male, and female/female combinations. Age, work situation, and level of education were calculated by summing the proportions of survey completed by each individual for each variable.

Questionnaire response

In total, 315 questionnaires were returned, representing an absolute response rate of 40.1%. Ineligible surveys were removed (i.e., incorrect address, survey not applicable), resulting in an overall adjusted response rate of 52.0%. Using 12 questions selected from the original questionnaire, a telephone survey was conducted with 20 responders and 20 non-responders. There were no significant differences in response between these groups (p=.3260).

3.4 RESULTS AND DISCUSSION

Socio-demographic characteristics

Most of the respondents were located in Alberta (49%), followed by Saskatchewan (36%), and then Manitoba (15%) (Table 3.1). The average age of these producers was 50 YOA, equivalent to the prairie average of 52 YOA (Statistic Canada, 2007). HM producers were highly educated, 68% having a college or university degree. Although only 18% of surveys were completed solely by women only, 26% were also substantially completed by a male and female household member. Almost half 46% of the respondents had farms >500 ha and livestock herds >250 head in size, slightly greater than the prairie average of 473 ha and 179 head (Statistics Canada, 2007). The large majority (83%) of respondents owned some type of livestock, mostly cattle (70.5%) .

Holistic Management in practice

This is the first large scale and comprehensive characterization of the attitudes and experiences of those practicing HM anywhere. Yet there has been a long-standing

interest in HM. It has been taught in Canada since 1987 (HMI, 2007) and 47% of respondents in this study had practiced HM for >10 years, 27% for 5-10 years, and 26% for less than 5 years (Table 3.2).

The great majority (92%) of respondents had completed a Holistic Management course from a certified educator (Table 3.2). Early on, participants in Canadian courses would often travel hundreds of miles to attend. More recently, a group (usually 4-6 families) would be established and invite an HM educator into their communities to teach. The course is six days in length, and usually presented as two sessions a month apart, allowing participants to apply the new concepts to their operation.

Once the course is completed, participants are encouraged to form a management club to help support and promote the continued practice of HM. Most at least agreed that the club was essential for understanding the course content, providing support for new practices, and allowing for exchange of new ideas. As described by one respondent,

> 'In my opinion what has made the largest difference in our lives since I took the course was the fact that we have an active functioning holistic group to work together and share ideas with' (HM, 176).

Interest in HM continues to grow, and since six courses were conducted in 2006/2007, six new clubs have been added to the 10 that had previously existed in Manitoba (D. Campbell, pers. comm. 2006). This growth has been facilitated by recent support from the federal government (e.g., Canadian Agricultural Skills Service program and local grazing clubs).

Role of goal setting

The foundation of HM is the creation of a three-part goal based on quality of life, forms of production, and future resource base, and this is taught early in the course. As one couple from Alberta shared: 'The HM course helped us clarify our goals based on discovering what were our most important values' (HM, 23). Each farmer possesses a unique set of goals that result in differing management strategies (Brodt et al., 2006), and since the practice of HM is not technology specific, they are able to choose strategies that best reflect their priorities, as individuals and/or as families. Of all the open ended questions included in the survey, the goal setting question provoked the most response and all agreed that goal setting plays a central role in decision-making on the part of individuals, families, and farm operations. As one producer from Alberta explained: 'goal setting has given us a clear direction for issues of business, family, and community/ environmental concerns' (HM, 110). Another respondent from Alberta expanded on this idea by stating that 'when you have a goal you have a measuring stick to evaluate progress' (HM, 76).

The importance of families prevailed for many, as reflected by their use of '*our family*' and '*we*' in their responses. Many discussed how input from family members had become an important part in decision-making and goal setting. One respondent stated: 'Holistic Management helped engage our family in problem solving…decisions made through meetings involving the whole family created a more positive atmosphere' (HM, 51). Similarly, another producer indicated the combined emphasis of family and community:

> 'Holistic Management has reinforced goal setting as an exclusive priority for every decision in our family's everyday life as well as for the farm. This is important because we focus on being informed and making sound business decisions with our entire family as well as the community' (HM, 56).

This approach contrasts greatly with a conventional farm management approach that emphasizes individual decision making, although it was not accepted by all. 'This worked well when most of the family was at home; however, when it came time to our last child, he refused to participate' (HM, 51). Similar sentiments were shared by other managers regarding the challenges posed by family dynamics and aging children with respect to goal setting and decision-making. One respondent discussed how goals 'must be based on personal values' and that 'we can have family goals, personal goals and we must support each other in achieving our individual goals' (HM, 23).

Although many commented on the difficulty of establishing goals, once in place they represented a valuable tool for evaluating whether and to what degree the subsequent management decisions were effective.

> 'Setting the goal is the hardest part. Once the goal has been set, decisions become much easier. You simply ask yourself, will this decision take me closer to my goal or not, and act accordingly. Progress is definitely being made towards the goal because we've been basing our decisions on getting closer to the goal rather than random decisions just based on circumstances at the time' (HM, 22).

Indeed, goal setting helps anticipate obstacles in a larger context and thus facilitates proactive responses (Sindelar et al., 1995). These responses greaten a sense of control over decision-making and over day-to-day operations (Duram, 1997), as well as crises that might otherwise affect their operations.

Motivations for adopting HM

When asked about their motivations for adopting HM (Table 3.3), environment and economics were ranked first and second, respectively. Thus, respondents wanted to *'take better care of the environment'* (mean=6.45, SE=0.04), and *'learn how to improve pasture and/or crop production'* (mean= 6.26, SE=0.05). These statements were closely followed by a willingness *'to make a profit'* (mean=6.20, SE=0.05), and the more social motivations to *'improve family's quality of life'* (mean=6.19, SE=0.06) and *'incorporate other priorities beside those that are economic'* (mean=6.13, SE=0.05). It is important to note that the highest ranked motivations incorporated economic, environmental, and social priorities, speaking to the systemic approach of HM.

Environmental impacts

When referring to the environmental, social and economic impacts of adopting HM, 19.2% of managers exclusively referred to improvements in the environment (Figure 3.1). Indeed, many become involved in sustainable agriculture out of concern for the environment (den Biggelaar and Suvedi, 2000). As one producer from Alberta indicated:

> 'The environmental changes on our farm have been the most dramatic because we have been rotational grazing, reserving areas for wildlife, planting shelterbelts, and practicing minimal tillage for several years' (HM, 55).

The practice of rotational grazing, common among those with livestock, was noted by many as improving the environment. As described by a couple from Saskatchewan, rotational grazing 'gave us a definite improvement in our pasture condition' (HM, 191). Many also described how they had seeded cropland into grasses: 'by seeding down more grass, and managing the grazing better, the health of the land and water has improved' (HM, 179). One producer from Saskatchewan observed 'we have noticed native species returning and a big increase in grass production' (HM, 145), Similarly, 95% of those interviewed in the US see HM as increasing biodiversity by 95% (Stinner et al., 1997). Other environmental changes (Table 3.4) associated with grazing included, in reverse order of importance, *increases in litter* (mean=6.00, SE=0.07), *increases in vegetation cover in pastures* (mean=5.93, SE=0.06), *less bare soil* (mean=5.87, SE=0.07), and *decreases in soil erosion by wind and/or water* (mean=5.67, SE=0.09). As a respondent indicated: 'less erosion, more fertility, more biodiversity' (HM, 264).

Economic impacts

Fewer (8.7%) referred exclusively to the economic impacts of practicing HM (Figure 3.1), although it was clear that many respondents did benefit economically, thus 'practicing Holistic Management on economics has substantially increased profit' (HM, 295). Other studies have similarly shown that 80% of HM managers perceived profit

increases as a result of practicing HM (Stinner et al., 1997), and that 90% of HM managers reported increased economic satisfaction (Orchard, 1996).

Some benefited from the financial planning that is emphasized in HM: 'we know what we have spent and what we are going to spend' (HM, 89), whereas others benefited from lowering the cost of production and thus increasing profitability: 'Since taking HM in the early 1990s, our gross income has substantially declined while the profit margins have dramatically increased' (HM, 303).

Respondents reported decreases in expenses for pesticides and fertilizers, equipment purchases, repairs and maintenance, fuel, and labour (Table 3.5). Expenditures for some items did increase, reflecting associated changes in management practices. These included expenses for fencing and water development of pastures for grazing livestock, as well as education and business travel (Table 3.5). Respondents looked to other approaches that relied less on technology and machinery, such as the use of grazing animals to cut costs while improving the environment. Indeed, many thought that an over reliance on technology has contributed to the ongoing farm crisis:

> 'Here in Canada farmers have been pushed off the land because they bought into all the new technology which seemed to make life easier but got them into a dependency to outside forces beyond their control. High yields and larger holdings had to compensate for low prices while input costs rose steadily' (HM, 44).

For another couple, keeping up with new technology and equipment was not feasible for the scale of their operation:

> 'With only 800 acres and old equipment we knew we would be in trouble if we cropped the land. We converted 400 acres from crop to pasture land by fencing and grazing' (HM, 203).

Social impacts

Social impacts (7.7%) of practicing HM were as important as the economic impacts (Figure 3.1). Many described how 'socially we have more free time' (HM, 22) and that they had changed how they interacted with their families. 'Socially, I am trying to focus more time with family, especially my children' (HM, 244). The following changes in social well being were ranked high by respondents: *'I can better identify what is important in my life'* (mean=5.93, SE=0.05), and *'I cope with new problems to a greater extent'* (mean=5.72, SE=0.06) (Table 3.7). Many referred to the role HM clubs and the larger HM network played in contributing to increases in social well-being. Referring to the support that these clubs provided, one respondent from Manitoba indicated:

> 'The most change has been in the social aspect. We meet as a group every month and bring different problems to the group to be solved as a group. We have gained respect for each other and look forward to our meetings every month' (HM, 47).

Indeed, 74% of holistic producers had belonged to a club at some point, and 41% continued to meet with their clubs on a regular basis (Table 3.2). The top ranked benefits by all producers who ever belonged to a management club (Table 3.6) included, in descending order of importance: '*I have gained more knowledge'* (mean = 6.27, SE = 0.06); *meeting with the group has been important in supporting the practice of HM'* (mean = 6.15, SE = 0.08); and *'allows me to consider different alternatives to a problem I am trying to solve'* (mean = 6.11, SE = 0.06). Reflecting on these benefits, a Saskatchewan manager shared that

> '(The club) has been very helpful by getting together with other folks to share ideas, discuss common problems and their possible solutions' (HM, 305).

A strength of the HM framework is that it facilitates the exchange of knowledge among producers, especially for those belonging to clubs. Hassanein and Kloppenburg (1995) also found that dairy farmers in Wisconsin practicing rotational grazing shared their knowledge of the natural world with neighbours, and during field days and conferences. Instead of relying on outside expertise for innovation, the producers themselves generate ideas and solve problems through these networks of support. A major role of these clubs is to generate relationships and trust, especially around sharing economic information, which is a topic that farmers rarely share with one another, especially in times of duress (Carolan, 2006).

Although there were many benefits associated with clubs, many encountered challenges. The top ranked challenges (Table 3.6), in descending order of importance,

included: *'we do not have a clear enough purpose for our group'* (mean=5.35, SE=0.19); *there are some members that talk the talk but don't walk the walk'* (mean= 4.89, SE=0.18); and '*there is a lack of interest from participants*' (mean=4.78, SE=0.18).

Some clubs failed due to lack of participation. As one manager shared 'I believe HM has merit; unfortunately, when the course was held it had far too few members and the support group was never sustained past the first meeting we hosted' (HM, 289). Others cited lack of time and commitment from group members, 'our club split off from non-commitment from the other members. It got to be a social more than a working club' (HM, 105). Indeed these social networks can breakdown when participants feel they have achieved a set outcome and are no longer interested in attaining new ones (Pretty and Ward 2001).

Holistic managers often encounter a lack of support and even suspicion by those outside of the HM network (Stinner et al., 1997; Orchard, 1996). Indeed, 46% of the respondents agreed that 'neighbours are suspicious of HM' (mean=4.44, SE=0.01). One producer commented that this uncertainty compromises the social impacts of HM such that: 'Social impacts are unperceivable because most neighbors fail to understand' (HM, 51). Although there may be tension between neighbours or even among family members, these attitudes tended to change over time. As another producer observed 'We see the neighbours adapting to some of our practices' (HM, 293). This was especially true for rotational grazing and bale grazing, practices that are increasingly adopted across the prairies even though they may have first been used by HM producers.

Addressing all three pillars of sustainability

In general, respondents recognized the importance of sustainable agriculture and the need to incorporate economic, environmental and social priorities in achieving these ends. Reflecting the holistic nature of HM, almost two-thirds (64.12%) of respondents indicated that at least two of these areas had changed because of HM (Figure 3.1) and the great majority (90.8%) at least agreed that *'since adopting HM, we have made changes to farm more sustainably* (mean= 6.04, SE=0.06) (Table 3.8). Respondents also recognized that HM had contributed to '*a better understanding of how everything is connected on our farm'* (mean=6.00, SE=0.06)'such that 'All three areas have changed considerably and that change in any '(one) area will impact the others' (HM, 194). Another showed how futile it was to manage any one component without affecting the others:

> 'The three go hand in hand on our farm. For example, round bale grazing[1] is good for the environment as the cattle get to spread their own manure in the pasture all year long instead of only summertime. Round bale grazing is good for us socially as we are not bogged down with chores of feeding cattle everyday. Economically it saved diesel fuel and wear and tear not having to feed daily' (HM, 242).

In affirming the importance of all three pillars, one producer communicated how HM helped establish management decisions that promoted them all:

> 'All three aspects of these three pillars of sustainability affect one another. We began farming organically shortly after taking the HM course and have seen improvements in all three areas on our farm and in our lives since then. We would likely still not be farming today if taking the HM course and forming a goal had not given us the courage to switch to organic farming' (HM, 97).

This goal was established early in the planning process 'because true sustainability is built into your goal - you cannot move forward in one area without impacting all areas' (HM, 237). These insights combined importance contradicts the findings of den Biggelaar and Suvedi (2000) who found that the majority of conventional and sustainable producers living in the north-central region of the U.S. overwhelmingly defined sustainability in an environmental and/or economic context, which, in turn the technological and economic centered solutions advocated by farm extension, researchers, and government policy (Allen, et al., 1991).

Producers also acknowledged the importance of thinking beyond the bounds of their own farms and the importance of HM for their larger communities and agriculture as a whole. Thus, most (91.3%) agreed that *'healthy rural communities (were) essential for sustainable agriculture'* (mean=6.06, SE=0.11), that *'Holistic Management is an important solution to rural decline'* (mean=5.88, SE=0.08) (Table 3.8). To that end, HM helped producers cope with BSE and were much more optimistic about the future of agriculture than were their non-HM counterparts (Yestrau, 2008; C5). Some recognized the importance of extending these networks of support even further; as one respondent from Alberta expressed, 'I believe that HM could provide a useful way of connecting

urban and rural populations with the potential of uniting people in a way of working towards a sustainable existence respectful of societies and the earth' (HM, 298).

3.5 CONCLUSIONS

This study is the first to systematically characterize Holistic Management and to assess to what degree it addresses all three pillars of sustainability. The strength of the HM model is that it is processed-based, thus empowering producers to evaluate the economic, environmental, and social implications of their decisions and actions against their previously established holistic goals. Networking and ongoing education is of central importance and, is allowing these producers to face unanticipated challenges and to interact with potential new members (Higgins, 1998).

These results confirm that Holistic Management is unique in that it actively addresses the social dimension of sustainability, within and outside the farm (Gafsi et al., 2006). On the farm, HM was used to improve the quality of life of farm families by increasing communication and facilitating greater participation of all family members in decision-making. Off-farm, HM contributed to new social networks in the forms of management clubs and a larger HM community across the country. Regardless of how healthy individual farms become, they cannot survive without healthy communities (Jaffe, 2003), many of which suffer from depopulation and a decline in infrastructure. The HM clubs help compensate for the decline in traditional forms of social support such as volunteering and sports clubs associated with rural depopulation.

HM separates itself from the other technology- and environment-centered approaches to agricultural sustainability that make little if any mention of the importance

of community. However, it should be noted that nothing precludes HM producers from making use of any of those technologies if consistent with their management goals. There has been much recent work on the importance of linking social with economic priorities (e.g., Government of Canada, 2004; Feenstra, 1997; Gertler, 2001). Socioeconomic and community economic development highlight the social, as well as economic capital that emerges from initiatives such as new generation cooperatives that at once benefit individual farm families and their larger communities (Stozek and McLachlan, submitted; Anderson and McLachlan, submitted). Yet even these generally make little explicit mention of the environment and its importance for these communities.

The practice of Holistic Management in Canada has developed as a grassroots response to challenges that confront farmers in North America. Instead of being conceived of and led by experts and developers of technology, it is largely driven by the producers themselves. The current rural crisis facing Canadian farmers requires innovative solutions that are locally self-sustaining. Holistic Management allows producers to take leadership roles in identifying priorities and addressing these challenges that are diverse in nature and can vary substantially from family to family. Although this movement has flourished in, and perhaps because of, the absence of governmental support, the lack of exposure and resources might potentially compromise the degree to which is communicated among and indeed adopted by other producers. Unlike the organic and more recent local food movements, HM has yet to capture the attention of potentially supportive consumers. There is a need for government policy and regulation in agriculture that recognizes and supports the practice of HM but that allows it to remain

producer-driven. To that end, HM represents meaningful hope to farmers and communities alike: a sense of hope that is rare in these rural landscapes.

Notes

1. Bale grazing involves harvesting forage as round bales, which are then moved to winter feeding sites on pastures where manure for crop fertilization is needed.

Table 3.1. Socio-demographic characteristics of holistic managers (% of each category for each variable)

Variable	All Combined (n=315)[a]
Province	
Alberta	49
Saskatchewan	36
Manitoba	15
Gender	
Females (%)	18
Males (%)	54
Both[b] (completed <30 - 70) (%)	28
Mean Age	
>55 years	33
40-55 years	52
<40 years	15
Education	
College/University	68
High School	24
Grade School	8
Farm Size (ha)	
>500 ha	46
100 - 500 ha	30
<100 ha	24
Livestock herd size[c]	
>500	17
250 - 500	23
<250	37
No Livestock	24

[a]The sample size for each variable will vary according to the number of missing responses [b]'Both' indicates that two individuals completed between 30% and 70% of the survey as a unit [c]Livestock is defined as any ruminant animal

Table 3.2. HM characteristics of holistic managers (% of each category for each variable)

Variable	All Combined (n=315)[a]
HM Course	
Yes	92
No	8
Length of time since course	
>10	47
5-10	27
<5	26
HM Club Membership	
Yes	41
Yes, but no longer	33
No	26

[a]The sample size for each variable will vary according to the number of missing responses

Table 3.3. Manager's motivations for practicing HM

Likert Question	Mean scores[a] (SE) (n=315)[b]
Take better care of the environment	6.45 (0.04)
Learn how to improve pasture and/or crop production	6.26 (0.05)
Make a profit	6.20 (0.05)
Improve family's quality of life	6.19 (0.06)
Incorporate other priorities beside those that are economic	6.13 (0.05)
Explore my interest in a new grazing method	6.00 (0.07)
Reduce dependence on chemical inputs	5.99 (0.08)
Learn what others who have had HM training know	5.96 (0.06)
Establish goals as a family	5.96 (0.06)
Involve children with farm decisions	5.41 (0.08)
Get out of debt	5.11 (0.10)
Be on the leading edge	4.58 (0.10)

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'.

[b] The sample size for each variable will vary according to the number of missing responses

Table 3.4. Manger's perceptions of environmental changes to pastures since practicing Holistic Management.

Likert Question	Mean scores[a] (SE) (n=315)[b]
I have noticed an increase in litter	6.00 (0.07)
There has been in increase in vegetation cover in my pastures	5.93 (0.06)
When I look across my pastures, I can see less bare soil as a result of our grazing system	5.87 (0.07)
I have noticed a decrease in soil erosion by wind and/or water	5.67 (0.09)
Livestock manure now decomposes more quickly	5.50 (0.07)
There has been a noticeable increase in the soils ability to infiltrate water	5.48 (0.08)
I have noticed an increase in native grass species	5.39 (0.08)
I have noticed more wildlife on my land	5.20 (0.08)
I have noticed a decrease in noxious weeds compared to previous system	5.26 (0.09)

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'.

[b] The sample size for each variable will vary according to the number of missing responses

Table 3.5. Changes in farm expenses as a result of practicing Holistic Management (% of each category for each variable)

Variable	Percentage Change[a] (n=315)[b]
Water development	46
Fencing	35
Education	33
Business travel	14
Phone	12
Wages	-5
Trucking	-9
Insurance	-10
Labour	-11
Interest	-12
Vet bills	-21
Equipment mainteance	-25
Fuel	-30
Equipment repairs	-30
Seed	-34
Equipment purchase	-38
Pesticides and fertilizers	-51

[a] Negative values in percentages represent decreases in expenses and positive values represent increases [b]The sample size for each variable will vary according to the number of missing responses

Table 3.6. Likert question response of managers to the benefits and challenges of practicing Holistic Management

Likert Questions		Mean scores[a] producers no longer belong to HM club (SE)	Mean scores[a] producers presently belong to HM club (SE)	Mean scores[a] of all producers (SE)
Benefits	In general, I have gained more knowledge	5.93 (0.12)	6.46 (0.06)	6.27 (0.06)
	Allows me to consider different alternatives to a problem I am trying to solve	5.80 (0.12)	6.29 (0.06)	6.11 (0.06)
	Meeting with the group has been important in supporting the practice of HM	5.60 (0.16)	6.43 (0.07)	6.15 (0.08)
	Has provided support for management problems or questions I may have	5.58 (0.16)	6.28 (0.07)	6.04 (0.07)
	Helps me better deal with stress	5.30 (0.15)	5.83 (0.09)	5.65 (0.08)
	Even with the advent of the BSE crisis, there is a positive mood when we meet	5.15 (0.17)	6.07 (0.09)	5.84 (0.08)
	Allows me to talk about personal problems I am	4.96 (0.17)	5.74 (0.11)	5.46 (0.10)
Challenges	We do not have a clear enough purpose for our group	5.35 (0.19)	3.26 (0.15)	3.95 (0.14)
	There are some members that the talk the talk but don't walk the walk	4.89 (0.18)	3.62 (0.15)	4.02 (0.13)
	There is a lack of interest from participants	4.78 (0.19)	2.40 (0.11)	3.18 (0.13)
	There is a lack of commonality among group members	4.64 (0.20)	2.59 (0.12)	3.24 (0.13)
	Our group no longer has any new ideas to share	4.39 (0.19)	2.53 (0.12)	3.10 (0.12)
	There just is not enough time to attend meetings	4.27 (0.22)	2.31 (0.10)	2.95 (0.12)
	There is too far of a distance to travel to meetings	4.24 (0.26)	2.49 (0.12)	3.05 (0.13)
	My group is limited in its ability contend with new crises	4.18 (0.20)	2.89 (0.13)	3.27 (0.12)
	There is an increase in "personal politics"	3.81 (0.21)	2.44 (0.12)	2.88 (0.12)
	There is a lack of trust among group members	3.54 (0.19)	2.22 (0.11)	2.64 (0.11)

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'.

Table 3.7. Changes in social-being of mangers' since practicing Holistic Management

Variables	Mean scores[a](SE) (n=315)[b]
I am happier with the direction in which my farm/operation is heading	5.95 (0.06)
I can better identify what is important in my life	5.93 (0.05)
I cope with new problems to a greater extent	5.72 (0.06)
I have built new connections with other HM farmers/practitioners	5.68 (0.08)
Family members are more likely to communicate with one another	5.43 (0.07)
I spend more time with family	5.42 (0.07)
My stress level has reduced	5.33 (0.08)
I now involve my children in making decisions for the farm/operation	5.01 (0.09)
I have adequate support from my non HM neighbours	4.39 (0.09)

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'. [b] The sample size for each variable will vary according to the number of missing responses.

Table 3.8. Perceptions of sustainability by managers' since adopting Holistic Management

Variables	Mean scores[a](SE) (n=315)[b]
Healthy rural communities are essential for sustainable agriculture	6.06 (0.11)
Since adopting HM, I have made changes to farm more sustainable	6.04 (0.06)
I have a better understanding of how everything is connected on our farm	6.00 (0.06)
Holistic Management is an important solution to rural decline	5.88 (0.08)

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'. [b] The sample size for each variable will vary according to the number of missing responses.

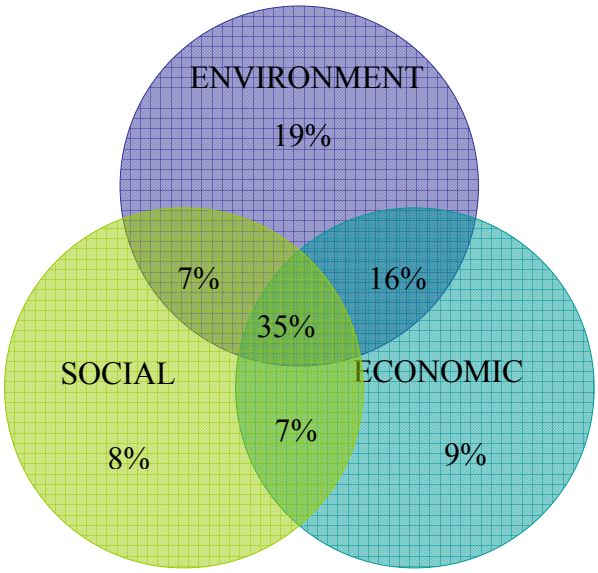

Figure 3.1. Categorization of the impacts of practicing Holistic Management by producers in respect to the three dimensions of sustainability (n=208).

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CHAPTER 4: BSE, Holistic Management, and Adaptation

4.1 ABSTRACT

Farmers and rural communities across Canada have been devastated since bovine spongiform encephalopathy (BSE) was identified in Alberta in May 2003. The immediate trade restrictions and closing of the US/Canada border to Canadian beef had huge implications for the livestock industry, especially at the farm-level. Not only were farmers trying to cope with the BSE crisis, they were also contending with declining rural populations and record low farm incomes. Holistic Management (HM) is an important grassroots initiative that is now practiced on 30 million ha across four continents. The goal of this study was to contrast the impacts of BSE on HM and non-HM producers and to explore the potential of HM for adapting and dealing with rural crises such as BSE. Data were collected from 315 HM producers and 1,470 non-HM producers living in western Canada using a mail out questionnaire. Overall, the major impact of the BSE crisis was economic in nature, but there were also substantial social impacts. The multiple stressors experienced by producers challenged their ability to adapt. However, HM producers were much less affected by the BSE crisis than their non-HM counterparts, and were significantly more confident in the future of the livestock industry. Community involvement, within the family and lager community, and farm management techniques, such as rotational grazing and subsequent support of the management club, were identified as factors that helped HM producers adapt to BSE. Indeed, for many HM producers adapting and confronting the crisis made them more resilient. The results highlight the importance of community driven approaches used by farmers to proactively mitigate the many challenges they face in the agricultural sector.

4.2 INTRODUCTION

Background

On May 20, 2003, a BSE-infected cow was discovered in Canada, which had severe and unanticipated consequences for the livestock industry (Leiss and Nicol, 2006). Over 40 countries immediately imposed import restrictions (Leiss, 2003); the most significant of which was the immediate closure of the Canada/US border to movement of beef products and live cattle from Canada. Canada's domestic meat packing plants were unable to handle the resulting oversupply of live cattle over the next 18 months (Senate, 2004). In August 2003, the US lifted their ban on boneless meat from cattle less than 30 months old; however, it was not until July 2005 that live cattle less than 30 months of age could be imported to the US.

The impact of BSE (bovine spongiform encephalopathy or Mad Cow Disease) put the livestock industry and indeed rural Canada into turmoil (Senate, 2004). There was an immediate drop in farm cash receipts for cattle and calves from CAD 5.2 billion in 2002 to CAD 2.5 billion in 2003 (Mitura and Di Piétro, 2004), which by 2005 had resulted in direct and indirect costs to the economy that surpassed CAD 5 billion (Leiss and Nicol 2006). The impacts were greatest in Alberta, Saskatchewan and Manitoba as these provinces contain two-thirds of Canada's beef cattle farms (Mitura and Di Piétro, 2004). The Canadian government allocated CAD 312 million to create a BSE Recovery Program as a short-term solution aimed to help producers through the resulting crisis. However, funding was directly tied to the number of cattle; ironically those having many cattle, including meat packers, benefited most from the program (LeRoy and Klein, 2005)

whereas small and mid-size operations were left relatively vulnerable (Ashraful and McLachlan, submitted).

BSE: a Canadian rural context

Impacts of BSE on farmers and rural communities, and indeed the GDP, are substantial (CAHC, 2003); however, rural communities across the prairies had already been undergoing a period of rapid transition and adversity (Senate, 2004). Between 1999 and 2001, the number of fulltime farmers decreased by 26%, the largest decrease in 35 years (Senate, 2002). Services including schools, banks and infrastructure including railways, and grain elevators continue to shut down (Macleod et al., 1998). Decreases in agricultural subsidies and increases in input costs result in increasingly slim profit margins for farms in the prairies, such that the net income for Canadian farmers in 2002 was $7.2 billion (Statistics Canada, 2004), which further resulted in farm foreclosures and bankruptcies (Boyens, 2002). And of all of this preceded bovine spongiform encephalopathy (BSE), which has further exacerbated the challenges facing Canadian farmers and has helped create “the worst farm crisis since the 1930s” (Qualman and Wiebe, 2004).

BSE: a global context

Bovine spongiform encephalopathy has had devastating economic impacts around the world, and, in many European countries, on human health. According to Charlebois and Labreque (2007), “the global spread of BSE stands as one of the most alarming socioeconomic and social welfare predicaments in modern time.” In the last fifteen years,

it has been one of the "highest-profile issues in animal health and food safety" (Leiss and Nicol, 2006). BSE belongs to the family of transmissible spongiform encephalopathy (TSE), including chronic wasting disease (CWD) in deer and elk and scapie in sheep and goats. In 1986, spongiform was first discovered in the brains of cattle in Southern England. BSE resulted in the eventual infection of more than 185,000 cattle, the slaughter of 18 million cattle (USDA, 2003), and the infection 135 people with its human variant Creutzfeldt-Jacob disease (vCJD) (Hill et al., 1997). In 1996, domestic beef consumption in the UK dropped by 30% (Fox and Peterson, 2004), and an inquiry into BSE and variant CJD in the United Kingdom estimated the total net cost of the crisis at £3.7 billion (Lord Phillips, 2000). Its primary means of transmission to cattle is feed contaminated with rendered material from other BSE-infected cattle (USDA, 2003), and there is strong evidence that BSE-contaminated food is responsible for vCJD in humans (Knight, 1998). The initial denial and subsequent mismanagement of the disease by British authorities (Gerodimos, 2004) allowed for the continued transport of contaminated feed and diseased animals throughout Europe, the Americas and Asia (Langford, 2002). Infected cattle have now been found in 30 countries and the OIE (Organization Internationale des Epizooties) has developed science-based guidelines for managing the disease that have been approved by 167 countries (OIE, 2007).

BSE and adaptation

The farm-level impacts of and responses of rural residents and producers to BSE have yet to be systematically examined in Canada, or for that matter anywhere in the world. Published social research on BSE has focused on risk perception of consumers

(e.g., Setbon et al., 2005; Weitkunat et al., 2003; Lanska, 1998; Miller, 1999); the role of urban media in risk communication (Richmond, 1997; Kitzinger and Reilly,1997); and consumer behavior (Sinaceur et al., 2005; Berg, 2004; Harvey et al., 2001). In the science literature, BSE and vCJD research has largely focused on the disease and its transmission (Knight, 1998; Horby, 2002; Wilesmith et al., 1991). These studies reflect the heightened concerns regarding human health and consumer reactions as first shaped by the BSE crisis in the UK. In Canada, by contrast, the BSE crisis has not been a human health concern but primarily one of economics. Recent studies on the Canadian BSE experience have focused on risk communication and management (Leiss and Nicol, 2006), crisis management and food safety (Charlebois and Labrecque, 2007); US Canada trade relations (O'Neil, 2005); post BSE marketing (Rude et al., 2007); and public policy (LeRoy and Klein, 2005). Yet none has focused on farmers or rural communities, despite substantial impacts that have been widely reported in the media, especially in the farm press. This study will examine the vulnerability and adaptive responses of western Canadian producers to BSE, especially those practicing HM.

Vulnerability and BSE

Vulnerability is closely linked to the concepts of sensitivity and adaptive capacity (Reid et al., 2006; Yohe and Tol, 2002; Smit and Wandel, 2006), and these concepts have been discussed extensively in the recent climate change literature. Although there is no single accepted definition of vulnerability (Fussel, 2007, Kelly and Adger, 2000), the IPCC (2001) defines vulnerability as

> "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climatic variation to which a system is exposed, its sensitivity, and its adaptive capacity."

The sensitivity of a system reflects the extent that is affected, while adaptive capacity refers to the systems ability to adjust (Smit and Wandel, 2006).

In their review of the food security, natural hazard, and climate change literature, Kelly and Adger (2000) observed that the human dimension was often missing from these studies and thereby emphasized the importance of individuals and social groupings when responding to external stressors that affect their livelihoods and well-being. Smit et al. (1999, 2000) suggest that three questions underlay adaptations to climate change and other stressors: (i) adaptation to what? (ii) who or what adapts? and iii) how does adaptation occur? When trying to determine what is being adapted to, the nature of climate related stimuli must be determined in its full complexity. Thus, adaptation in agriculture may reflect a chain of stressors that begins with changes in precipitation and moisture conditions, which in turn affect drought, then crop yields and finally incomes (Smit et al., 1999). In most empirical agricultural adaptation studies the system is explored at the farm level (Belliveau et al., 2006; Reid et al., 2006; Bradshaw et al., 2004) although processes that underlie adaptation can operate at multiple scales of organization. While this framework has been developed for agricultural adaptation to climate change and variability, it is applicable to other global environmental changes,

such as the spread of animal disease, especially when they combine with other climate-related stressors.

Farmers have been responding and adapting to global environmental change for centuries. Although change may be occurring on a global level, agricultural adaptation focuses on decision making about changing conditions at the local or farm level (Bryant et al., 2000). In western Canada, political, economic, climatic and technological factors are responsible for substantial changes in agriculture (Bradshaw et al., 2004). Numerous studies have examined the agricultural impacts and subsequent adaptations to climatic variation and change in Canadian rural communities (e.g., Bradshaw et al., 2004; Bryant et al., 2000; Wall and Morzall, 2006; Belliveau et al., 2006; Reid et al., 2006; Smit et al., 1996). Producers operate within a multi-stressor environment and assessing producer adaptations specifically to climate change is challenging (Belliveau et al., 2006; Bradshaw et al., 2004) and the cumulative effect of many different stressors can affect the vulnerability of producers (Belliveau et al., 2006). When examining the "double exposure" faced by the agricultural sector in India, O'Brien et al. (2004) examined the regional vulnerability to climate change along with other global stressors, particularly those associated with poverty. Although adaptations, like the stressors themselves, can be multi-fold in nature and operate at multiple scales of organization, many empirical studies use 'bottom up' approaches to explore the circumstances that affect the producers and their adaptive responses, factors that influence their responses, and the role of these responses in mitigating future risks (Smit and Wandel, 2006; Belliveau et al., 2006). These small-scale approaches recognize that the impacts and responses are often most strongly felt at the local and regional level and acknowledges the rich local knowledge of

rural communities in shaping these responses, these sometimes occurring in isolation from governmental responses.

Holistic Management and BSE

Although agricultural adaptation is often viewed as expert-based and technological in nature, community and socially driven responses also play an important, albeit underappreciated, role. One such rural grassroots response has been the adoption of Holistic Management (HM) across North America. Farmers are now applying HM to over 30 million acres of agricultural land around the world (Holistic Management International, 2007). Initially developed by Alan Savory (1999), HM is a decision-making model that emphasizes the connection between environmental, economic, and social well-being. At first, the managed system needs to be described as a whole, by identifying any decision makers, the physical resources that generate revenue or support, and the money resulting from the resource base. The subsequent development of a three-part holistic goal focuses on quality of life, forms of production and future resource base, this holistic goal driving and guiding every significant management decision (Savory, 1999). Possible solutions to management challenges are subjected to a number of testing guidelines and the final decision is then continually monitored. Management clubs are often created to help support the ongoing practice of HM, these usually emerging from courses taught by certified Holistic Management educators, often farmers themselves. Although, the HM framework is adaptable to any livelihood, it is most commonly employed by livestock producers (Stinner et al., 1997).

The premise behind HM is, by definition, one of holism. This holistic approach to decision making contrasts strongly with the reductionist approach that dominates and give rise to conventional agriculture (Stinner et al., 1997). Yet, the numbers of those practicing HM continue to grow, especially in the US where rural organizations, agencies, and universities have played an important role in its promotion (Francis 1999; Nerbornne and Lentz, 2002). In Canada, the role of agencies and universities has been substantially smaller, yet, rural communities have compensated and thus the adoption of HM continues to grow. In February 2007, the first Western Canadian Holistic Management Conference was held in Brandon, Manitoba and organized largely by local producers. The sold out conference featured producer panels, a motivational speaker, and board members from Holistic Management International. Although this was the largest HM conference in Canada, over the last 20 years producers from across Canada have been organizing field days and other events to promote HM.

Despite the widespread popularity of HM, very little research has been conducted on this topic and there has yet to be a comprehensive study on the movement much less its role in adapting to crises such as BSE. Studies that do exist have focused on economical and environmental benefits, the latter including changes in such as increases in biodiversity (Stinner et al., 1997; Nerbornne & Lentz, 2002), as well as the role of HM along with organic farming as proactive farming practices that may provide meaningful alternatives for producers (Duram, 1997).

My research explores to what degree Holistic Management represents a viable solution for adapting to and dealing with the many ongoing crises that plague agriculture in Canada and beyond, whether they be social, economic, or biophysical in nature. The

three main objectives of this study are to (1) examine and contrast the impacts caused by the BSE crisis on HM and non-HM producers, (2) explore how adaptation occurs amongst HM producers to BSE at the farm level, and (3) investigate the potential of HM in future adaptations to unanticipated crisis events. Although focused on farmers in western Canada, this study could be relevant for producers and rural communities adapting to environmental changes around the world.

4.3 METHODS

Description of study area

The study area, located in western Canada, includes the provinces of Manitoba, Saskatchewan, and Alberta. This region comprises three main Ecozones: the Prairie Ecozone, Boreal Plains Ecozone, and the Boreal Shield. The subhumid to semi-arid climate of this region is dominated by cold winters (average -9.4 ^{o}C in Lethbridge, AB and average -18.3 ^{o}C in Winnipeg, MB) and short warm summers (average 16.1 ^{o}C in Edmonton, AB and average 19.7 ^{o}C in Winnipeg). Annual precipitation across this region is highly variable, ranging from as low as 250 mm in southeastern Alberta to less than 700 mm in the Lake Manitoba Plains (Environment Canada, 2005).

Western Canada comprises 49.2% of all farms in Canada, and from 2001 to 2006 there was a 10.0% decline in the total number of farms across these three provinces (Statistics Canada, 2007). The greatest decrease in farm numbers was Saskatchewan (12%), followed by Manitoba (10%), and then Alberta (8%) (Statistics Canada, 2007). Although Canada is considered a field-crop growing country, almost two thirds (64.5%) of western Canadian farms were comprised of beef ranching and farming (including

feedlots) and, indeed, this region alone represents 72% of Canada's total number of cattle and calves. The average number of cattle and calves in western Canada on Census day 2006 was highest in Alberta at 221 head, followed by Saskatchewan at 160 head, then by Manitoba with 154 head (Statistics Canada, 2007). Producers from Western Canada employ various soil conservation practices, and 54.9% of livestock producers reported practicing rotational grazing (Statistics Canada, 2007).

Data collection techniques and sampling procedure

A mixed methods approach (Creswell, 2003) that incorporated the collection of quantitative and qualitative data was used to explore the impact of and responses to BSE on farmers and rural community residents practicing Holistic Management. Individual and group interviews were conducted with HM producers and other stakeholders in the fall of 2005, in part to help better understand HM and to inform the subsequent design of a questionnaire. Themes explored for the questionnaire included the environmental, social and economic implications of practicing HM, the role of management clubs in achieving these ends, and the exploration of HM as an adaptive response to BSE. The survey was pre-tested with HM producers in Manitoba and the feedback used to construct a final survey instrument. A list of addresses was compiled from mailing lists obtained from certified Canadian Holistic Management educators who generate revenue from teaching HM courses. Questionnaires were only sent to those who were known to practice HM at some point and/or those who had taken a HM course. Study design was approved under the Joint-Faculty Human Subject Research Ethics Board Protocol at the University of Manitoba (No. J2005:059). To increase response rates, extra steps were

taken in the design of the survey instrument including hand-addressing all envelopes; a cover letter was signed by the researchers; postage stamps; and an incentive coupon from a national coffee chain (Dillman 2000; Fink, 2003; Folwer, 1995). On 13 February 2006, 792 of the 12-page surveys were sent to HM producers across western Canada followed by reminder postcards at one and two-week intervals, respectively.

Data from a '*BSE and Farmers'* survey, also conducted through the Environmental Conservation Lab at the University of Manitoba, was used to assess similarities and differences between HM producers and non-HM producers living in western Canada. The non-HM survey was designed to assess the socioeconomic and environmental impacts and resulting adaptive responses of agricultural producers across western Canada. A similar data collection technique was used to that of the HM survey, in that individual interviews and focus group interviews were initially conducted with livestock producers, in part to help inform the construction of the survey instrument (see McLachlan & Stozek (2006) for more detailed methodology). However, the sampling procedure differed for the non-HM survey as the sample size was much larger than the HM survey. A random stratified approach was taken, these strata being cattle production density and proximity to the nearest federally inspected slaughterhouse. Low and high cattle production was defined as 0-21 cattle km^{-2} and 22-65 cattle km^{-2}, respectively. A 150 kilometer buffer zone radius, centered on federally inspected slaughterhouses in each province might sufficiently distinguish any advantage producers or communities with respect to slaughterhouse access. All census districts (CDs) from Alberta, Saskatchewan and Manitoba featuring at least some agricultural production were assigned to these four strata. Two CDs were randomly selected from each of the strata in each of the three

provinces (*n*=24). Although provincial mailing lists are available for Alberta, none were available for either Saskatchewan or Manitoba therefore the non-addressed admail service at Canada Post had to be used to access "farm households". Rural post offices were randomly selected throughout each test CD such that no one post office exceeded 80 farms and such that the total for each CD was 400-410 farms. On 21 February 2006, 9,713 10-page surveys were mailed to these post offices across the 24 test CDs for subsequent distribution to the farms. The surveys were followed up at 10-day intervals by a reminder postcard and then a four-page reminder survey consisting of a subset of the questions selected from the larger questionnaire.

Both questionnaires were designed using Likert scale and open-ended questions. The former consisted of a 7-point scale ranging from 'strongly disagree' to 'strongly agree', whereas the latter gave respondents an opportunity to provide responses in their own words. A subset of questions that assessed the impacts of BSE was included in both the HM and the non-HM survey, thus allowing us to directly contrast the responses from the two groups of producers. Both surveys took approximately 30-60 min to complete.

Questionnaire response

In total, 315 Holistic Management surveys were returned, representing an overall adjusted response rate of 50.7% whereas for the larger non-HM survey 1,470 surveys were returned, resulting in a 33.3% adjusted response rate. Using 12 questions selected from the original questionnaires, a telephone survey was conducted with 20 responders and 20 non-responders regarding the HM questionnaire. With respect to the non-HM survey, five responders and five non-responders were contacted in each of the four

sample strata in all provinces. In addition, those that had not responded were asked to indicate reasons for their refusal. There were no significant differences in response between responders and non-responders for the HM survey (P=0.326) and the non-HM survey (P=0.824). Lack of time and cynicism about research were cited as reasons for not responding to both surveys. With respect to the non-HM survey, most non-responders (83%) simply did not recall receiving a survey at all, indicating that they had likely discarded the surveys assuming they were junk mail.

Data analyses

Comparison between HM and non-HM survey respondents

Socio-demographic variables from the HM survey and non-HM survey were summarized and assessed for homogeneity of variance using Levene's Test for equality of variance in SPSS Version 10 (SPSS, 1999). Variables included province, hectares of land, number of livestock, age, work situation, level of education, and the economic standing of respondents (Table 4.1). The HM survey approached gender in a unique manner that recognized the whole-family planning philosophy emphasized with the practice of HM, excluding a direct comparison of gender response between the two surveys. If two respondents had completed the survey together, they were each given the opportunity to answer the demographic questions independently and were asked to indicate what percentage of the survey they had each completed. Any two people completing 30 to 70% of the survey as a team were classified in the gender category as 'both'. The both category included female/male, male/male, and female/female combinations; however, 98% of those responding to the both category comprised were

female/male pairings. For the variables of age, work situation, and level of education, values were calculated by taking the proportion of the surveys completed by each individual multiplied by the corresponding variable and added together. Means and standard error were calculated for all these variables and compared using t-tests (SPSS, 1999).

There were substantial differences in the socio-economic status of respondents to the HM and non-HM surveys, in particular with respect to age, work, education, and economic stability (Table 4.1). Although HM respondents were roughly comparable in age to non-HM respondents (50.3 vs. 52.9 years), they were more financially stable, and had higher levels of formal education. Interestingly, HM producers were also more likely to work off-farm, likely reflecting the much higher percentage of female respondents in the HM survey (17.8% vs. 9.1% for the non-HM survey). In contrast, no significant differences were found in geographical location, land base, or number of livestock between HM and non-HM respondents.

Twelve socio-demographic, farm, and HM-related variables were selected to represent independent variables that could be used in subsequent model building (Table 4.2). These included year taken HM course, HM management club membership, province, hectares of land, crop diversity, number of livestock, age, work situation, gender, level of formal education, economic standing, and community mindedness. To determine respondent's level of community mindedness, participants were asked to rank the importance of various character attributes when adapting to BSE, one of which was community support. If respondents ranked community support in their top third of these characteristics, they were identified as community minded and if community support was

ranked in the bottom third, they were labeled as individually minded. A Spearman rank correlation matrix was used to assess multi-colinearity among these independent variables, and since no two variables had an $r > 0.7$, all were retained for analysis.

Factors underlying HM producers concerns toward BSE related issues

Factor analysis (varimax rotation) was used to identify the impacts and responses of HM farmers and rural residents to the BSE crisis (SAS Version 9.1, SAS Institute Inc., USA). Any loading on a factor that was at least 0.400 was assigned to a factor. The alpha coefficient was calculated to test the reliability of the Likert scale (Cronbach, 1951). Any alpha values >0.60 are considered satisfactory for internal consistency of a scale and appropriate for variable reduction (George and Mallery, 2003). Results of the factor analysis indicated that three factors could be extracted from the 17 BSE-related variables, these being Community (Factor 1), Impacts (Factor 2), and Farm Management (Factor 3). Cronbach Alpha values for Factors 1, 2 and 3 were 0.83, 0.70, and 0.65, respectively; the corresponding eigenvalues were 3.06, 1.91, and 1.16, respectively, and accounted for 99.8% of the variance in the data (Table 4.3).

HM surveys with no missing responses (n=258) were sorted into low, medium, and high categories using the scores from each factor. A binary response was created by eliminating the middle 33rd percentile (n=172) for subsequent logistic regression analysis using Akaike's information criterion (AIC). Unlike traditional hypothesis testing involving a null hypothesis, AIC is used to generate and compare multiple working hypotheses (Akaike, 1987; Anderson and Burnham, 2002). A set of models were identified that consisted of different combinations of independent variables thought to

affect BSE related challenges that confront producers. These models were generated from *a priori* hypotheses (Burnham & Anderson, 2004) garnered from the literature and from our extensive work with rural communities across western Canada. In order to compare models, Akaike's information criterion difference with small bias adjustment (Δ AIC) and the Akaike weights (w) were used to evaluate the strength of evidence supporting each model. The Δ AIC is a measure of each model relative to the best model. Burnham and Anderson (2002) advocate that a level of substantial support for a particular model occurs when the Δ AIC<2. The Akaike weights are also useful in providing a measure of the relative importance of a variable as it is used to indicate the probability that the model is the best among the whole set of candidate models (Anderson et al., 2000). The cumulative weights (AICc) for each independent variable thought to influence BSE related risk by summing the AICc model weights of every model containing that variable (Burnham and Anderson, 2004). Summation of the Akaikie weight's confirmed that variables with the largest AICc weights have the greatest influence on BSE related impacts and responses.

4.4 RESULTS

Impacts associated with BSE

Impacts associated with BSE will be summarized first, these separating on Factor 2. At one extreme, these impacts were associated with stress and worry, were long-standing, and had negative repercussions for the larger community. Indeed, the statement '*stress and worry increased within my community'* (mean= 5.65, SE= 0.07) was ranked highest by HM producers (Table 4.4). Many spoke of the financial stress caused by the

BSE crisis: 'The BSE issue impacted me very much as my income dropped substantially. Mostly I just made due with less' (HM, 271). One producer from Manitoba shared a similar experience 'BSE has had a direct impact on our profit margins and managing post BSE is a daily challenge' (HM, 56). Likewise, an HM producer from Alberta commented, 'Nothing can prepare you for that (BSE), you just go into survival mode' (HM, 133).

Other producers indicated that the impacts of BSE were aggravated by other coinciding stressors, many of which were associated with changes in climate: 'we were severely hit with drought and grasshoppers before hit with BSE' (HM, 10). Similarly, another producer from Alberta described how 'years of drought and then BSE has made it very difficult' (HM, 195). These multiple stressors described by producers have also been documented elsewhere in the literature. Belliveau et al. (2006) describe how climatic stimuli alone may only constitute a moderate risk, but when combined with other stresses may represent a considerable vulnerability to producers. Reacting to multiple stresses concurrently may also pose challenges to farmers' ability to adapt as they are 'double exposed' (O'Brien et al., 2004). Indeed, Bradshaw et al. (2004) concluded that one of the barriers in understanding farmer adaptation to climate change is the complexity in accounting for non-climatic risks. It is apparent that single stressors or risks cannot be examined in isolation. In exploring the impact of the BSE crisis on producers, it is thus important to incorporate the impact of weather or pests in addition to other stresses associated with rural decline. Producers make management decisions amidst various and interacting climatic, environmental, market and economic forces (Reid et al., 2007).

The impacts of BSE were also recognized as long-term in nature, and the great majority (83.1%) agreed with the statement that *'the effects of BSE will continue to affect rural communities in the future'* (mean=5.40, SE=0.07). This contrasts strongly with the media coverage of BSE, which assumed that the crisis was over when the border between the US and Canada reopened in 2005. The impacts of BSE were so severe for some producers that they were simply unable to continue farming. As one producer from Alberta declared, 'Not farming - three years of drought and especially Mad Cow' (HM, 152), a response similar to another from Manitoba who stated 'When BSE came we just quit farming completely' (HM, 137). According to Statistics Canada (2007), between 2001 and 2006, the number of beef farms dropped by 10.2%, many of these producers declaring bankruptcy or ceasing their operations completely during the first year of BSE (Charlebois and Lebrecque, 2007). Exiting from farming was one of the three main adaptive strategies shown by producers in western Canada in response to BSE crisis, either by downsizing and pursuing off-farm employment or, indeed, by leaving the industry completely (Anderson et al., 2007).

Producers and rural community residents are not a homogenous group, and impacts of BSE varied widely among respondents. Perceptions of or sensitivity to outside or 'exogenous' forces reflecting both personal and farm characteristics (Smit et al. 1996) can influence the ability of producers to implement various adaptive responses (Bryant et al., 2000). To further explore the impacts of BSE, plausible models were constructed from the independent variables using AIC (Table 4.5). The best model included two variables: economic well being (ECONO) and gender (GENDER); the cumulative AICc value for each variable was 0.99, and 0.57, respectively (Table 4.6). Respondents that

were least economically well off suffered the greatest impact from BSE, and the impact declined as well-being increased (Table 4.2). With respect to gender, respondents completing surveys together perceived a higher impact to the BSE crisis in comparison to men or women alone; 98% of those filling in surveys together were a man and women (Figure 4.2). As one Manitoba couple indicated 'BSE has put a considerable financial and emotional strain on us and our ranch' (HM, 221). Little work has been conducted on the role of gender in rural adaptation, much less BSE (Thurston and Amaratunga, 2007). Subsequent interviews with respondents suggested that men and women had diverging views of the impacts, reflecting the strong gender roles that characterize rural communities in western Canada. Male respondents seemed to focus more on management concerns and women on the social changes and community, which may have resulted in a more holistic picture when surveys were completed together.

HM vs. non-HM producers

Both HM and non-HM producers strongly agreed that '*BSE poses extremely low public health risks'* (mean=6.11, SE=0.08 vs. mean=6.17, SE=0.04) (Table 4.4). There was also a shared level of strong disagreement that *'BSE is an issue of the past'* (mean=2.78, SE=0.09 vs. mean=2.49, SE=0.05). When it came to the statements regarding people relying more on others in the community and support for local business increasing, both HM and non-HM producers were equivocal in their responses (Table 4.4).

However, substantial differences occurred in response from HM and non-HM producers regarding both the immediate and long-term impacts of BSE. Interestingly,

non-HM respondents were significantly ($P<0.0001$) more likely to feel that stress and worry had increased (mean= 6.33, SE = 0.03 vs. mean=5.65, SE=0.07), that the effects of BSE would persist into the future (mean=5.6, SE=0.04 vs. mean=5.40, SE=0.07), and that BSE had negative impacts on community (mean=6.29, SE=0.04 vs. mean=5.26, SE=0.08). Differences in outlook between the two groups are most likely attributable to the adaptive strength of HM. As one Manitoban HM producer shared: 'due to my exposure to HM I have met and made so many fantastic contacts and as a result of this have experienced great personal growth that I was more able to deal with the BSE crisis' (HM, 150). The HM producers were also significantly ($P<0.0001$) more confident about the future of the Canadian livestock industry (mean=5.51, SE=0.09 vs. mean=5.06, SE=0.05) (Table 4.4). As an HM producer from Alberta indicated:

> 'HM allowed us to hold back our cattle for two years. By 2005 we had doubled our herd and fed more cattle per acre than our non HM neighbours. Without HM we would have had to sell in 2004 and we would have taken a financial beating' (HM, 115).

With respect to government, HM producers were somewhat critical of the governmental responses to the crisis, more so than non-HM producers (mean=3.32, SE=0.12 vs. mean=2.79, SE=0.05). As one HM respondent from Alberta expressed 'the government programs certainly help although they are usually far behind the fact' (HM, 271). Although government safety-nets often act to reduce the vulnerability of producers, with the ever changing nature of government programs and indeed the crisis itself, they can also be a source of exposure (Reid et al., 2007).

Another HM couple felt that governmental aid was inherently problematic.

> "Our belief is that most people will not make a change in their practices as long as there is always a government "safety net" program to rely on. For example, our neighbors made more money with the government funded BSE relief programs than those proactive people who took initiative to manage their own affairs for the betterment of their land and families" (HM, 61).

Duram (1997) also found that proactive alternative farmers in Colorado were less likely to participate in government programs as they relied on the diversity of their operation to sustain them through crises, and that this self reliance characterized many of the alternative (i.e., organic and HM) farmers.

RESPONSES

Adaptation as a response to the BSE crisis

The HM producers were generally more optimistic than their non HM counterparts. Although the former were obviously affected by the crisis, respondents were generally more hopeful, recognizing that these impacts could be overcome.

> 'We strive to educate ourselves about many issues – especially BSE and the decimation of our industry. Confidence in the health of our land and livestock and knowledge of the unjustified assault on our livelihood actually helped us remain assured that this can be overcome' (HM, 36).

Short term and long term decisions made to cope with impacts have been described as tactical and strategic responses, respectively (Smit et al., 1996). The latter are notable changes made to a farm operation that extend beyond a farm season (Smit et al., 1996), in this case, the adoption of Holistic Management. As reflected by one HM producer,

> 'Having a written goal and a direction that gets monitored frequently allows us the confidence to challenge previous ideas and make changes and adapt quicker. We now do a lot more acting instead of reacting' (HM, 199).

For some producers, adapting and confronting the crisis actually made them more resilient: 'I believe we are stronger after BSE than before it' (HM, 274). Other's attributed this resilience in their ability to plan ahead, as one couple responded:

> 'We set our profit that we want to make a year in advance and so far have met or exceeded our profit goals. BSE is no longer a controlling factor in our lives, but rather BSE is only one of many things to consider in our decision making process' (HM, 199).

This sentiment was echoed by another producer with respect to the long-term planning approach that characterizes HM: 'We were in a strong financial position going into the BSE crisis because of HM. HM also gave us a longer term view of the situation and allowed us to look past the BSE crisis' (HM, 194). Other producers spoke of BSE as creating opportunities, and described the role that HM played in their positive outlook.

> 'I feel that BSE also created opportunities and HM helped me to find these opportunities. It also helped me to feel confident with decisions I made. HM definitely reduced the amount of stress on the farm' (HM, 22).

Role of community in adapting to BSE

The role of community in adapting to BSE separated out on Factor 1, exhibiting a wide range of factors scores. At one extreme, producers were largely individualistic in nature, indicating: 'We do our own thing' (HM, 90). Some respondents were forced to seek off farm employment, and as a result had less time available for community interaction: 'I work off farm, so time is at a premium' (HM, 228). McCoy and Filson (1993) also found that those having off-farm work were less satisfied with their quality of life as they had less time to spend with family and friends.

At the other extreme, many producers were community-oriented, finding strength and hope from their relationships with family, the larger HM community and/or the surrounding rural communities. One couple from Saskatchewan reflected, 'We took the BSE situation and turned it into an opportunity to develop/strengthen our team and probably wouldn't have been able to see that opportunity without HM' (HM, 211). Another felt that 'by keeping a positive attitude and having positive friends it was easy to stay focused on the big picture rather than the small blips in time' (HM, 176). In identifying adaptations to stress in farm and ranch families, Carson et al. (1994) found that high levels of family hardiness, the degree to which families communicate and work together to problem solve, corresponded with successful adaptations resulting in an improved quality of life.

To further explore community responses to BSE, plausible models were constructed from the independent variables using AIC (Table 4.7). The summation of the Akaike weights resulted in a value of 1.00 for the community mindedness (COMM), 0.60 for gender (GENDER), 0.57 for age (AGE) and 0.41 for work situation (WORK) (Table 4.6) and comprise the best model (Table 4.5). HM producers who were more community minded seemed to be especially able to adapt to the challenges posed by BSE (Figure 4.3). One HM producer linked this relationship to strong community support and decision making.

> 'HM has reinforced goal setting as an exclusive priority for every decision in our family's every day life as well as the farm. This is important because we focus on being informed and making sound business decisions with our entire family as well as the community' (HM, 56).

Although relationships with non-HM neighbours were not always easy, some indicated that the HM practices elicited some interest.

> 'We see the neighbours adapting to some of our practices, our family has become closer and more encouraging. We are not experiencing much problem navigating the squeeze on agriculture' (HM, 293).

Another farm family simply stated 'We may have aroused jealousy in some of our neighbours' (HM, 293). In their interviews with HM producers in the United States, Stinner et al. (1997) similarly found that HM producers "were considered odd by their

immediate neighbours." Despite these differences many HM producers felt overall that they had strong community support in coping with the BSE crisis.

For many respondents, community involvement stemmed from meeting others in the larger HM community or the often tight-knit HM clubs they joined: 'HM has been a good direction to go. The group socializing has been excellent. We've met great people…' (HM, 172). Over 60% of the respondents had belonged to a management club at some point in time, these generally consisting of 4-6 farm families that met on a monthly basis. For many, these clubs became a major source of support for not only the practice of HM, but also in dealing with the challenges associated with BSE.
Many respondents explicitly indicated the importance of the club during these times of crisis:

> 'We had a group and a network of positive thinking people who look for solutions to problems rather than dwell on what is going wrong. Through them we found ways to lower our cost of production. The group was also a positive place to be when everyone in the coffee shop wasn't' (HM, 220).

Not all HM producers were part of management clubs; for some there simply was not a club close by or for a variety of reasons their club stopped meeting. One producer commented:

> 'My sense is that most of us were already busy with other community groups and involvements. No one had the energy to keep going after the first couple of years and from my perspective people were content to let it just become a social gathering rather than use it as a working gathering to identify challenges, brainstorm solutions, and keep managing holistically' (HM, 99).

With respect to gender, men and women responding alone were associated with greater levels of adaptability than those responding as couples (Figure 4.4). This, in part, might again reflect the greater adverse impacts perceived by these double-respondents. The relationship between adaptation, community mindedness and gender was most apparent in the respondents who associated with low levels of adaptability (Figure 4.5a). Indeed, 43.8% of females, 77.8% of males and 73.5% of those completing a survey together ('both') were characterized by low levels of i) adaptability and ii) community mindedness, i.e., 'individualist. In contrast, high levels of adaptability were not strongly associated with any specific level of community mindedness (Figure 4.5b). For example, female respondents were community minded (27.3%), mixed (36.3%) and individualist (36.4%). Our finding that women who perceived a greater ability to adapt were both individualistic and community minded is supported by the findings of Chiappe and Flora (1998).

Some female respondents found that HM provided a level of support that helped them cope with their non-traditional gender roles: 'HM allowed me, a single woman, to successfully take over and run a farming business on my own' (HM, 85). Trauger (2004) also found that women functioning as primary farmers were attracted to a sustainable agriculture that was less reliant on chemical use and mechanization. Another woman commented on the impact of HM on her daughter. 'It is interesting to note that it was the HM course which made our oldest daughter feel that a living in agriculture is possible' (HM, 79). Chiappe and Flora (1998) interviewed 27 Minnesota farm women involved in sustainable agriculture operations, and found that these women perceived alternative agriculture as a means of "making life less stressful and improving the quality of life of

their families." Thus one daughter in this study observed, 'mom works part time instead of full time' (HM, 203).

Management implications of HM for adapting to BSE

The agricultural and management potential for HM to mitigate challenges associated with BSE separated out on Factor 3. Many respondents had confidence in the livestock industry and believed HM played an important role in reducing the impacts of BSE (Table 4.3). Most HM producers (78.0%) agreed that *'HM helped reduce the adverse impact of BSE on the farm'* (mean=5.40, SE=0.10) and most (68.0%) agreed that '*if more people practiced HM, BSE would have much less of an impact on producers*' (mean=5.00, SE=0.01). Many indicated that HM had already substantially reduced the adverse effects of BSE, in part allowing producers to make do with less. As one respondent from Saskatchewan indicated:

> 'We believe we're going in the right direction. BSE didn't change that. We want to stay in the business so HM is used as a tool to make us more efficient. This allowed us to withstand the lower cattle values due to BSE' (HM, 217).

While appreciating the value of HM, others recognized that it was only one part of the solution to the crisis: 'This was a crisis beyond comprehension and holistic management was only one small tool in the basket to our success out the other side' (HM, 299).

The cumulative Akaike weights for the independent variables reveals that the variables (MGMTCLUB) 1.00, (LAND) 0.79, and (CROPDIV) 0.74 (Table 4.6) comprised the best model (Table 4.8) for describing the role of HM farm management in

adapting to BSE. Respondents who never joined a club were less able to adapt to BSE than those who met regularly with their clubs (Figure 4.6). Clubs allow participants to share and discuss new farm management techniques (Hassanein and Kloppenburg, 1995), and to support one another when exploring innovative responses to unforeseen events such as the BSE crisis. One producer observed:

> 'Our fellow members in the Holistic Management club were helpful and, during this time, regularly shared their observations and thoughts on the BSE crisis as it unfolded. As a result, we did what we could to position ourselves so that we could move forward when it was over' (HM, 305).

Another respondent was similarly optimistic: 'Our management club was good for support. We looked at BSE as an opportunity to expand because we see a future in grass farming' (HM, 154). For many, these management clubs were crucial in allowing them to adapt and respond to the BSE crisis. When examining rotational grazing networks in Wisconsin, Hassanein and Kloppenburg (1995) concluded that 'networks make possible the kinds of small wins that might ensure not only the continued viability of particular family farms, but the future of agriculture in the region.' The formation of farm networks can build resilience as they can facilitate the growth of human relationships and trust among participants (Milestad and Darnhofer, 2002).

Although the social and economic benefits of HM were clearly important, many respondents also noted that the environmental benefits associated with HM, in turn allowed them to better adapt to unforeseen circumstances.

> 'We have seen huge change in the diversity of species of plants and animals also in the water cycle. Economically things are getting better due to the land providing more for us with less input which in return frees up more social and family time. If you take care of the land, the land will take care of you' (HM, 197).

Increases in profitability and improvements in the environment as a result of the practice of HM were noted by Stinner et al. (1997) in almost all of the interviews they conducted with HM producers.

Many producers also related their ability to adapt to the challenges posed by the BSE crisis as resulting from the innovations resulting from HM. One respondent stated that HM 'gave us other options to look at to keep in the cattle business (i.e., different pasture management practices than what I was used to doing). We also looked at different cropping practices' (HM, 6). The most popular management tool in Holistic Management, reflected by the number of livestock producers who have adopted this stewardship approach, is planned grazing. While this approach generally involves rotational grazing, it is incorporated within a longer term strategic plan that emphasizes the importance of monitoring and the need to adapt to unanticipated changes in the grazing system. When farmers adopt rotational grazing, men who were generally responsible for such a task had more time available and this time was spent with family (Chiappe and Flora, 1998).

4.5 CONCLUSION

Despite the great economic burden that BSE has had for countries around the world, surprisingly little research has been conducted on the impacts of BSE on agricultural producers much less how they are adapting to these stressors. BSE has been found in 40 countries and the resulting border closures have resulted in significant global economic impacts. Attention has generally been focused on vCJD and its widely recognized link with BSE, which may have eclipsed concern for rural stakeholders. In contrast, the small number of cases of infected cows in Canada (currently 12 compared to 189,000 in the UK) and the absence of any direct effect on human health has prevented this from occurring. Indeed, if anything, consumer purchases of beef rose during the crisis (Senate, 2004).

Although the great majority of respondents were adversely affected by BSE, the major impact of the BSE crisis was economic in nature, as the livestock industry was immediately affected by the closing of the US border to Canadian beef. Without sufficient slaughter capacity within Canada, producers were left with growing herd sizes and declining beef prices. These, in turn, had substantial social impacts. Many rural residents were forced to find additional off-farm employment, resulting in increased work loads, reduced time for families, and overall stress and worry were commonly reported among rural residents. Yet my results also show that HM producers in western Canada were much less affected by the BSE crisis than their non-HM counterparts.

Two factors seemed to help HM producers adapt to BSE: community involvement and farm management. As communities are undermined by depopulation and the collapse of infrastructure, those that remain become even more dependent on social networks.

The networks of choice that are facilitated by HM clubs and the larger HM community provide a support network for producers that allows for the exchange of new ideas, problem solving, as well as comfort in times of duress. The technical aspects of HM, focusing on financial planning and goal setting, allow producers to evaluate their farm operation and family goals in an ongoing, iterative, and holistic manner. Once the HM framework was adopted, a wide variety of coping strategies could be practiced that best suited the producers and families. HM supports innovation in farming practices, and as a proactive approach at once increased self and community reliance while reducing dependence on government. Unlike the government programs that tend to be of short duration and crisis-specific, HM represents a series of tools that can be applied to any situation.

What makes HM particularly interesting is that it is a grassroots phenomenon that has gone largely unnoticed by experts. Instead of being driven by agency staff and academics, it is driven by the producers themselves, many of whom become the instructors in the HM courses. HM is promoted by producers for producers, which makes it very powerful, but this very fact proves to also be a challenge as it takes longer for it to be spread and be adopted by other producers. In contrast to subsidy programs provided by the government that often only deal with the short term impacts of a given crisis, whether it be a flood, drought, or disease crisis such as BSE, HM is a long term adaptive strategy that is not stressor specific. While HM merits recognition in its potential in climate change or other phenomena threatening agriculture, perhaps more focus should be on the grassroots nature and adaptive capacity to deal with crises in general. Unfortunately, grassroots, local, non expert based responses are underrepresented in the

literature. Also of concern is the role of experts or government in facilitating the adoption of the framework, while still allowing it to be producer-driven. The huge potential of HM in dealing with unanticipated changes facing rural communities merits further research. Although this study is limited to Western Canada, I feel that similar results could be possible for other communities looking to adapt to global environmental change.

Table 4.1. Comparison of socio-demographic characteristics for Holistic Management (HM) and non-HM surveys.

Variable	Mean (SE)		Significance
	HM Survey	BSE Survey	
Land (ha)	2104.94 (187.26)	2081.06 (113.45)	0.925
Livestock	359.58 (50.37)	186.32 (9.60)	0.001
Age	50.34 (0.65)	52.9 (0.25)	<0.001
Province[b]	1.7 (0.05)	1.88 (0.02)	0.001
Gender[b]	2.11 (0.04)	1.09 (0.01)	n/a[c]
Work[b]	2.45 (0.10)	1.95 (0.04)	<0.001
Economic Status[b]	3.16 (0.07)	2.21 (0.03)	<0.001
Education[b]	2.92 (0.06)	2.19 (0.03)	<0.001

[a] Significance for Levene's Test for equal variances ($p<0.001$).

[b]Variables assessed on scales where Province (1=Alberta, 2=Saskatchewan, and 3=Manitoba); Gender (1=female,2=male, and 3=both; Work (1= full time farmer and 5= non-farmer); Economic status (1=least stable and 5=most stable), and Education (1= least educate

[c] Variable n/a for comparison due to different categorical options for each survey

Table 4.2. Explanatory variables used in developing a set of models to examine the impacts of BSE.

Abbreviation	Variable
AGE	Age of respondent (years)
COMM	Level of community mindedness (community minded, community and individually minded, individual)
CROPDIV	Number of crops
ECONO	Economic situation of respondent
EDUCATION	Ranking of highest level of education completed (grade school, high school, college, university)
GENDER	Gender of Respondent (female, male, both)
LAND	Total hectares of land
LIVE	Total number of cattle
MGMTCLUB	Management club membership (yes, yes but no longer, no)
PROV	Province of respondent (Alberta, Saskatchewan, Manitoba)
WORK	Work situation of respondent (full time, part time, retired)
YRCOURSE	Length of time since taking a Holistic Management Course (years)

Table 4.3. Variable reduction of HM producers concerns towards BSE related issues using factor analysis

Factor	Variable	Variance	Alpha	Eigenvalues	Factor loadings	Mean scores all producers (SE) (n=258)
Factor 1- Community	People became more willing to share with others as a result of BSE	49.83%	0.83	3.06	74	4.50 (0.08)
	People in the community communicated more openly with one another				85	4.24 (0.01)
	People relied more on others in the community				84	4.18 (0.08)
	Support for local businesses increased because of BSE				55	4.13 (0.09)
	In many ways, BSE strengthened my community				46	4.07 (0.09)
Factor 2 - Impact	Stress and worry became much more prevalent within my community	31.03%	0.70	1.91	45	5.65 (0.07)
	The effects of BSE will continue to affect rural communities in the future				51	5.40 (0.07)
	BSE had a negative impact on our community				48	5.26 (0.08)
	BSE placed my livelihood at risk				59	4.65 (0.11)
	BSE created the worst rural crisis since the “dirty thirties”				62	4.36 (0.11)
	My family’s ability to participate in volunteer activities was reduced as a result of BSE				44	3.31 (0.10)
Factor 3 - Farm Management	I have confidence in the future of the Canadian livestock industry	18.94%	0.65	1.16	47	5.51 (0.09)
	Holistic Management helped reduce the adverse effects of BSE on our farm				72	5.40 (0.10)
	If more people practiced HM, BSE would have much less of an affect on producers				65	5.00 (0.01)

Variance, alpha values, eigenvalues, factor loadings and mean scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree".

Table 4.4. Comparison of Mean responses to BSE related impact questions for HM and BSE survey

Question	Mean scores[a] HM producers (SE)	Mean scores[a] non-HM producers (SE)	P-value
BSE poses extremely low public health risks	6.11 (0.08)	6.17 (0.04)	0.558
Stress and worry increased within my community as a result of BSE	5.65 (0.07)	6.33 (0.03)	<.0001
I have confidence in the future of the Canadian livestock industry	5.51 (0.09)	5.06 (0.05)	<.0001
The effects of BSE will continue to affect rural communities in the future	5.40 (0.07)	5.68 (0.04)	<.0001
BSE had negative impact on our community	5.26 (0.08)	6.29 (0.04)	<.0001
BSE placed my livelihood at risk	4.65 (0.11)	5.89 (0.05)	<.0001
People became more willing to share with others as a result of BSE	4.50 (0.08)	4.15 (0.05)	<.0001
BSE created the worst crisis since the "dirty thirties"	4.36 (0.11)	5.16 (0.05)	<.0001
People relied more on others in the community	4.18 (0.08)	4.07 (0.04)	0.200
Support for local businesses increased because of BSE	4.13 (0.09)	3.92 (0.05)	0.033
In many ways BSE strengthened my community	4.07 (0.09)	3.56 (0.05)	<.0001
Government responses to BSE were adequate	3.32 (0.12)	2.79 (0.05)	<.0001
My family's ability to participate in volunteer activities was reduced as a result of BSE	3.31 (0.10)	4.38 (0.05)	<.0001
BSE is an issue of the past	2.78 (0.09)	2.49 (0.05)	0.004

[a] Scores were derived from a 7-point scale, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree'.

Table 4.5. Number of model parameters, differences in Akaike information criterion (Δ-AICc), and AICc weights (w) for models developed for the role of respondent concern regarding the impacts associated with BSE.

Model structure	-2Log(L)	k	Δ-AIC$_c$	AIC$_c$w
ECONO + GENDER	224.596	3	0.0	0.581
ECONO	227.663	2	1.1	0.342
ECONO^2 + GENDER	227.294	4	4.7	0.055
ECONO * GENDER + AGE	231.248	4	8.7	0.008
GENDER	236.383	2	9.8	0.004
ECONO + GENDER + AGE + WORK + CROPDIV + EDUCATION + LIVE + YRCOURSE + MGMTCLUB + PROV + LAND + COMM	214.479	13	9.9	0.004
AGE	237.487	2	10.9	0.003
LIVE + CROPDIV	236.319	3	11.7	0.002
WORK + CROPDIV * AGE + GENDER + EDUCATION	230.944	6	12.4	0.001

Table 4.6. Rank/cumulative AICc weights (w) for all twelve independent variables hypothesized to influence respondent concern toward the challenges associated with BSE.

Variable[a]	Rank of Cummalative weight[b] (AICc)		
	Factor 1 (Community	Factor 2 (Impact)	Factor 3 (Farm Management)
AGE	3(0.57)	3(0.49)	4(0.47)
COMM	1(1.00)	11(0.49)	11(0.27)
CROPDIV	6(0.31)	5(0.42)	3(0.74)
ECONO	8(0.26)	1(0.99)	10(0.27)
EDUCATION	8(0.26)	6(0.37)	8(0.34)
GENDER	2(0.60)	2(0.57)	5(0.40)
LAND	7(0.27)	11(0.28)	2(0.79)
LIVE	7(0.27)	7(0.36)	6(0.38)
MGMTCLUB	8(0.26)	9(0.33)	1(1.00)
PROV	8(0.26)	10(0.30)	9(0.29)
WORK	4(0.41)	4(0.45)	11(0.27)
YRCOURSE	5(0.38)	8(0.34)	7(0.35)

AICc, Akaike's Information Criterion with small-sample bias adjustment (Burnham and Anderson, 2002)

[a] Variables are decribed in Table 4.2.

[b] Cummulative AICc weight of variable = the percent of weight attributed to models containing that particular varibale and is calculated by summing AICc model weights of every model containing that variable.

Table 4.7. Number of model parameters, differences in Akaike information criterion (Δ-AICc), and AICc weights(w) for models developed for the role of community in dealing with the challenges associated with BSE.

Model structure	-2Log(L)	k	Δ-AICc	AIC_cw
WORK + AGE + GENDER + COMM	215.402	5	0.0	0.405
COMM	222.565	2	1.1	0.228
COMM2 + AGE + GENDER +WORK	214.744	6	1.3	0.206
COMM + AGE + GENDER + WORK + MGMGTCLUB	215.833	6	2.4	0.120
AGE*GENDER + COMM	222.109	4	4.7	0.039
GENDER	233.532	2	12.1	0.001
AGE	234.991	2	13.6	<0.001
COMM*AGE + GENDER + WORK	229.499	5	14.1	<0.001
MGMTCLUB	238.371	2	17.0	<0.001

Table 4.8. Number of model parameters, differences in Akaike information criterion (Δ-AICc), and AICc weights (w) for models developed for respondent concern regarding technical farm management in dealing with BSE challenges.

Model structure	-2Log(L)	k	Δ-AIC$_c$	AIC$_c$*w*
MGMTCLUB + LAND + CROPDIV	202.633	4	0.0	0.032
MGMTCLUB + LAND	206.787	3	2.1	0.204
MGMTCLUB +LAND^2 + CROPDIV + AGE	201.21	6	2.6	<0.001
MGMTCLUB	212.502	2	6.0	0.027
LAND + MGMTCLUB + CROPDIV + AGE + GENDER + LIVE + YRCOURSE + EDUCATION + PROV + ECONO + COMM + WORK	196.503	13	12.1	0.001
LAND + LIVE + CROPDIV	221.78	4	19.3	<0.001
LAND	229.619	2	23.2	<0.001
MGMTCLUB*LAND + CROPDIV + AGE	226.985	5	26.4	<0.001
CROPDIV	237.677	2	31.2	<0.001

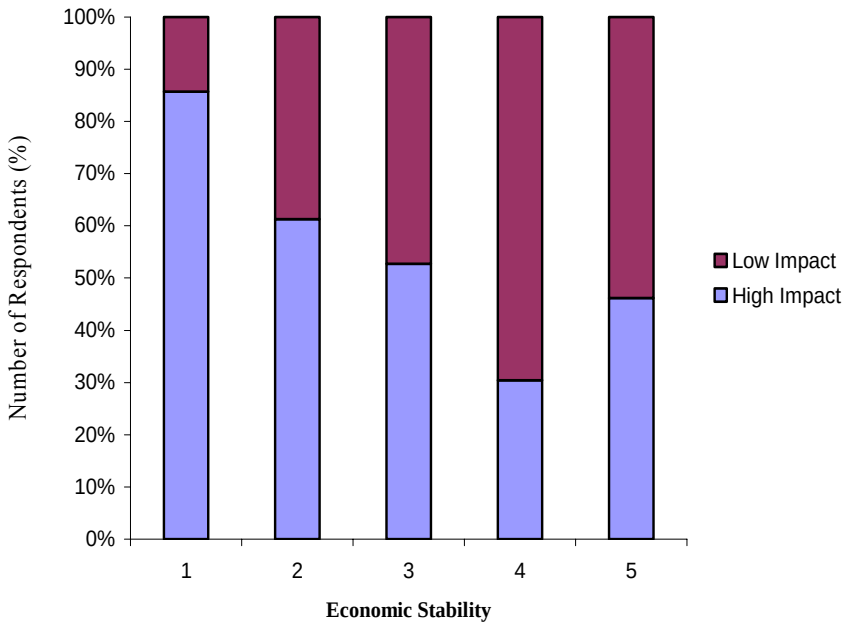


Figure 4.1. HM producers perception of the impacts of BSE based on farm/ranch financial statement (n=172) (1=least stable, 5=most stable).

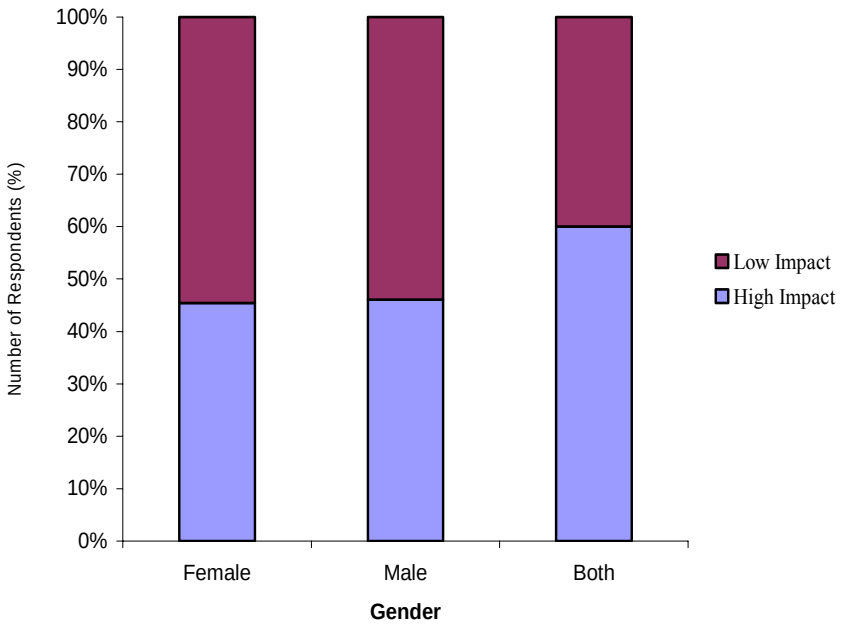


Figure 4.2. HM producers perception of the impacts of BSE based on gender (n=172) ('both' = completed by two respondents).

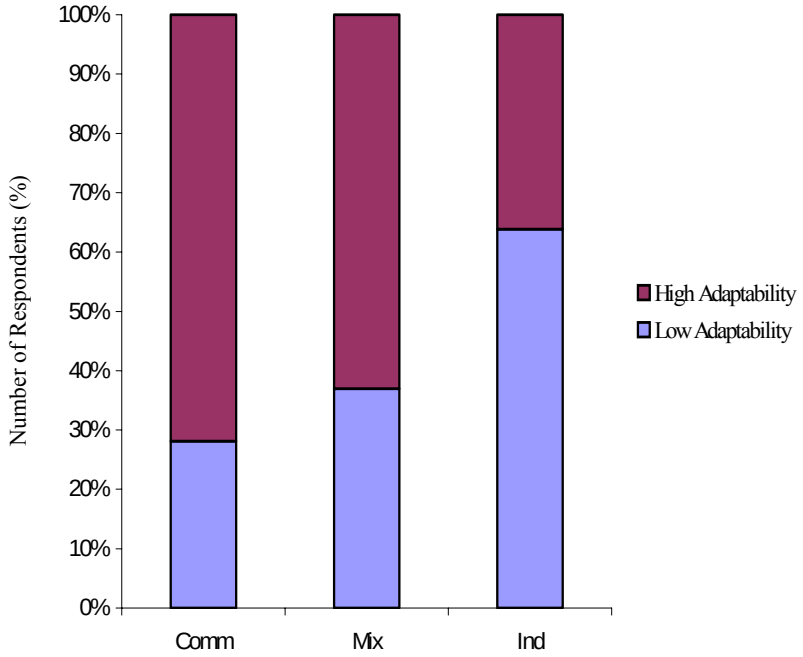


Figure 4.3. HM producers perception of their ability to adapt to BSE based on level of community mindedness (n=172) (comm=community minded, mix=community and individually minded, ind=individualist)

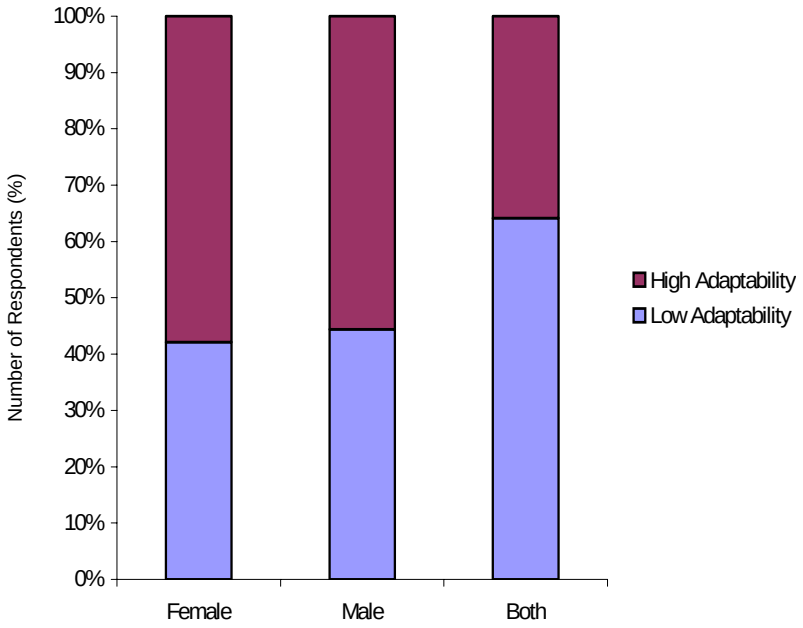
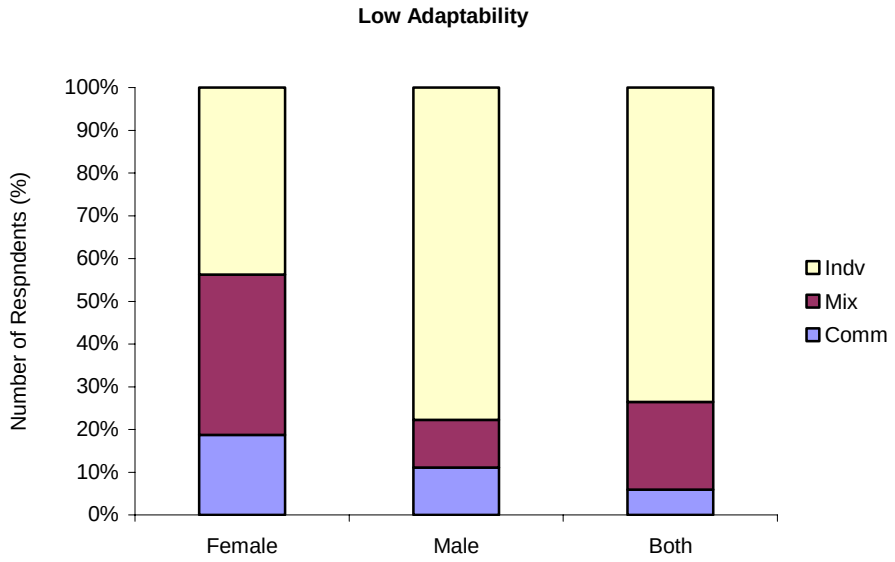


Figure 4.4. HM producers perception of the impacts of BSE based on gender (n=172) ('both' = completed by two respondents).

a)



b)

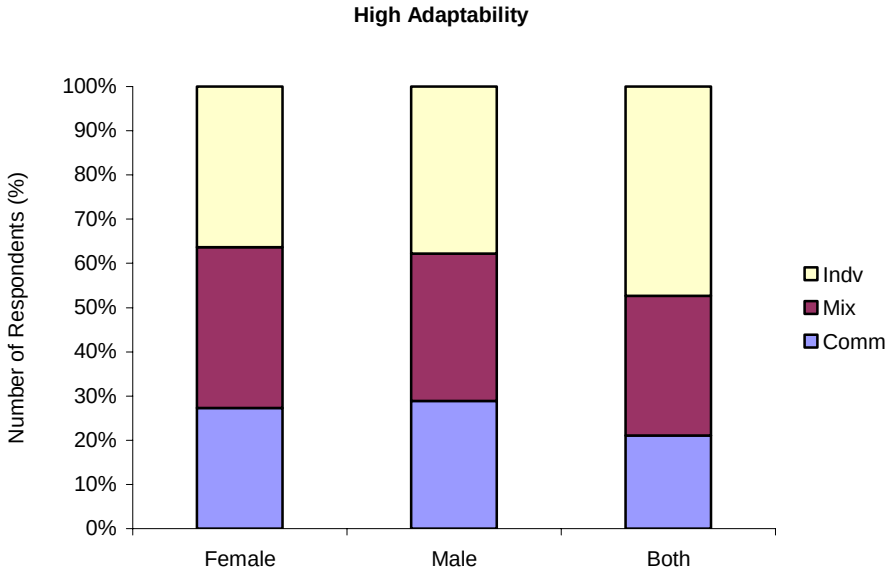


Figure 4.5. The relationship between gender, community mindedness, and a)low adaptability b)high adaptability among HM producers (n=172).

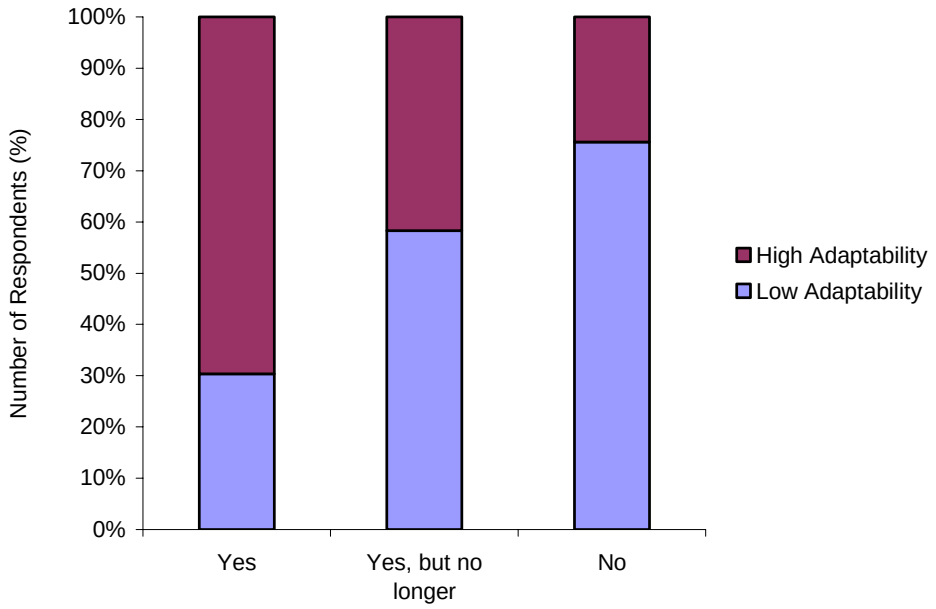


Figure 4.6. HM producers perception of their ability to adapt to BSE based management club membership (n=172).

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CHAPTER 5: Final Discussion

RESEARCH OUTCOMES

My results highlight that Holistic Management is generally a successful alternative approach to farm management. An integral part of HM is the mutual learning that takes place among producers. Indeed, the very fact that most certified HM educators are producers themselves allows for horizontal exchange of knowledge. The formation of HM clubs has been an important network opportunity for many holistic managers. Although the clubs have presented opportunity for many managers, not all clubs have been able to sustain themselves due to lack of interest from group members, travel distance, and time commitment.

In terms of motivations for adopting HM, the results indicate that managers were motivated by environmental, economic, and social factors. Some managers shared the difficulty they had in applying all of the HM model steps to their operation. Despite these problems, many HM producers were highly motivated to continue practicing a holistic approach. Such motivation was also reflected by the high response rate for the survey despite its length and completion time. Many added notes to their returned survey. An important motivating factor in adopting HM was establishing goals as a family. The emphasis on the social aspect of HM is unique in agriculture, as most agricultural practices or technology only aim to decrease environmental degradation and increase profitability. As agriculture is one of the few industries predominantly run by family operations, to ignore the social aspects of these operations could have serious and adverse implications. The HM model allows managers to create a three-part goal that aims to balance environmental, economic, and social well being. Indeed, approximately

two-thirds of HM mangers noted that since applying a holistic approach to their farm operation they have seen improvements in all three areas. Environmentally, producers adopted practices such as minimal tillage, seeding land into grass, and rotational grazing of livestock. As a result, changes in the environment included decreased erosion, increased biodiversity, and increased litter. Economically, HM allowed producers to find ways to minimize expenses through financial planning exercises. Many noted that changes in environmental practices, such as rotational grazing, allowed for reduction of costs related to equipment and technology. Socially, holistic mangers described having more time for family. Many mangers also described the importance of the HM network in supporting and providing feedback about their operations.

These results further indicated that BSE was having devastating socioeconomic impacts on producers and rural communities. The impacts of BSE were further compounded by other stressors such as extreme weather variability (i.e., droughts) and record low Canadian farm incomes. Although still clearly affected by the crisis, producers practicing Holistic Management in western Canada were substantially less vulnerable than non-HM producers. The study demonstrated how HM has enabled producers across western Canada to mitigate many of the adverse effects of this crisis and highlighted the degree to which rural communities are able to adapt given the opportunity and resources. Even more notable is the optimism shown by the respondents in the study given how challenging the prospects of agriculture are in the prairies.

Two factors were identified that underlay the adaptive responses of HM producers to stressors such as BSE. The first factor, community, revealed the importance of support networks. For many producers, HM played an important role in facilitating the growth of

new social networks, largely in the form of local HM clubs that meet regularly and provide emotional and economic support in times of stress. The larger regional HM community that meets less frequently at conferences, workshops, and field days also plays an important affirming role for these producers. With the imminent reality of rural depopulation, local services such as banks, schools, grocery stores also decline. Rural residents thus become even more dependent on alternative social networks such as HM.

The second factor, regarding the technical farm management aspects of HM, focuses on financial planning and goal setting and allows producers to evaluate their farm operation and family goals in a holistic manner addressing economic, social, and environmental priorities. Once producers adopt the HM framework there is a variety of coping strategies that can be practiced and adapted to their most immediate and individual needs. As a proactive approach that facilitates innovation in farming, HM allows for ongoing responses to an ever changing farming industry. Indeed, many noted that they did not want or need to rely on government programs when coping with these changes as their management responses were proactive instead of reactive in nature. Arguably this, in turn, has allowed producers to become more self sufficient and resilient, and, indeed, more optimistic about their futures and the future of agriculture.

FUTURE DIRECTIONS

This research is the first of its kind to systematically assess the practice of Holistic Management, identify the impacts of the BSE crisis on producers, and explore the role of HM in contending with crises such as BSE. I used a participatory approach, which incorporated individual and group interviews to produce a final survey questionnaire.

Due to the holistic nature of this study, a large amount of data was produced making it difficult to explore all findings in great detail. I attended monthly meetings with a Manitoba HM club for almost two years, this informing much of my research design and data interpretation. Follow-up interviews with survey participants from all provinces would have allowed for further exploration of survey results. Since this study focused on western Canadian holistic managers, caution should be taken when generalizing results to other countries. Thus, a study comparing the benefits and challenges associated with the practice of HM in different countries would be useful. Another prospect for research relates to the applicability of the HM framework to communities, organizations, and businesses. Indeed, several surveys in this study were returned as the respondents were practicing HM, but were not farmers.

Results from this study point to other future avenues of research especially relating to the assessment of animal disease in the context of global environmental change. Worldwide, the increased incidence of animal diseases such as Foot and Mouth, Avian Affluenza, and BSE have had huge economic impacts; however, studies of these diseases fail to recognize farm level impacts and adaptations. The research currently undertaken in the Environmental Conservation Lab at the University of Manitoba represents the first systematic and farmer-focused evaluation of the impacts of and responses to BSE in Canada, and points to the need of further research in this area.

A PERSONAL REFLECTION

From the beginning, this research has grown out of observations and interactions with farmers across the prairies. When I first decided to pursue a Master's degree, there

were broad theme areas that I was interested in studying. However, it was my experience in the community of Clearwater, Manitoba during a travel study course that I found a topic that was truly inspiring and left me wanting to learn more.

I remember fondly as a child spending my summers on my grandmother's farm - riding in the cab of the combine, eating meals in the field during harvest, growing my very own watermelons, and snatching eggs from the hens. As I started getting older and taking on more responsibilities, I spent less time on the farm. My first few years at university left me disconnected from the natural environment and unsure of what direction I was headed. When the opportunity came to take a travel course based in rural Manitoba to learn about rural living and farming, I was eager to participate.

The course, *Living Rural Communities and Environments*, taught by Dr. Stéphane McLachlan, took place from August 18-28, 2004 in Clearwater, Manitoba. Since this was a travel course, the entire 10 days was spent camping in this small community composed of 75 residents. The philosophy of course was based on experiential learning - our classroom became the farms and local businesses we visited, and the teachers were those local residents operating them.

We visited a number of diverse farm operations throughout the course, and coincidently three of these tours were with farm families practicing Holistic Management. As an Environmental Science undergraduate student, sustainable farming practices such as organics and Permaculture were often discussed. However, during the course was the first time I had ever heard of HM. Although confused with what exactly HM entailed, I was taken back by the optimism of the farm families we visited. This course had taken place amidst the BSE crisis, and an early August frost had ruined many

crops in the area. Despite the impending realities of these outside forces, the HM practitioners were hopeful and energetic.

From this experience, it seemed fitting to focus my Masters research on Holistic Management, especially with the lack of information and comprehensive studies available on this topic. With a topic to pursue, I could now begin the research process. I registered for a Holistic Management course offered by Don and Bev Campbell, a farm couple who had been practicing HM for over 20 years. The course took place in Gladstone, MB and fifteen were in attendance. On the first day of class I was very nervous, not only did I not know anyone, I was the city slicker from Winnipeg with no cows and no farm. However, I quickly realized that having cows or a farm was not a requirement to manage holistically. The course also confirmed that HM is not a grazing method or a way of growing grass, what it really comes down to is a way of making decisions that balance healthy land, people and profit.

On the last day of class, Don and Bev encouraged our group to form a management club. A month after the course was complete, the Big Grass Group held its first meeting, and still meets on a monthly basis. Over the next two and half years I attended meetings with the club, and these meetings have been vital for my own understanding of HM, as well as developing my research project. Although the group has formerly participated in helping direct the research through a group interview, they have also been an equally important support of my research as a whole.

In the summer of 2006, I had the opportunity to take a break from my research to help teach the same university course where I had been first introduced to Holistic Management. It was very interesting to see the student's reactions to the course,

especially in regards to Holistic Management. Some came from farming backgrounds, while others were brought up in the city. One of the students commented how

> 'before I took this course I never knew such a (HM) theory/ system/ philosophy/ lifestyle existed. The idea that decisions are made by both husband and wife, and quite often children is very intriguing. The stress on farmers these days is astounding and the simple act of sharing decision-making helps to ease that burden. Coming from a farming family I can see the unity that it can bring to a family, especially in challenging times. During my first phone conversation to my dad back in Saskatchewan after I returned from the Clearwater course, I brought up the issue of Holistic Management and that perhaps our family should look into it.'

Another student shared that it was

> 'the tour of Don's ranch that maybe captured the spirit of HM best for me when he said, *caring for the land is my number one priority and by doing so, the land will be more productive and the financial goals will take care of themselve*s.'

The observations and comments from students echoed a similar experience that I encountered the first time I was introduced to farmers practicing HM.

By undertaking a participatory approach to this research study, I feel that I was able to better understand the benefits and challenges experienced by farmers in the

prairies, especially those practicing Holistic Management. I attended as many farm tours, workshops and conference that involved some aspect of HM. From a bus trip to Meadow Lake, Saskatchewan to tour the ranches of several farm families, to the first ever Western Canadian Holistic Management Conference in Brandon Manitoba, the time spent engaging and listening to managers makes me confident with the direction of my study. The extra time taken to complete this research is, in part, a result of this participatory approach. However, without these experiences I would not feel confident with the scope and direction that my research has taken, especially given how little other research has been conducted on HM. Indeed, the greatest confirmation of the value and direction of my research came from members of the Big Grass Group at a conference where I had shared the preliminary results of this research to 300+ farmers, most of whom were practicing HM. Two members from the group stood up and shared with the crowd how they were excited to have someone from the city interested in what was happening in their communities and families, and thanked me for being a part of their group. It was at this moment that I myself experienced the social benefits, and in particular the community aspect, that holistic managers were speaking of throughout this research study.

Only time will reveal the long term fate of holistic managers in Canada. Based on the results of this study, the prosperous Canadian farmer described by the Calgary Board of Trade in 1906 might once again be “common place”, and Holistic Management may prove to be the driving force for a truly sustainable agriculture.