WATER, EQUITY, AND THE RURAL CONSCIOUSNESS : AN AGRICULTURAL RESPONSE TO WATER SHORTAGE IN THE OKANAGAN VALLEY OF BRITISH COLUMBIA

by

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Abstract

The combined effects in the Okanagan Valley of rapid population growth, climate change, and an environment that is naturally hot and dry are expected to exacerbate the region's already limited water supplies to a point where critical water shortages could occur within the foreseeable future. This issue is particularly relevant within the agricultural sector, as the water that has been allocated for irrigation in the valley may not be available if increasingly dominant urban demands impinge on farm requirements. Based upon an extensive series of interviews and a focus group session with Okanagan irrigators, this thesis documents current water use patterns, as well as agricultural perceptions surrounding the factors that contribute to both present and anticipated water shortages in the valley. Insight gained from this research has also been applied to an evaluation of various water shortage adaptation options. In particular, water trading and collaborative approaches to water management have been assessed for their acceptability and appropriateness within the Okanagan Valley.

This discussion has been placed within the context of sustainable development theory and political ecology, which together demand a consideration of the ways that policies and management regimes may disproportionately impact upon various stakeholders and the natural environment, in positive and negative ways. Drawing upon this framework, it has been concluded that the preferences of Okanagan irrigators surrounding water shortage adaptation options are affected by the presence of a number of conditions that are seen as threatening agricultural viability in the valley. In light of this, opinions surrounding the usefulness of water trading and collaborative management are often based upon a desire to

preserve the agricultural base in the Okanagan, while also balancing environmental and essential domestic requirements.

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Chapter 1: Introduction

It is widely believed that the problem of water scarcity, already a significant issue in many parts of the world, will become more extreme in the years to come as a result of climate change and increasing human consumption. For certain regions that are characterized by already arid climates, growing populations, and high levels of economic growth, pre-emptive strategies aimed at encouraging sustainable water management are fundamental for ensuring that there will be sufficient future supplies and that threats to the natural environment be limited, while also minimizing conflicts between various stakeholders, such as farmers and urban residents (UN-Water 2006, 2). Even within Canada, a presumably water rich nation, the issue of water shortage has become more of a concern, particularly where growing populations are forced to adjust to a limited availability (Sprague 2007, 23-28). Adequate supplies of fresh water are essential not only for preserving all life through direct consumption, but also constitute the cornerstone of agricultural production, and hence our food supply. It is therefore evident that the success of any community is dependent upon its capacity to adapt to changes in water availability, while simultaneously undertaking measures to reduce consumption and manage this resource sustainably.

The Okanagan Valley, located in the southern interior of British Columbia, is projected to experience a heightened sensitivity to water shortage in the years to come (Cohen et al. 2006; Merritt et al. 2006; Neilsen et al. 2006). The Okanagan's agricultural sector is particularly vulnerable to these shortages, as the region is highly dependent upon irrigation to sustain the crops that are grown here. Ensuring that there are adequate supplies of water to meet the needs of farmers in the Okanagan is important for a variety of reasons. Primarily, Okanagan agriculture acts not only as an important supplier of produce throughout

British Columbia, but also represents one of only two distinct regions in Canada that can support the production of tender fruits and grapes (Embley, Hall and Cohen 2001, 10). A serious water shortage, even for only one year, can result in losses of these kinds of crops for as long as 8 to 10 years (Canada. Agriculture and Agri-Food Canada 2003, i) Furthermore, farmers in the Okanagan are often operating under British Columbia's Agricultural Land Reserve (ALR) program, which aims to protect agricultural land from urban encroachment by barring certain land uses within these regions (SmartGrowthBC 2007). If there is not enough water for normal farm operations, then agriculturalists are caught in a difficult position, being unable to sell their land for alternate uses, but also incapable of making sufficient profits on the farm. Finally, the many vineyards and orchards located in the Okanagan are a popular draw for tourists, which contribute significantly to the Okanagan economy during the summer months (British Columbia. BC Stats 2006, 1).

This thesis is concerned with addressing the issue of water shortage in the Okanagan, particularly within agricultural areas, by evaluating the ways that locally prevalent environmental and demographic factors intersect with governance structures and policies to affect sustainability outcomes surrounding water. In order to ensure the viability of the Okanagan's important agricultural sector, alternatives must be considered regarding how water is allocated and used. The present study is informed primarily by the perceptions and practices of local irrigators. This includes a consideration of the many different factors that affect the decisions farmers are willing and able to make surrounding their irrigation practices, as well as any strategies that they have adopted to deal with agricultural water shortage. Specifically, two mechanisms are evaluated, water trading and collaborative water governance, for their acceptability and applicability within the Okanagan context.

Recognizing that Okanagan farmers will most comprehensively understand the issues surrounding agricultural water shortage, this research has been approached from a collaborative perspective, drawing on the tenets of action research in order to shed light on the specific risks faced by the agricultural community (Alston and Bowles 2003, 158-159), any adaptive measures which are being executed, and ideas and preferences surrounding management alternatives. The primary goals of this study are to document the water use patterns of Okanagan irrigators, to record agricultural perceptions surrounding risk, as well as factors seen as contributing to the risk of water shortage in particular, and to evaluate water shortage adaptation options. Ultimately, this research should be seen as a tool which can be used to represent agricultural practices and attitudes when considering alternative approaches to water management.

This thesis has been broken down into six different sections. The first, this chapter, provides an introduction to the Okanagan area, which is designed to illustrate the demographic and environmental background, as well as governance structures, within which water policy planning is situated. The second addresses the theoretical and methodological positions that I have adopted, including a discussion of water trading and co-operative water management practices. The third section discusses the methods that were employed for data collection, specifically a series of irrigator interviews and a focus group session, as well as the characteristics of the study sample. Sections four and five discuss the results of the study in the context of two major themes that emerged. Section four addresses the shared agricultural identity or culture that exists in the valley, and how this is presently seen to be in jeopardy, thereby affecting farmers' attitudes surrounding water governance and conservation. Section five focuses on governance, management systems, and policy-making

in the valley and includes an assessment of water markets and water trading, as well as collaborative strategies. Finally, the seventh section concludes this report, summarizing the findings of the study and offering recommendations and suggestions for further research.

1.1 Study Area

In order to fully understand the importance of this study, as well as the positions occupied by various stakeholders in the valley, this report must be prefaced by a description of the study area and operational framework that largely determine how water is allocated and used in the Okanagan. The area under study consists of the entire Okanagan Valley, from the town of Armstrong in the north to Osoyoos at the Canada/US border, and including the towns of Keremeos and Cawston. (Figure 1.1). Farmers from these areas were included in the study, even though they generally draw upon the

Figure 1.1 Study Area (Google. 2009)

Similkameen River for their water supplies, since issues affecting the Okanagan watershed, including water shortage, urbanization, and concerns surrounding rare or endangered species and habitats, often extend into the Similkameen Valley (Canada. Environment Canada 2000). The valley is divided into three regional districts, the North Okanagan Regional District, the Regional District of Central Okanagan, and the Okanagan-Similkameen Regional District, which provide services such as parks and recreation, sewers, and garbage collection, among other things (Regional District of Central Okanagan 2008). The Okanagan watershed, which serves as an accepted boundary for the valley, is comprised of all of the land containing water which flows into the major lakes that are located along the valley corridor (Freedman 2004, 139). It should be noted however that the Okanagan valley, as it is presently defined, does not truly coincide with the natural limits of this watershed, as it continues beyond the Canada/US border, with its waters eventually flowing into the Columbia River system (Neilsen, Smith et al. 2001, 1). The main bodies of water that act as a drainage basin for the Okanagan watershed consist of Okanagan, Kalamalka, Skaha, Vaseux, and Osoyoos lakes (Canada. Natural Resources Canada 2008), with water flows being controlled through dams that have been built on Okanagan, Kalamalka, Skaha, and Vaseaux lakes (Embley, Hall and Cohen 2001, 9). However, the primary source of water in the Okanagan flows from the many tributary streams and creeks, implying that water users are drawing from many sub-basins that feed the larger basin.

1.1.1 Geographic and Ecological Background

Geographically, the Okanagan represents a relatively distinct region within the country, receiving an average of only 30 to 50 cm of rainfall per year, the majority of which

falls during the winter, earning it the classification of having a semi arid climate (Shreier, Lavkulich and Brown 2007, 5). Precipitation rates are greater at higher elevations, while the valley bottom receives lower levels, "ranging from 25 cm in the south valley to 45 cm in the north" (Okanagan Water Stewardship Council 2008, 5). Additionally, relatively high rates of evapotranspiration occur throughout the valley due to the comparatively long, hot summers that are characteristic of the Okanagan. These factors could become even more extreme due to the effects of climate change, which studies have demonstrated may lead to reduced snowpacks and earlier snowmelt, resulting in less water being available during peak summer months when demand is highest (Cohen et al. 2006, 332; Merritt et al. 2006, 93). Already, minimum annual temperatures recorded in the north Okanagan have increased by two degrees over the last hundred years, and the number of frost free days in a year have increased by approximately 27 since 1907 (Brewer and Taylor 2001, 16). Issues related to managing water resources under these circumstances are compounded by the fact that there is a great deal of regional variation throughout the Okanagan, in part due to the presence of a number of distinct ecosystems and meso-climates which render some areas much hotter and drier than others. For example, Armstrong in the north receives an average of 1.35m of snow annually and has a mean July temperature of 19.2 degrees, while Oliver in the south receives only 0.60m of snowfall, and has a mean July temperature of 23 degrees (Embley, Hall and Cohen 2001, 9).

Due to the relatively low levels of precipitation, as well as the hot and dry climate, the Okanagan exhibits a variety of ecological features that are unique to Canada. In particular, the southern Okanagan-Similkameen region is recognized as one of the primary areas in the province for species diversity and rare species (Ogilvie 1998, s.4.2.1). In fact,

nearly a third of British Columbia's rarest and most imperilled plant and animal species are found in the Okanagan Valley (British Columbia. Ministry of Environment n.d.). Many of these species live in the Antelope-brush habitat that is located in the southern end of the valley. This rare habitat, which ranks among the top four most endangered ecosystems in Canada, has been so often converted for agricultural and urban purposes in the valley that today, less than 9% of the area's Antelope-brush ecosystems remain undisturbed (The Nature Trust of British Columbia 2004, 2). Other rare and endangered species that are found in the Okanagan valley include the tiger salamander, burrowing owl, and Chinook salmon, all of which have been affected by considerable habitat loss and degradation (South Okanagan-Similkameen Conservation Program n.d.).

Loss of habitat and the endangerment of certain plant and animal species are linked to the problem of water scarcity, as serious water shortages can lead to the degradation of natural ecosystems when environmental demands cannot be met due to over-consumption for human purposes (UN-Water 2007, 7). It is human consumption, expressed first through agricultural expansion in the valley and later by urban development, coupled with both the realized and anticipated effects of climate change, which can be seen as affecting water availability and water quality in the Okanagan (Wagner 2008, 24). Not only have the Okanagan's unique shrub-steppe and grassland communities been compromised by development that has taken place in the valley, but the region's wetland areas have been reduced to only 4% of the total land area, representing a loss of an estimated 85% of the valley's original wetland eco-zones (British Columbia. Ministry of Environment n.d.). The loss of wetlands in the Okanagan has occurred as a result of overdrawing both surface and groundwater supplies, draining and filling ponds and marshes for agricultural and urban

development, and altering waterways through the damming and channelization of local rivers (Cannings and Durance 1998). This should be seen as a particularly serious issue, as approximately 80% of wildlife are highly dependent on these ecosystems for habitat and food sources (South Okanagan-Similkameen Conservation Program n.d.). Recognizing the interdependency that exists between various natural functions and systems, it becomes clear that the net impacts of unsustainable water management practices in the valley extend beyond primarily anthropocentric concerns, to those revolving around the health of entire ecosystems.

1.1.2 Population

The physical attributes of the Okanagan must be considered in conjunction with the demographics of the region. Communities throughout the entire Okanagan basin have experienced substantial population growth over the past 30 years. While the population for the valley was 114,000 in 1971 (Harltey 2005, 300), it sat at 344,891 in 2007 when BC Stats released their annual census data (British Columbia. BC Stats 2007). Today, approximately half of the residents of the Okanagan live within the boundaries of the Regional District of Central Okanagan, which includes the Okanagan's largest city, Kelowna, with the North Okanagan and South Okanagan-Similkameen districts representing around a quarter of the valley's population each (British Columbia. BC Stats 2007). Based on past growth rate figures, it is projected that the population in the valley could reach 460,300 by the year 2031 (Harltey 2005, 301). Growth of this nature, when coupled with climate change projections for the valley, is suggestive of future scenarios whereby increased demands for water will be met with inadequate supplies. Keeping in mind that environmental demands must also be

met, it becomes clear that there could be insufficient water supplies throughout much of the summer during particularly hot, dry years. The severity of this issue was illustrated in 2003 when the Okanagan suffered a major drought and severe forest fires, which seriously stressed water supply systems in a number of regions (Brandes and Kriwoken 2006, 77). Dealing with this kind of growth in the Okanagan is further complicated by the fact that some areas are now shifting from primarily agricultural communities to urban centers characterized by rapid development. For this reason, when considering how water ought to be managed in the Okanagan, it is important to consider the role that farming plays in the valley.

1.1.3 Okanagan Agriculture

Prior to European settlement in the Okanagan valley, the Syilx people, who live in the Interior Plateau region of the Columbia River basin (Sam 2008, 1), were living off the land, largely utilizing modes of production that allowed them to achieve a balance with the natural environment (Garrish 2002). Many of the first European settlers to come to the valley were involved in ranching, which was generally established in response to the availability of large, inexpensive tracts of land in the Okanagan at the time (Garrish 2002), the suitability of the valley's grassland environments for raising cattle (Wagner 2008, 25), the relative ease of caring for cattle compared with other types of agriculture (Okanagan History Vignette n.d., 72), and encouragement as early as 1862 by officials such as BC's governor, Sir James Douglas, to provide meat to prospecting communities in the Cariboo region (Cox 2004, 7). Within a generation, demand for land had increased in the Okanagan, and land developers began purchasing and subdividing larger plots which were sold as fruit farms (Ruzesky and Carter 1990, 11). This shift to fruit farming represents a move away from patterns of land

use that were largely compatible with the local ecology, to one that revolved around the general ideology of control or dominion over nature. This attitude, which would ultimately lead to the displacement of many of the region's original Syilx inhabitants (Sam 2008, 37), is exemplified in the wide scale acceptance of a means of agricultural production that never would have been possible in the Okanagan without irrigation (Wilson 1989, 1). Along these lines, Garrish notes, "that fruit trees ever came to be planted in the Okanagan remains a testament to the efforts of local boosters, and their success in detaching the marketing of the orchard landscape from the dictates of the natural environment" (Garrish 2002). Since the success of local developers was contingent upon the capacity to provide water to the fruit farms that they were marketing, it is not surprising that they played a prominent role in the formation of the valley's original irrigation systems.

In British Columbia, water is allocated based on the principles of prior appropriation and beneficial use, as opposed to the riparian rights system which dictates that residents of properties adjacent to a body of water are granted the right to use that water (Wilson 1989, 16). Prior appropriation arose in the western United States and Canada, where water is generally more scarce than many of the areas where riparian rights systems have emerged, in order to tie water rights to the actual use of water (Castle 1999). The prior appropriation system is based on the principle of first in time, first in right, with the earliest water user's future access right being based upon the continued use of the water that had been originally recorded as being of beneficial use (Wilson 1989, 19). According to the principles of beneficial use, water can be diverted away from the original source in order to supply potential water users who are not situated within proximity to a river, lake or stream. The

existence of such a system was a precursor to developing the fruit tree industry in the Okanagan.

Since individual orchardists would likely be unable to afford to construct irrigation systems for themselves, the provincial government passed legislation in 1892 that allowed private companies to hold water licenses (Wagner 2008, 30). The result of this legislation was that, by 1912, a substantial number of private corporations were responsible for the provision of irrigation water in the valley (Wilson 1989, 22), many of which included the original land developers who, in certain circumstances, were able to utilize these water rights in conjunction with their land holdings to establish what continue to be primary agricultural centres in the valley today (Wagner 2008, 30). However, orchardists in the Okanagan were generally unsatisfied with the services that were being provided by these private irrigation companies, and demanded reformation. By 1914, a new water act had been introduced partially in response to these kinds of demands allowing water user communities, mutual water companies, land and water companies, and public irrigation corporations to apply for water licenses (Wilson 1989, 26). It was in response to this legislation that many of the co-operative, farmer controlled irrigation districts and water user communities arose. This move towards farmer involvement in managing irrigation water was mirrored by the formation of a number of co-operative marketing and distribution associations by farmers seeking higher returns on their produce (Dendy 1981).

Today, a variety of land uses are employed within the Okanagan's agricultural sector. While there continues to be a ranching presence in the valley, this is dominated by tree fruits, particularly apples, which constitute the majority of farms (Statistics Canada 2008). Furthermore, grape production and winery operations are presently flourishing as a result of

warming trends that have enhanced the capacity to grow grapes in the valley, changes in international trade agreements that have allowed for the sale of Canadian wines to international markets (Belliveau, Smit and Bradshaw 2006), and marketing techniques adopted by the Vintners Quality Alliance (British Columbia Wine 2001). Additionally, land prices have escalated to the point that winery operation, which carries the benefit of drawing tourist dollars, is often seen by newcomers as one of the only means of making a profit in agriculture that justifies the high cost of purchasing land (Pender and Lawrason 2009). This has unsurprisingly occurred alongside considerable growth in the tourism sector in the valley, as well as changes in provincial legislation permitting small operators to obtain liquor licenses that allow them to serve the wine that they produce at their wineries (British Columbia. Ministry of Agriculture, Food and Fisheries 2004, 1). While the region's agricultural sector is characterized by considerable diversity, exemplified by farmers from a variety of backgrounds growing a number of different crops on plots that range from being very small to hundreds of acres, it is evident through the continued existence of many of the farmer controlled organizations in the valley that agriculturalists are familiar with the idea of co-operation, and have employed collaborative strategies to fill farm based needs in the past. However, the way that farmers in the valley feel today about these kinds of systems is uncertain. It is for this reason that one of the primary objectives of this project is assessing what farmers think about these kinds of systems, and the capacity that co-operative institutions may have in addressing issues associated with the possibility of future water shortage.

1.1.4 Regional Limitations

The Okanagan is characterized by the complex interaction of a number of different social, cultural and environmental factors, which all coalesce to establish the overarching approach that is taken to water management in the valley. It is the existence of these factors alongside one another which makes the call for sustainable water governance regimes all the more pressing, as the region's pre-existing aridity is exacerbated by climate change, population growth, and conflicts between rural and urban sectors. The perceptions and practices of Okanagan irrigators in general are framed by a long time involvement in farming in the valley, and should be appreciated as encompassing a kind of cultural association with the way that water is used in the valley, in addition to a business perspective. Furthermore, these perceptions should be placed within the broader discussion surrounding the benefits associated with growing and eating local sources of food, such as reducing the environmental and social costs associated with transporting food long distances (Suzuki and Boyd 2008, 53-54). Agriculture also carries benefits beyond those associated with food production, as it provides a landscape that is often valued by residents and visitors to rural areas. This is particularly relevant in the Okanagan, which is characterized by tree fruit and grape production, which are appreciated for their aesthetic qualities, and are often cited as a draw for tourists to the region. Hence, it becomes clear that there are a number of factors which must be balanced in order to arrive at a truly sustainable solution to issues surrounding water shortage in the valley. On the one hand, continued growth is expected within the valley, while on the other, preserving agriculture is of benefit not only to local farmers, but also to the wider Okanagan community. Meeting these objectives requires a consideration of the natural limits that the local geography, including postulations associated with climate change, place on development in the valley.

1.2 Institutional Framework

The way that water is managed and used in the Okanagan is influenced by a number of different institutions and governing bodies. Water administration is overseen in the valley by a variety of stakeholders, including the regional districts and the Okanagan Basin Water Board (OBWB), municipal water companies, First Nations communities, irrigation districts, and water user communities (Embley, Hall and Cohen 2001, 9), in addition to individual supplies that come from wells or personal licenses to draw water from nearby rivers, creeks, or streams (Carmichael, Journeay and Talwar 2005, 279). The way that water is managed in the Okanagan is also affected by federal and provincial policies.

1.2.1 Provincial and Federal Regulations

Water management systems within Canada are shaped by regulations created at a variety of jurisdictional levels. Water allocation and management options within a region or municipality are affected by decisions made at federal and provincial levels, as well as by those made internationally when a water basin crosses the Canada/US border. While all of these levels influence the way that water is controlled in Canada, the provinces are primarily responsible for water management (Canada. Environment Canada 2008). Each province has "evolved its own legislative approach to water, and this has resulted in a large number of water regimes in Canada – regimes that are often quite different from one another" (Muldoon and McClenaghan 2007, 247). Broadly, these regimes are designed to address issues related to water supply, flow regulation, authorization of various water use applications, and pollution control (Canada. Environment Canada 2008). It is at the discretion of the provinces

that certain duties related to water management, such as the treatment of wastewater, are allocated to municipalities. Furthermore, provinces have increasingly been seeking partnerships with certain non-state and quasi-governmental actors in order to produce more qualified and collaborative, and hence more appropriate, assessments of the manner by which local water resources might be allocated to meet user demands (de Loë and Kreutzwiser 2007, 87).

The role of the federal government in regulating the use of water in Canada has varied throughout the years. Due to the federal governments' augmented capacity to take action surrounding environmental issues that are inter-jurisdictional in nature, it has a role to play in settling disputes regarding water that crosses provincial boundaries (Inscho and Durfee 1995, 52). However, responsibilities at the federal level have traditionally been limited to "fisheries, navigation, federal lands, and international relations including responsibilities related to the management of boundary waters shared with the United States" (Canada. Environment Canada 2008). This is relevant within the valley as the Okanagan watershed crosses the international border into Washington, with its waters eventually flowing into the Columbia River system (Neilsen et al. 2001, 1). In order to deal with issues that may arise surrounding water that crosses into the United States, the Boundary Waters Treaty (BWT) between Canada and the US was passed in 1909 by the International Joint Commission (IJC) (International Joint Commission 2008). The IJC, which is "designed to act as a single body in seeking impartial solutions to problems in the joint interest of Canada and the United States" (Becker 1993, 243), is a federally mandated board which is served by both government officials and members of the general public. The only direct involvement of the IJC in the Okanagan is through the International Osoyoos Lake Board of Control,

which is responsible for overseeing the Zosel Dam. The Zosel Dam, which was originally built in 1927, effectively controls the elevation of Osoyoos Lake. The board of control is responsible for issuing drought declarations, and in response raising the water level of the lake, which is a primary source of irrigation water for farmers in the area (International Osoyoos Lake Board of Control 2006).

1.2.2. The Okanagan Basin Water Board

The Okanagan Basin Water Board (OBWB) was established in 1969 in response to provincial legislation suggesting that a better understanding of issues surrounding both water availability and water quality throughout the province was required. It was felt that this goal would be best achieved in the valley by a watershed based agency, acting as a collaboration of the three regional districts (Okanagan Basin Water Board 2009). Shortly after its implementation, the OBWB was tasked with co-ordinating the execution of recommendations stemming from 1974's Okanagan Basin Study, which was completed to "develop a comprehensive framework plan for the development and management of water resources for the social betterment and economic growth of the Okanagan valley" (Canada-British Columbia Consultative Board 1974, 6). Acting as basin-wide authority designed to provide a wider perspective on water related issues that affect the entire valley, the OBWB has never actually had any regulatory powers, but rather aims to improve communication between the three regional districts and act as an advocate of issues related to the well being of the greater watershed (Okanagan Basin Water Board 2009). This includes such functions as administering basin wide programs, representing local needs, securing and providing funding for programs and projects surrounding the health of the Okanagan basin, and

providing a forum for communication amongst the three regional districts (Okanagan Basin Water Board 2009). It should be noted that the original recommendations stemming from the Okanagan Basin Study of 1974 were to amalgamate the Okanagan's three regional districts and endow the OBWB with the authority to "carry out water resource management functions" (Canada-British Columbia Consultative Board 1974, 8).

Several of the issues put forth in the 1974 Okanagan Basin Study were recently re-evaluated in March of 2008, when a report was released addressing the continued need for stronger cross-regional governance. In this report, it was suggested that a need exists to deal with issues surrounding climate change and water availability at a valley wide level, and that the co-ordinating agency must possess the regulatory power that the OBWB is currently lacking. Furthermore, it was asserted in this report that such an agency should equitably represent the three regional districts, while allowing for localities to deal with issues surrounding their own services (Okanagan-Similkameen Task Force. 2008, 2-3). This suggests that the OBWB may have a greater role to play in determining water use practices in the future if a serious commitment to creating a watershed based authority with regulatory powers emerges. However, for now, the role of the OBWB rests in its capacity to advise on manners affecting the entire Okanagan basin, leaving it up to the regional districts and municipalities to adjust their actions accordingly.

1.2.3 Municipal Responsibilities

Municipalities located throughout the Okanagan valley are responsible for providing water to customers living within their jurisdictions. This includes both domestic and

agricultural water users. However, in a number of areas, agricultural water distribution has traditionally been the responsibility of irrigation districts and other irrigator administered organizations, such as water user communities. While this is still largely the case in Kelowna (Kelowna Joint Water Commission 2006), municipal takeover of water provision has occurred in a number of areas. This has likely arisen in response to increasing amounts of domestic users living in rural areas, as well as stricter regulations surrounding drinking water quality that may require expensive upgrades that are often more affordable for the regional districts, which are able to access provincial funding. An example of this is seen in the Vernon area, where the city of Vernon, the district of Coldstream, and the North Okanagan Water Authority merged in 2003 to form Greater Vernon Services, which now serves all water users who reside within these three regions, including agricultural irrigators (Greater Vernon Services n.d.). The towns of Penticton, Summerland, and Oliver provide examples of other municipalities that are responsible for supplying water for both domestic and irrigation purposes (The City of Penticton 2007; The District of Summerland 2006; Town of Oliver 2003).

1.2.4 Irrigation Districts and Water User Communities

Throughout the Okanagan valley, a number of irrigation and improvement districts provide both domestic and irrigation water to residents. These irrigation districts range in size from small, co-operative water user communities undertaken by a handful of farmers who have collaborated to construct and maintain a system of water provision (Cannings and Durance 1998), to large scale suppliers of both domestic and irrigation water, such as the South East Kelowna Irrigation District and the Black Mountain Irrigation District in the city

of Kelowna. Many irrigation districts in the valley were originally established following changes to the water act in 1914 which allowed public corporations and water user companies to hold water licenses and distribute the water. However, in light of demographic shifts in the valley, including increased urban expansion and heightened domestic demand for water, many irrigation districts have a considerable role to play in providing household water (Glenmore Ellison Improvement District 2002-2003; Black Mountain Irrigation District 2004). Irrigation districts, which can be seen as "autonomous local government bod[ies] responsible for providing water services for the benefits of our ratepayers" (Black Mountain Irrigation District 2004) have traditionally been run by members of the water using community, and there has generally been strong agricultural representation. However, in areas that are characterized by rapidly expanding urban centres, a greater number of domestic users are being supplied by irrigation districts, as well as seeking membership on their administrative boards, which has increased the potential for rural/urban conflict, an issue that is often associated with situating domestic homes in close proximity to farm land (Curran 2005, 23).

1.2.5 Private Water Licenses

In the 1870s, the process of recording water licenses in the Okanagan officially commenced (Ruzesky and Carter 1990, 35). Today, there are 6900 water licenses in the Okanagan-Shuswap area (Cohen and Kulkarni 2001, 9). These are predominately licenses held privately by individuals to draw from local bodies of water, as well as a relatively smaller number of corporate licenses. However, the corporate licenses that do exist tend to be significantly larger than those held privately by individual irrigators. It should be noted

that groundwater in British Columbia falls under the 'Unlicensed Category' in the Water Protection Act, and that groundwater use is often unregistered, and therefore the amount of irrigation water being drawn from private or jointly held wells is largely unknown (British Columbia. Ministry of Environment 1996, s. 12). For this reason, it is difficult to estimate the exact amount of water that is being used within the province, including how much is available and being used for agricultural purposes.

1.2.6 Multi-Dimensional Water Management Regimes

Water governance in the valley, and the corresponding patterns of use that emerge, is impacted by decisions that are being made along a continuum of water policy planning. Local management regimes, which must fit within frameworks outlined at federal and provincial levels, should be sensitive to recommendations made by the Okanagan Basin Water Board, acting as a representative of the three regional districts on issues that affect the entire watershed, and will ultimately be structured based upon local level circumstances and preferences. Regulations made by higher level authorities must be respected, and the importance of taking a basin wide approach to water management cannot be understated given the many risks and limitations associated with using or altering waterways without considering potential impacts to the entire interconnected water system (Iyer 2003, 72). At the same time, the opinions and needs of local water users and organizations must be acknowledged when water policy planning and implementation is put into practice (Ferreyra and Beard 2007, 272). The Global Water Partnership, a coordinating agency developed under the United Nations Development Program, the World Bank, and the Swedish International Development Agency, asserts within its mandate the importance of taking a

more holistic approach to water management that involves participation at the local level (Global Water Partnership n.d.). This idea was put forth in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro, which saw the evolution of a set of principles aimed at encouraging sustainable water practices, which include the assertion that decisions must be made "at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects" (United Nations 1992). Reconciling the demands of all stakeholders, including representatives from distinct user groups, such as domestic and agricultural users, necessitates the adoption of an interdisciplinary perspective in order to ensure that the ecological function of the larger watershed remains intact, while still meeting the needs of different water user groups at the local level.

Chapter 2: Theoretical and Methodological Framework

2.1 Introduction

Water scarcity, already a serious concern for many, is expected to increase as the forces of climate change and population growth couple to reduce the availability of this resource. Without secure access to water, livelihoods will be threatened, conflicts intensified, and the overall well-being of people living with shortage reduced. In light of actual deficiencies that are already occurring, alongside the projected worsening of this situation, alternative water management plans are being considered with an increasing sense of urgency. Recognizing that sustainable natural resource management is a process that must be suited to the ecological, cultural, and economic conditions that exist within the local context (Mowforth and Munt 2003, 35; Khor 2004), this study assesses whether or not current policies surrounding water allocation and governance may be ill suited to the demographic and environmental realities that are present in the Okanagan valley, and how this affects the capacity of local farmers to meet their irrigation water demands, especially during times of shortage. In particular, the role that farmers play in determining how their irrigation water is managed has been evaluated, alongside a consideration of if and how enhanced grower input and involvement would actually promote efficiency. This study has focused on the opinions of farmers, as it has been recognized The results of this study will be useful within the broader context of regional water management policy, as they will be used to elaborate upon the capacity for local input in determining how a resource might be governed so as to achieve goals associated with sustainable development. In order to properly appreciate both the objectives of this research, as well as the significance of the

results, a discussion of the underlying theories and concepts will be necessary, alongside an explanation of the paradigmatic and methodological positions that inform this study.

This research, which focuses on producing practical, workable solutions to the issue of water shortage through the consideration of policy outcomes on both demand and supply side issues, necessitates a theoretical and conceptual framework that generates results which enhance the capacity of stakeholders to address an area of concern. Research of this nature can be seen as falling within a pragmatic paradigm, as individuals operating under this ideology are typically interested in real world applications, and determining best approaches for dealing with a problem (Creswell 2007, 22). This worldview naturally corresponds with action research, which encourages citizens to analyze and explain their situations in order to develop a plan aimed at resolving negative circumstances (Berg 2004, 196). The approach that is taken to addressing the issue of agricultural water security in the Okanagan, while structurally influenced by an adherence to pragmatic principles and designs affiliated with action research, will consist of content related to the theories and concepts that are explored and represented below. These include sustainable development theory, political ecology, and concepts surrounding property rights and ownership.

2.2 Procedural Design

2.2.1 Pragmatism

The goals that are associated with this study demand a critical questioning of the way that certain systems may be structured so as to discourage sustainable patterns of resource use, and conversely, how organizational structures can be refined in order to maximize

efficiency. Arising in response to stimuli such as the expansionist mentality that often informed colonial policy, and later the rapid urban growth and development of a thriving tourism sector within the Okanagan, water management strategies in the valley have historically been preoccupied with accommodating more people, often with different interests. This has often occurred in the absence of foresight regarding the future availability of water in the Okanagan. While this research includes an exploratory component, it is primarily focused on finding solutions to the environmental and social problem of water scarcity in the Okanagan, with an emphasis on the agricultural sector. This project demands an instrumental approach to research that seeks truths or realisms, which can be applied when addressing the consequences, both realised and anticipated, of water shortage (Dewey 1905, 325). This concept fits within a pragmatic paradigm, which "focus[es] on the outcomes of research – the actions, situations, and consequences of inquiry" (Creswell 2007, 22). While pragmatism can take a number of forms, in general, those who ascribe to this worldview believe that the purpose of thought is to guide action, and that meaningful research should have practical applications (Nubiola 1996). Within relatively recent times, the pragmatic philosophy has been redefined to suit the explicit needs of discourse surrounding environmental issues. Within this worldview, known as environmental pragmatism, there is a specific focus on attempting to solve environmental problems through a consideration of the multiple moral perspectives that determine societal behaviours affecting the natural environment (Dryzek 1997, 85). This paradigm is particularly relevant for this research, which involves the interpretation of various attitudes adopted by agricultural water users surrounding the management of this resource, alongside a consideration of the perspectives of the many other stakeholders in the valley who have an interest in protecting the region's water supplies.

Setting out to answer the question of how water can be allocated more efficiently requires that a variety of research methods be employed in order to explore both the perceived shortcomings of the present water system and possible ideas regarding solutions, as well as to document the way that water is currently being used. This is aligned with the pragmatic stance that the research methods employed should be those that are best suited to address the research question, which may necessitate the use of a variety of different techniques (Creswell 2007, 23). That being said, caution must be exercised when acting under the umbrella of pragmatism so as to avoid focusing exclusively on arriving at a particular outcome or answering a specific question to the degree that alternative ideas or conceptions that might arise throughout the course of the research are overlooked.

2.2.2 Action Research Methodology

Approaching this study from a pragmatic paradigm demands an approach to research that allows for the generation of practical and functional results. It is for this reason that I have engaged in action research, which has been described as "a family of research methodologies which pursue action (or change) and research (or understanding) at the same time" (Dick 1991 as cited in Altrichter et al. 2002, 131). Furthermore, action research is considered to be data driven, and therefore relevant to a pragmatic worldview (Hase 2006). For the purposes of this research I will draw on action research methods that emphasize organizational reform (Dickens and Watkins 1999), with a focus on participant input and collaboration, whereby citizens are involved in the process of generating solutions to the problems that affect them (Hope and Waterman 2003, 125). Although the roots of action research are debated, this framework is largely attributed to the works of Kurt Lewin, who

suggests that it "gives credence to the development of powers of reflective thought, discussion, decision and action by ordinary people participating in collective research on 'private troubles' that they have in common" (Lewin as cited in Berg 2004, 195). Somekh elaborates on Lewin's position, which she sees as supporting action for systemic change, noting that these kinds of changes can be effected by concerned individuals, depending upon the degree to which their actions are constrained by the institutional and social structures within which they operate (Somekh 2006, 20). Assessing the institutional constraints that limit the potential for sustainable water management in the Okanagan will be a fundamental component of this action research project, as it is within these limitations that citizens recognize, negotiate, and act upon problems surrounding water shortage in the valley. At times, action research may necessitate or recommend the breaking down of these structures, in order to arrive at a more holistic and locally satisfying conclusion. This aligns with the notion that "action research is conscious and deliberate, a characteristic that leads to 'strategic action'" (Tripp 1990, 159).

The manner in which participation is defined for the purposes of this study will dictate the level of involvement of respondents. Within action research, participation can range from a situation where "citizens are full partners in the research process and are usually referred to as co-researchers" (Small 1995, 944), to a case where research is conducted with and for local informants in order to arrive at a conclusion, leaving it the task of community members to translate the research findings into results that are applicable to their situation (Minore et al. 2004, 368). Fundamentally, local level collaboration recognizes "the agency of citizens as '*makers and shapers*' rather than as 'users and choosers' of interventions or services designed by others" (Gaventa 2004, 29). I am aligned with this

perspective, as I recognize that individuals should have a greater decision making role surrounding the way that the resources upon which they depend are allocated and used. While this study has not been designed explicitly by community members, the research itself can be seen as being situated within the community, as it has arisen in response to the perceived risk by both farmers and water policy planners in the valley of increased incidence of water shortage in the Okanagan in the years to come. Although, due to time and funding constraints, participants could not be consulted regarding all aspects of this study, it has been largely motivated by a desire to collaborate with community members and involve agricultural irrigators in water resource planning. This approach is similar to that which was employed by Bessette (2006) in an action research project that was designed to establish water management committees in rural villages in the Nakanbe River basin in Burkina Faso. Throughout this study, emphasis was placed on encouraging dialogue amongst local stakeholders in regards to water use and allocation, as well as enhancing the capacity for community involvement in organizational components of water resource management and conflict resolution (Bessette 2006, 7). This resonates with goals associated with action research that emphasize building the capacity of local level stakeholders to "face difficulties realistically, to apply honest fact-finding, and to work together to overcome them" (Lewin 1946, 42). In both the project described by Bessette, as well as the present study, principles associated with action research influenced both the research design, as well as the kinds of ideas that were examined throughout the course of the study, such as investigating preferred levels of stakeholder involvement in resource management.

Action research that engages community members can be conducted in a number of ways. A primary concern surrounding the design of action research projects revolves around

the generation of knowledge that is accepted by stakeholders as valid, while at the same time is implicit in fostering equitable social change and enhancing the well-being of communities (Brydon-Miller, Greenwood and Maguire 2003, 11). Often, action research is described as a process which requires the researcher to employ a number of steps, continually re-evaluating and reforming the plan for action. A basic model for conducting action research involves four stages: "(1) identifying the research question(s), (2) gathering the information to answer the question(s), (3) analyzing and interpreting the information, and (4) sharing the results with the participants" (Berg 2004, 197). This structure is useful for the purposes of this study as it is open enough to allow for varied degrees of collaboration and community involvement at all stages. Furthermore, the inclusion of a final stage which involves sharing the results with the participants aligns with the goal of creating a study that has a practical use for Okanagan farmers. Action research is particularly suitable for this project as it speaks to my desire to engage in research designed to effectively communicate an idea or situation, create knowledge, enhance the capacity of local communities, and facilitate action (Saik Yoon 2006, 275). While this project is directed specifically towards exploring options and generating change in the Okanagan, this framework also serves as a useful tool for describing a process whereby empowerment and capacity building are fostered through stakeholder co-operation in the design and implementation of water management systems. Again, this speaks to the suitability of action research for this study, as this approach is generally recognized as enabling activities that "foster change on the group, organizational, and even societal levels" (Dickens and Watkins 1999, 127).

2.3 Sustainable Development

Simply stated, sustainable development theory suggests that the "earth's resources must be used in ways that assure the well-being of future generations" (Thomas 1993, 33). Although concerns regarding environmental degradation had already been expressed for many years, the notion that the viability of human systems may ultimately be sacrificed by changes to natural ecosystems was formally recognized in 1983 by the Brundtland Commission, with the creation of the UN World Commission on Environment and Development (United Nations Commission on Sustainable Development 2007). Within the report that came out of this meeting, it is stated that:

> ...major, unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all of these. The rate of change is outstripping the ability of scientific disciplines and our current capabilities to assess and advise.
>
> (World Commission on Environment and Development 1987).

Access to certain natural resources is considered by many to be a fundamental human right, and preserving these resources for future use and ecological functions aligns with the idea of inter-generational justice, which asserts that "each generation does not possess unlimited rights over the natural and human environment" (Page 2007, 233). The relationship between justice and sustainable development can also be applied to analyses of present day systems, as ensuring that equity in access to resources is achieved across a variety of socioeconomic criteria falls under the umbrella of this overarching theory (World Commission on Environment and Development 1987). This includes a consideration of the natural environment, and best approaches for maintaining the integrity of local ecosystems. Hence,

by situating this study within the body of thought surrounding sustainable development, it becomes necessary to approach water policy planning from a systems perspective. This demands a consideration of the way that sustainability is defined, as well as how to achieve a balance between competing uses.

While sustainability theory broadly suggests that future generations should have the same opportunities as those living in the present, the manner through which this should be achieved is debatable. According to some, natural resources, including depletable stocks, can be consumed and even exhausted by present generations so long as future interests are protected (Tietenberg 2006, 94). This approach suggests that human populations could theoretically continue to use up resources at the current rate, so long as a substantial portion of the revenue generated through the use of these resources is reinvested in technologies that could be used by future generations to replace the services provided by the original resource. An example of this would be an increasing reliance on desalinated water from the oceans in order to provide fresh water for human consumption. However, others would contest that this is insufficient and that actions should be based on the precautionary principle, which places emphasis on avoiding any activities that could potentially cause ecological harm (Shiva 2005, 65). Since the value that future generations will place on a specific natural resource or the wide-scale impacts that ecological degradation may impart are uncertain, citizens must act with care in the present to preserve the environment. The way that sustainable development is defined within a particular region or in regards to a specific ecological resource such as water will vary depending upon the perceptions of local citizens, the goals adopted by regional and municipal planners, and the relative influence of different user groups. Part of this study involves defining how it is that agricultural irrigators in the

Okanagan appreciate the concept of sustainability, and the implications that this has on preferred water management techniques.

Recognizing that sustainable development can be interpreted differently depending on the goals and motivations of stakeholders, it becomes clear that this concept should not be seen as having one fixed definition, but rather as fluid and therefore responsive to a variety of factors and conditions. It is for this reason that the position that is occupied within the overarching framework of sustainable development will determine the kinds of objectives that are sought. While effort will be made to represent the opinions of respondents surrounding the concept of sustainable development, my position within the sustainability debate will also affect the manner through which I engage in the study of water management options. Components such as the sample that is chosen and the kinds of questions that are asked inevitably correspond with my own belief system, as the very structure of this study involves a value judgement which suggests that current practices in the Okanagan are indeed unsustainable, as was outlined in the first chapter of this thesis. For example, although possibilities exist for alternative means of generating freshwater, such as desalinization of ocean water, this study focuses on how freshwater resources are presently being used, targeting inefficiencies that result in wasted water. Many examples of successful water management plans have been implemented in other locales, including such cases as the Indian region of Rajasthan, which illustrates the power of well-structured, locally sensitive systems. It is noted that, "if Rajasthan has always offered a very different picture from the classical one of a desert the explanation lies in the way it manages the water it receives so parsimoniously, one can say, drop by drop" (Mishra 2001, 5). Although water is incredibly scarce in this arid region, proper management, based largely on local co-operation and

organization, has allowed countless generations to survive in what many might consider an uninhabitable area. That such a great feat can be achieved in what is virtually a desert, receiving between 16 and 100 mm of rainfall annually (Mishra 2001, 23), is testimony to the possibilities that lie in alternative management schemes for preserving water for future generations.

2.4 Political Ecology

Related to sustainable development is political ecology, a perspective which deals with the premise "that environmental change and ecological conditions are the product of political process" (Robbins 2004, 11), in addition to a variety of other factors. Political ecology seeks to identify what or who is responsible for the loss of natural resources, and how environmental degradation is engrained within our culture. It is within the domain of political ecology that the question of water rights arises. It must be noted that this right to water is often seen as "a part of, or akin to, the right to life. The right to life is not a property right" (Iyer 2003, 112). The kinds of water rights which are addressed by political ecology are those that are linked to the way that water is allocated, and how that water is used. Approaches range from free market environmentalism, which "stresses the importance of well-specified property rights as the proper mechanism to provide the incentive for entrepreneurs acting on specific time and space information" (Anderson and Leal 2001, 369) to social ecology, which suggests that "property, in this ethical constellation, would be shared and, in the best of circumstances, belong to the community as a whole" (Bookchin 2001, 453). Many political ecologists interject a form of ecological constructivism into these kinds of debates, asserting that "our concepts of reality are real and have force in the world,

but that they reflect incomplete, incorrect, biased and false understandings of an empirical reality" (Robbins 2004, 114). However, it has been acknowledged that incorrect or biased accounts of ecological conditions, which are often based largely on political and institutional structures, can be renegotiated by incorporating local knowledge systems which have emerged from peoples' experiences with the land (Robbins 2004, 115).

Political ecology provides a theoretical framework for deconstructing and examining the social and political processes that shape the way that the natural environment is managed. Approaching this research with this kind of a theoretical backing allows for the recognition that resource management failures or shortcomings are often the result of a larger systemic process, the design of which is in some way poorly suited to encouraging sustainability. Drawing on the idea that "systems have to be designed within the local climatic, hydraulic, economic, social, and legal context" (Bjornlund and McKay 2002, 769), political ecology serves as a useful tool for examining the institutional structure that frames water allocation in the Okanagan, enabling progress towards the generation of a knowledge base that is structured on local perceptions of scarcity. Furthermore, analyses associated with political ecology enhance the discussion surrounding governance alternatives that are available, shedding light on possible causes of mismanagement, and providing situational evidence of systems that are both socially and environmentally just. Often, this includes a consideration of the ways that social and political inequities may negatively impact upon the natural environment, and conversely, how ecological shortage or degradation may be disproportionately experienced by certain segments of society (Dryzek 1997, 177). Hence, political ecology should be seen as being instrumental in evaluating the degree of social justice that is attained through various management alternatives.

2.5 Property Rights

The way that ownership of water resources is defined will carry significant implications for the way that this resource is managed, potentially affecting the overall sustainability of water governance regimes. Property rights, which include both the privilege to determine how a particular resource will be used, as well as the assumption of any obligations or risks that may be inherent to the ownership of that resource (Nickum and Greenstadt 1998, 159), can be allocated in a number of ways. These include publicly administered resources, those held privately by individuals, or collective ownership by a group. Preferred property rights structures in regards to water will be influenced by the way that the issue of water scarcity is perceived. Two main perspectives have been cited. The first is that water is an economic resource that is scarce in certain circumstances, and should therefore be subject to mechanisms such as pricing reforms in order to ensure that it will continue to be available. The second emphasizes the need for water as a life sustaining resource, both for human and environmental purposes, and hence holds access to water as a fundamental human right (Derman 1998, 76). While goals associated with these two different perspectives may serve one another and may even be held simultaneously when considering the different options available for allocating a scare resource, the primary belief system of policy makers, system administrators, and water user communities will influence the kinds of property rights structures that are preferred. A discussion of common property theory and water trading, two different approaches to allocating and managing water rights, will highlight possibilities for water management reform. These approaches to defining property rights inform this research, as the perceptions of Okanagan irrigators have been

measured regarding the underlying theories behind both common property, or collaborative approaches to water management, as well as water trading.

2.5.1 Common Property Theory

The term 'commons' implies that "a resource is owned, managed, and used by the community. A commons embodies social relations based on interdependence and cooperation" (Shiva 2005, 21). The difference between an open-access situation and a common property regime must be noted. Open-access scenarios "have given rise to what has become known popularly as the 'tragedy of the commons'" (Tietenberg 2006, 72). This is actually a misnomer, as an open-access situation is not the same thing as a commons, since there is a lack of any kind of ownership, regulatory framework, or system of enforcement. Establishing a common management system involves changing "the situation from one in which appropriators act independently to one in which they adopt coordinated strategies to obtain higher joint benefits or reduce their joint harm" (Ostrom 1990, 39). Strategies may involve the creation of clear boundaries to access and membership, monitoring, conflict resolution mechanisms, and the implementation of some kind of penalty for violating collective agreements (Ostrom 1990, 180).

It is acknowledged within common property literature that certain functions may be best served by the group, while others may be more suited to other entities, such as the state. This renders the idea of the commons flexible, allowing for certain elements of common property theory to be incorporated into management designs. Such a system has the potential to allow for collaboration with and input from stakeholders at multiple levels, which is particularly useful when certain institutions are better prepared to deal with specific

components of water governance than others (Ferreyra and Beard 2007; Dudley 1992). The idea of community involvement in deciding how water should be managed was explored by Syme, Nancarrow and McCreddin (1999) in their assessment of the way that Australian water users defined various components of fairness in regards to water allocation. Overall, water users exhibited very clear support for the idea that water is a common good which ought to be managed for the benefit of entire communities, and that market mechanisms on their own would not be sufficient to ensure "an adequate holistic allocation policy" (Syme, Nancarrow and McCreddin 1999, 56). However, many of the respondents to this study also recognized that people often act based upon self-interest, and that government input, which would ideally be impartial, may be required to oversee and ensure equitable allocation (Syme, Nancarrow and McCreddin 1999, 60).

A water management scheme for the Okanagan that takes common property theory into consideration would utilize this idea of multiple institutional layering. Also referred to as 'nested units' (Ostrom 1990, 180), a system may be overseen by a local purveyor or regulatory board, but managed by the group. Speaking to the idea of extending opportunities for citizen participation and collaboration in decision making, which is seen as enhancing democratic practices (Cornwall 2004, 77), this kind of system would allow farmers to manage their water on a small scale by cooperatively deciding priority uses for water during times of drought, and potentially trading allotments amongst one another. However, functions such as the initial provision of water allotments may be better served at another administrative level. Enhancing the involvement of irrigators in managing local water within the Okanagan would require only adjustments to the present system of allocation, as opposed to the introduction of an entirely new organizational structure, as a functioning water

allocation system does presently exist in the Okanagan that draws upon policies and preferences at a number of institutional levels. Recognizing the possibilities that local level collaboration and managing water as a commons within agriculture may carry for encouraging sustainable practices, it is necessary to evaluate both the suitability of this approach for the Okanagan, as well as the ways that such a system could be designed. Since ideas associated with multiple institutional layering suggest that certain segments of society may be better suited to address particular issues, a consideration of the degree to which irrigators should be involved in the management of the water that they are using, and the role of various water management institutions must occur. This can range from locally organized planning sessions, to more wide-scale co-operation in the management of water resources.

2.5.2 Water Trading

Within a number of regions that have experienced water shortage, various forms of water trading and water markets are being explored and implemented. As urban areas expand, particularly in localities that are characterized by a significant agricultural presence, water trading has been recognized as potentially providing solutions to issues related to balancing domestic, agricultural, and environmental demands (Chong and Sunding 2006, 248). Different types of water trading mechanisms have been put into place in areas such as Australia (Bjornlund and McKay 2002), several south western US states (National Research Council 1992), Chile (Galaz 2004), and even Alberta (Nichol 2005). These kinds of systems have been implemented based on economic principles which suggest that, if property rights are exclusive, transferable, and enforceable (Tietenberg 2006, 63), and there is not enough water to meet all demands, then a point is reached where users must sacrifice something of

value in order to obtain the amount of water that they desire (Saliba and Bush 1987, 11). While this can be achieved in a number of ways, such as implementing price reforms in order to more accurately reflect the true cost of water (Renzetti 2007, 263-264), water markets and water trading are seen as being more responsive to temporary shortages, and have the potential to address discrepancies between supply and demand effectively in certain settings (Horbulyk 2007, 209). Well established property rights that allow for trading can encourage sustainability, as the owner of the right would be expected to use up the resource at a rate that will allow for benefits to continually accrue from the land. When the private right includes a renewable resource, and they reflect the characteristics of exclusivity, transferability, and enforceability, it is suggested that there will be an incentive to manage the resource in such a way that it will still be available for future use (Tietenberg 2006, 140-142).

The way that water is traded can range from a formalized water market where water is exchanged for a specified price by parties who often do not know one another, to the informal sharing of water between two neighbours in times of shortage. Furthermore, the structure of water markets will be dictated by the specification of who can participate in water trades. Horbulyk (2007) notes that,

> ...one might expect considerably different market behaviour and outcomes in, for example, a market that allows trades only among irrigators within one irrigation district than in a market that opens trading to any prospective purchaser.
>
> (Horbulyk 2007, 208).

The way that water markets are established within a given region must be reflective of local conditions if they are to engender results that include not only economic benefits, but also social and environmental. For example, Chilean water markets, which arose in response to the nation's new Water Code of 1981, have resulted in a situation where large companies are systematically using or degrading the water resources of smaller, less wealthy farmers. Water markets in Chile have resulted in vast inequalities because they are situated within a system characterized by a slow and largely ineffectual judicial system that is inaccessible to small scale rural water users due to constraints related to cost and the level of trust they have in these organizations (Galaz 2004, 427-428). Clearly, the establishment of any water trading regime must involve careful consideration of the particular local circumstances which may affect the way that water markets play out.

Within the Okanagan, water trading could take a number of forms. It could be used as a tool by irrigators to collaborate and assist one another in times of shortage by allowing farmers to trade amongst themselves, or it could be opened up to any interested buyers, including urban developers. Certainly, the Okanagan meets preconditions expected to foster water markets, such as aridity and a quickly growing population (Reisner and Bates 1990, 107). It becomes then a question of whether or not such a system is seen as being desirable by water users, and if so, how it might be implemented in a socially and environmentally just manner. Since consumers of natural resources such as water may not always approach the topic of allocation from a holistic perspective that considers all stakeholders, it is also necessary to consider the capacity of water trading to enhance or detract from the greater societal good. One example of how water markets have been executed in Canada can be found in southern Alberta, where irrigators have been granted the right to engage in water

trades during dry years when water is rationed (Nichol 2005, 60). This system has been relatively popular in southern Alberta, with 82% of irrigators who were surveyed asserting that "farmers should have the opportunity to buy and sell water in drought years" (Nichol 2005, 119). However, with an ultimate design of moving water from lower to higher valued uses (National Research Council 1992, 3), it should be noted that "allocating water to the highest bidder also has the potential to exacerbate social inequity" (Christensen and Lintner 2007, 227). The possibility for inequities to arise under a water trading scenario highlight the need to thoroughly investigate potential winners and losers who may emerge from a water trading scenario.

2.6 Summary

The methodological and theoretical perspectives that have been explored should not be seen as exclusive to one another, but instead as an overarching approach that is informed by all of these different components, with each portion linking to all others. For example, it is an acceptance of principles related to pragmatism which necessitates a theoretical position that employs highly evaluative and applicable ideologies, such as political ecology, an approach which demands the breaking down and rebuilding of unjust or ineffective institutional structures. Hence, while specific inquiry has been made into preferences surrounding governance options such as water trading or collaborative water management, ultimately these are linked to goals associated with sustainable development and political ecology. At the same time, while perceptions regarding sustainable development have been investigated, conclusions are ultimately linked to concepts surrounding political ecology, and the implications that this may have on property right design. Furthermore, this research has

been both executed and evaluated using principles connected with action research, which demands that the voice of community members, in this instance the Okanagan agricultural community, be represented and reflected through the research in order to arrive at practical and workable solutions.

Chapter 3: Research Methods

3.1 Introduction

One of the primary goals of this research was to determine the practices and perceptions of farmers in the Okanagan surrounding water shortage and water management alternatives. This study was designed partially in response to a number of reports that have been released delineating the expected outcomes of climate change throughout the Okanagan in light of regional demographic and environmental realities (Cohen and Kulkarni 2001; Cohen et al. 2006) In response to previous findings that suggest that the problem of water scarcity in the valley may become more extreme in the future, this study aims to foster a greater understanding of the practical implications of and perceptions surrounding these issues within the agricultural sector. The need for a study focused on the agricultural community was highlighted by Neilsen et al. in their study on climate change and crop water demand in the valley. That report elaborates upon the fundamental link between agricultural viability and the availability of adequate supplies of irrigation water, an issue which may become more pressing if climate change carries the expected outcome of increased crop water demand (Neilsen et al. 2001). Additionally, the present study builds upon the master's thesis of Schorb which evaluates perceptions surrounding risk management and water availability amongst wine-grape growers in the Okanagan (Schorb 2006). Due to the considerable difference in factors such as crop type and land holdings, as well as demographic distinctions that exist within the Okanagan's agricultural sector, the present study encompasses growers from a variety of agricultural sectors, including tree fruits, wine-grapes, and ranching.

The research methods that were employed throughout this study were designed to elicit standardized, comparable responses from participants, while still allowing for the inclusion of any comments or ideas which might arise spontaneously. This approach was taken because of the variability that exists within the valley's agricultural sector, as it allowed for a comparison across groups that are present within the farm community, while still capturing any important comments that did not fit within the scope of the prescribed research methods. Beyond the differences pertaining to crop type and farm size, agriculture in the Okanagan has also been undertaken by farmers from a variety of cultural backgrounds. While the original European settlers of the valley were of British decent, agriculture in the Okanagan has also been influenced by First Nations practices, which were in place prior to the arrival of white settlers, as well as by immigrants from an array of other nations, such as Portugal, India and Japan. Many of these groups maintain a strong presence within the agricultural sector today (Lanthier and Wong n.d.). For this reason, perceptions surrounding agriculture, including the practices that farmers engage in, can be seen as part of a complex fabric that is composed of the different kinds of farming that are occurring throughout the valley, the socio-cultural backgrounds of farmers, and historic ties to agriculture in the Okanagan. Since farming in the valley is not uniform, it was desired that this study be conducted in such a way as to illustrate factors that may contribute to or influence opinions, as well as the way that the agricultural experience varies according to certain criteria, thus impacting upon perceptions surrounding preferred water management mechanisms.

3.2 Research Instruments

A structured interview schedule was developed and was administered through a series of interviews with Okanagan irrigators. The interview schedule was designed to elicit both quantitative and qualitative data regarding water shortage adaptation options. Furthermore, a focus group session was conducted upon completion of the interviews in order to introduce a selection of prior respondents to the main themes which emerged from the study, and allow for elaboration of several key ideas. These methods were used to determine specific details regarding the farm operations of participants, and information relating to the irrigation systems that they were employing at the time of the interview. Furthermore, input was sought from participants regarding their preferred options for addressing the issue of water scarcity, including the kinds of mechanisms that farmers would like to see in place to help them meet their water needs during periods of limited availability. The data that were collected was analyzed to create a picture of how water is presently being used on the farm, and why farmers are or are not motivated to conserve water. This was complemented by the opinions of irrigators regarding the degree to which they feel that water shortage is even a concern in the valley, and how they would define sustainability within the Okanagan context. In particular, respondents were probed about their feelings surrounding various forms of water trading and co-operative water management. A detailed discussion of the methods that were employed will demonstrate how both the interviews and focus group session were appropriate research instruments for this study.

3.3 Structured Interviews

The majority of this research has been devoted to conducting structured interviews with farmers in the Okanagan regarding their water systems, water shortage adaptation options, and opinions surrounding a variety of issues related to present and future water management practices in the valley. Structured interviews were seen as beneficial as they present each respondent with "approximately the same stimulus so that responses to questions, ideally, will be comparable" (Berg 2004, 78). Since the desired end goal was to evaluate the perceptions and practices surrounding water shortage across an area that is characterized by agricultural and climatic variation, it was important to ensure that responses could be reasonably measured against one another in order to evaluate how farmers growing different crops or operating in different parts of the valley felt about the same issues. However, portions of the interviews also involved the use of some more open ended questions in order to allow participants the opportunity to express their ideas and opinions beyond the kinds of answers that would be expected in the more structured portion of the interview (Berg 2004, 81). Designing the interviews in this way aligns with a pragmatic position as it results in the generation of both quantitative and qualitative information which can be presented collectively in order to most effectively address the research problem (Creswell 2007, 23).

The structured interviews consisted of six different sections (see Appendix B). The first was 'Farm Details', which focused on the amount of land that was being irrigated and the kinds of crops that were being grown. This section also included questions about the amount of time that respondents spent working on their farms and the share of total household income that came from the farm business. It was expected that these factors may

influence the ways that the questions were answered. For example, someone working full time on a large farm from which the majority of their household income is derived may have a greater incentive to invest in efficient watering devices in order to save money and reduce the amount of labour needed. Additionally, it was expected that practices on the farm surrounding water use may vary significantly depending upon the kinds of crops that were being grown, and their corresponding demands. The farm details section was designed in order to address these kinds of hypotheses.

The second section revolved around 'Water System Details' and included questions regarding the irrigation systems that respondents were using and any recent upgrades that had been completed. Inquiry was made into why upgrades to their irrigation systems had or had not been undertaken in order to evaluate the factors that were most likely to motivate farmers to install more sustainable watering devices. This section also included a series of questions surrounding the source from which irrigation water was being drawn. In addition to providing a picture of the ways that water is being obtained throughout the valley, it was expected that preferences surrounding water governance and distribution alternatives may vary depending upon the source from which irrigation water is received. Furthermore, it was anticipated that irrigators drawing from certain sources, such as groundwater users or those drawing from creeks or rivers, may be in a better position to collaborate and potentially share water with one another.

The third section was called 'Information Sources'. This segment dealt with the methods that respondents used for deciding when to irrigate, alongside the sources that growers regularly consulted regarding farm management in general. By understanding more comprehensively the factors that influence when farmers decide to irrigate, it was felt that

suggestions might be made surrounding ways to tailor water management regimes to these features.

The fourth portion of the structured interview was called 'Water Shortage Adaptation Options'. It questioned respondents about the different risks that they manage for, and how they felt about various alternatives for dealing with drought in the valley. Specifically, irrigators were asked about their responses to the drought of 2003, and what parts of their farm operations would be most sensitive to water shortage. This was followed by a series of questions about the kinds of risks that farmers are managing for on their farms, as well as their feelings about sharing water with their neighbours or collaborating to manage water collectively as a strategy to mitigate the effects of drought. It was expected that some farmers in the valley may already have engaged in informal water trading with one another, or worked co-operatively to manage water resources that they held in common. Of interest were the conditions under which these kinds of arrangements might arise spontaneously if they were indeed occurring at all throughout the valley.

The fifth section of the interview contained a extensive series of 'Attitude' questions, which included a number of enquiries about respondents' level of agreement with statements surrounding water availability, use, and management options in the valley. Prior to finalizing the interview schedule, the attitude questions were categorized into five main classes in order to determine the theoretical positioning of respondents. These were agricultural fundamentalism, environmental stewardship, risk management, collective concern, and profit maximization. By ascribing these labels to each question prior to conducting the interviews, with most questions falling into more than one category, it was possible to ensure that each major attitude that might be expressed was adequately represented in this section.

Furthermore, it was anticipated that respondents may exhibit a higher level of agreement with statements representing a particular attitude, and we were interested in determining what these would be. Using this information, it was expected that linkages might be made between the positions occupied by Okanagan irrigators and preferences surrounding water management alternatives.

The final section of the interview dealt with 'Demographic Information', including place of birth, education level, and amount of time spent farming. It was anticipated that these factors may influence the amount of alternative irrigation systems and governance structures that respondents had been exposed to. Respondents were also questioned about their total household income, from sources both on and off the farm, as it was felt that this may affect the kinds of decisions that farmers are able to make surrounding the irrigation systems that they choose to install on their farms.

In most instances, I travelled to the home of the irrigator in order to conduct the interview. Similar to the approach taken by Schorb (2006), face to face interviews were chosen rather than having participants complete a self-administered survey, so that I would have the opportunity to clarify any ambiguous questions, as well as record any incidental comments that irrigators may have had which were not covered in the interview schedule (Schorb 2006). Interviews generally took between 45 minutes and one and a half hours, with several interviews lasting for more than three hours. Many of these longer interviews included a tour of the farm and the irrigation system. The interviews were not recorded, as the questions in the interview schedule were specific enough to easily note the responses, and it was felt that, due to the volume of data that was collected, there may have been too much information to record, transcribe, and analyze verbatim. Extensive notes were taken

regarding comments that were made by respondents beyond the scope of the questions included in the interview protocol. Following the first set of interviews, which were conducted with approximately fifteen different irrigators operating predominantly in the Kelowna area, the interview scheduled was modified based upon feedback that was received from respondents.

3.3.1 Participant Recruitment

Potential participants for this study were recruited in a number of ways. The ultimate goal was to obtain as large a sample as possible of the agricultural population given the time and funding constraints that were associated with the project. According to Statistics Canada's 2001 Agricultural Communities Profiles, there are a total of 3,888 farms in operation in the North Okanagan, Central Okanagan, and Okanagan-Similkameen Regional Districts combined. These farms are owned and managed by a total of 5,710 operators (Statistics Canada 2008). While every member of the agricultural community could not be contacted due to practical limitations surrounding the volume of farms in the valley and the time constraints of the project, in addition to a lack of contact information for many of the farms as a result of privacy restrictions that prevented the BC Ministry of Agriculture and Lands from providing us with a complete list of agricultural operators in the valley, it was desired that the option to participate be made available to as large a number as possible. Furthermore, recognizing that a variety of different types of farming are occurring throughout the valley, we hoped to stratify the sample where possible so as to represent the perspectives of irrigators growing tree fruits, grapes, and ground crops, as well as members of the ranching community. Table 3.1 represents the top five crops by area that are being

grown in the Okanagan's three regional districts for which Statistics Canada collected data. These figures demonstrate that a variety of crops are being grown throughout the valley, the

	North Okanagan Regional District		**Central Okanagan Regional District**		**Okanagan-Similkameen Regional District**	
	Crop	*Hectares*	*Crop*	*Hectares*	*Crop*	*Hectares*
Crop #1	Alfalfa	10,240	Apples	2,525	Alfalfa	4,666
Crop #2	Hay/ Fodder	3,871	Alfalfa	1,664	Apples	2,543
Crop #3	Barley	1,801	Hay/Fodder	906	Grapes	1,741
Crop #4	Corn	1,527	Grapes	888	Hay/Fodder	1,338
Crop #5	Winter wheat	721	Cherries	242	Cherries	526

Table 3. 1 Top 5 Okanagan Crops

(Statistics Canada 2008).

most popular of which are alfalfa, apples, hay, grapes and cherries. However, this table does not tell the whole story since certain crops, such as tree fruits and grapes, require much less land than others, such as hay or alfalfa being grown for cattle consumption. Therefore, the crops that are being grown on the largest number of hectares in the valley may not necessarily be those that are being grown on the largest number of farms. Due in part to this ambiguity, the option to participate in this study was extended to as many irrigators as could be contacted, and areas that were found to be underrepresented upon completion of the interviews were targeted for an additional round of interviews.

In order to become acquainted with members of the agricultural community, we were granted permission by conference organizers to attend a series of farm workshops that were conducted by the BC Fruit Grower's Association and South Valley Terralink, a local equipment and growing supply company. At these conferences, we were able to meet with Okanagan irrigators to discuss the possibility of arranging an interview. Since the area under study included the entire Okanagan valley, workshops were attended in a number of different towns and cities throughout the Okanagan. At the workshops, contact information was collected from anyone who was willing to participate in the study, which was subsequently entered into a database. The database, which was primarily created to store the contact information of potential respondents, was divided up according to the town or city in which the farmer was operating, the size of the operation, the type of crops being grown, and their water source. Additionally, any points of interest that arose during conversations that occurred between the researchers and the irrigators at these meetings were considered when drafting the final interview.

In addition to attending the agricultural workshops in order to make contact with Okanagan irrigators, the BC Tree Fruit Association agreed to include an information package, containing a description of the project with a call for participants, in one of their mail outs. All irrigators listed on the BC Tree Fruit Association's mailing list who were living within the boundaries of the study area were provided with a self-addressed, return postage paid reply card, which could be forwarded to the University of British Columbia should they have the desire to participate in this research. Once these cards had been returned to the university, the names were entered into the database that had been created following the workshops. Upon completion of this initial recruitment phase, a total of 120

people had indicated that they would be willing to be contacted at a later date to potentially set up an interview.

In order to supplement the list of potential participants, an internet search of the Tourism BC website was conducted to obtain the names and addresses of a number of vineyards throughout the Okanagan (Tourism BC 2008). The Tourism BC website was selected for this search because it claimed to provide a comprehensive list of all of the wineries in British Columbia, sorted by region. The search was completed by looking for the vineyards by town or city, which provided a list of all of the wineries within each area. The contact information was checked against what had already been entered into the database so as to avoid recording a duplicate location. These were also entered into the database that had been created to store the contact information of possible respondents. An additional 72 names, addresses and phone numbers were added to the list as a result of this search, arriving at a grand total of 192 prospective respondents.

Due to the original desire to obtain as large a sample as possible within the time and funding constraints, all of the people listed within the database were eventually contacted. At the time that interviews were being conducted in a particular region, potential respondents from that area were sent a letter formally requesting their participation. The letter reminded the irrigators of the intent of the study, and indicated that they were under no obligation to participate in the research. This letter was followed up by at least one phone call to schedule a time and location for the interview.

Upon completion of the interviews, it was observed that there was an absence of participants who were involved in ranching. At this time, a second list of potential respondents from the ranching industry was compiled by attending a stockmen's association

meeting in order to make contact with members of this community. At this meeting, a brief presentation was given regarding the project in order to familiarize the attendees with the kind of research that was being conducted. Following this presentation, it was requested that any interested parties speak with the researchers. An additional nine names were obtained at this meeting, and interviews were eventually arranged with five of these individuals. Following the same protocol as the first set of interviews, I travelled to the homes of the ranchers who had agreed to be interviewed. However, an additional set of questions had been added to these interviews (see Appendix D) in order to obtain information for another research project that was being conducted surrounding water use in the valley, with a focus on understanding the perspective of members of the ranching community as well. For this reason, these interviews were recorded and transcribed.

Following this final recruitment phase, a total of 201 potential participants had been identified, of which interviews were arranged and conducted with 78. The remainder of the people on the list either could not be contacted, were unable to provide the time that was required for the interview process, or were eliminated for various reasons, such as duplicate listings when business partners or family members from the same farm were each recorded.

3.3.2 The Sample

It is important to understand the features characterizing the population that was consulted for this research in order to elaborate upon the representativeness of the study, illustrate factors that may contribute to or influence opinions, and reveal areas where more information may be required.

The majority of farmers who were interviewed were from the Kelowna area, while there were also a significant number of respondents from Summerland and Oliver. Orchards, which are characterized in the valley by the growth of tree fruits such as apples, peaches, cherries and apricots, were the most common farm type of respondents. This was followed by vineyards, a number of which were operating wineries on the premises. Prior to the second phase of interviews, which targeted respondents who were involved in hay and/or cattle production, there had not been any participants representing the ranching community. However, interviews were eventually arranged with five individuals from the Summerland and Penticton areas. Table 3.2 details the locations and primary crops grown by respondents.

	Vernon	Lake Country / Oyama	Kelowna/Westside	Summerland	Penticton / Naramata	Oliver/ Okanagan Falls	Cawston/ Keremeos	Total
Tree Fruits	5	4	24	14	2	9	3	**61**
Vineyard			5		2	3		**10**
Ranch				2	1	2		**5**
Other			2					**2**
Total	**5**	**4**	**31**	**16**	**5**	**13**	**4**	**78**

Table 3. 2 Locations and Primary Crops of Respondents

In total, 61 participants were involved in tree fruit production, 10 owned vineyards, 5 were from the ranching community, and 2 grew other crops, including vegetables and lavender. Based on the fact that many farmers involved in ranching tended to utilize areas of land which are much greater than other types of farming, while tree fruit growers generally occupied smaller acreages, thereby comprising a larger number of actual farms in the valley,

it was felt that this sample was fairly representative of the agricultural population. However, some additional input from farmers involved in grape growing operations and the ranching industry could have been beneficial, but making contact with these individuals proved to be a difficult task, given the time and funding parameters of this study. Additionally, there were several communities, including Armstrong and Osoyoos, where it was impossible to arrange

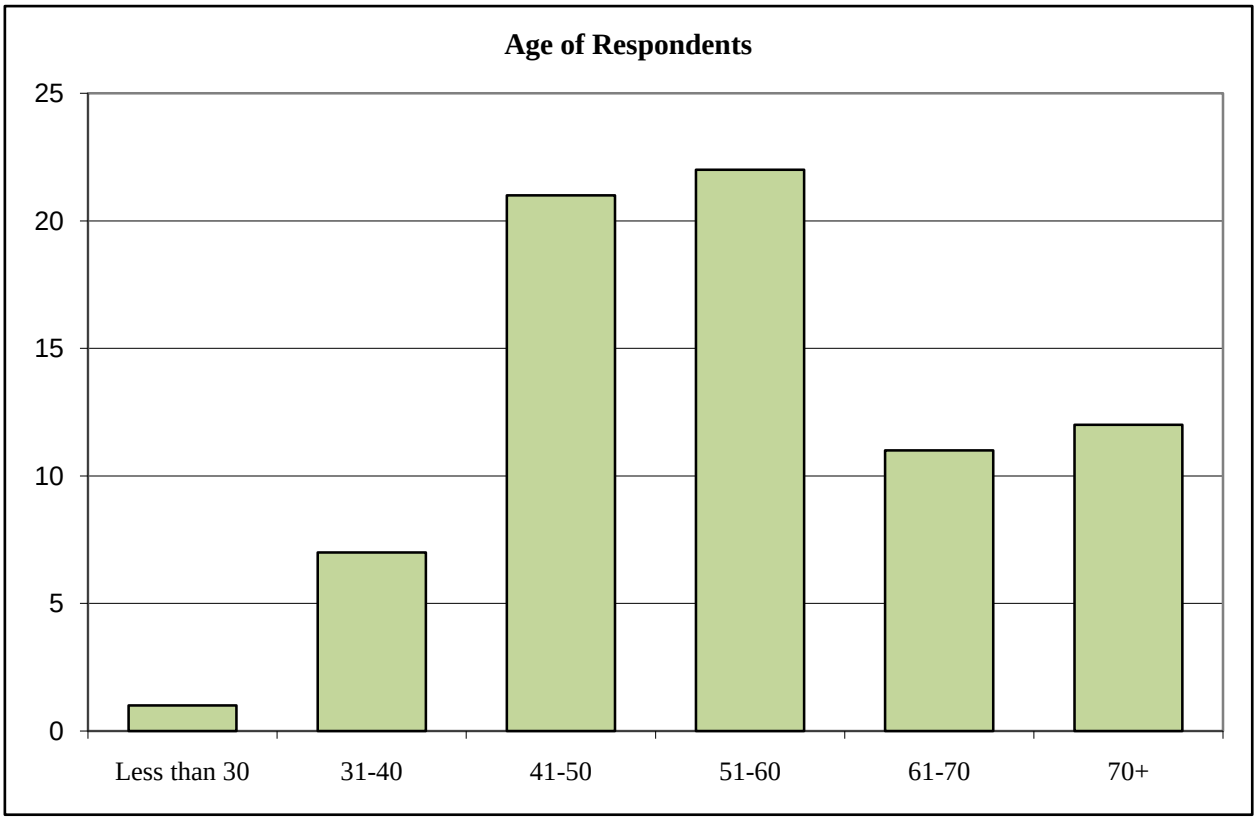

Figure 3. 1 Age of Respondents

an interview due to a lack of response from the irrigators who were contacted. Contribution from these communities could also have enhanced this research. Finally, the sampling methods that were employed may have unintentionally excluded representatives of larger, corporate farms, as the interviews were conducted almost entirely with respondents from small to mid-sized family farms. While several irrigators suggested that family farms are certainly the most prevalent kinds of farms throughout the valley, at least within the orchard

and ranching industries, it would have nonetheless been beneficial to speak with respondents who would not classify themselves as managers of 'family farms'.

Of the individuals who were interviewed for this study, nine were female and the remaining 69 were male, with an average age of 56.74 years. Figure 3.1 represents the breakdown of respondents by age group, demonstrating that the majority of participants were between the ages of 41 and 60, but that there was also significant contribution from farmers over the age of 60. The age of the interview sample, which is relatively advanced, naturally corresponds with the long time involvement in agriculture which was common, with an average amount of time spent farming of 27.01 years. Ten respondents indicated that they had been involved in farming for more than 40 years. The majority of respondents stated that they have always farmed in the Okanagan, with an average amount of time spent farming in the valley specifically of 25.49 years. As such, it is not surprising that 78.67% of

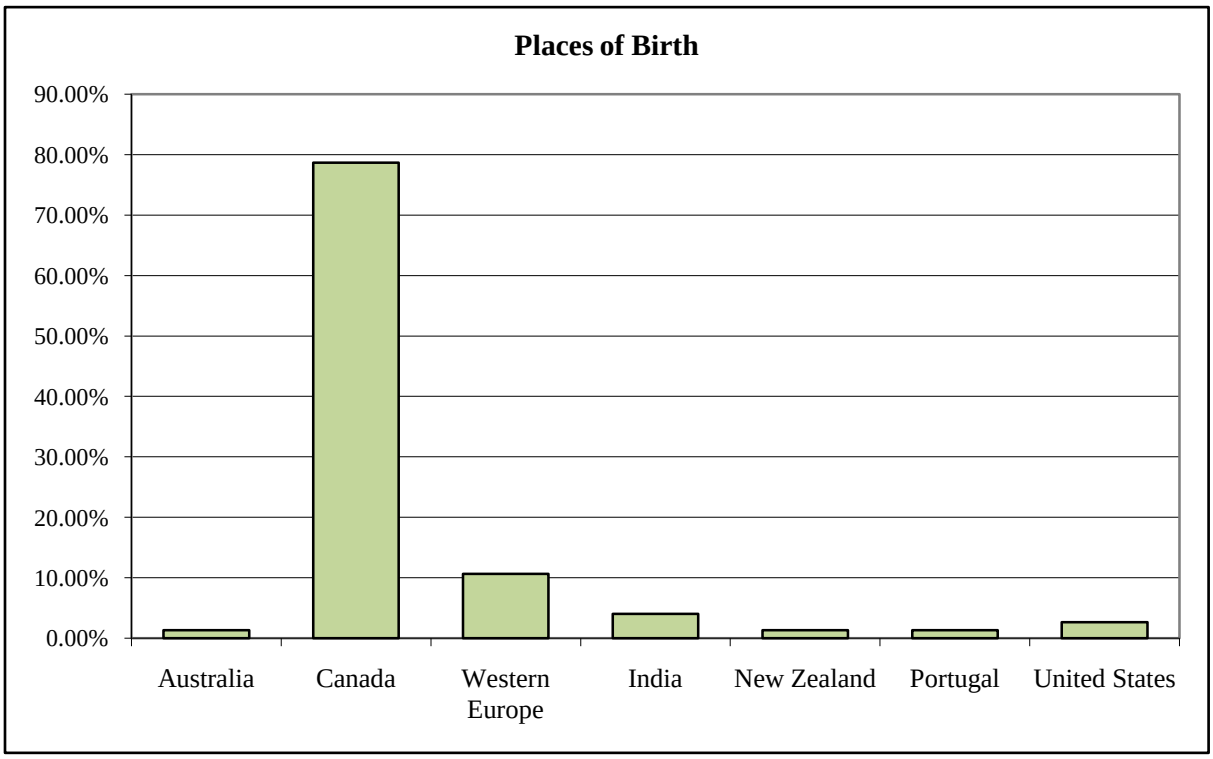

Figure 3. 2 Birth Places of Respondents

respondents ascertained that their country of origin was Canada, the majority of which were originally from the Okanagan valley.

Figures 3.2 and 3.3 respectively illustrate the places of birth of respondents and the areas of origin within Canada of participants who were born in this country. Other areas that were represented were Australia, New Zealand, Western Europe, India, Portugal and the United States. Often, the opinions of these respondents were influenced by experiences that they had in their countries of origin, such as one respondent from Australia who suggested that the issues that are present in the Okanagan in regards to potential water shortage scenarios are the same kinds of issues Australians faced a number of years ago. Taken as a whole, the long time involvement in farming of the average respondent, as well as the

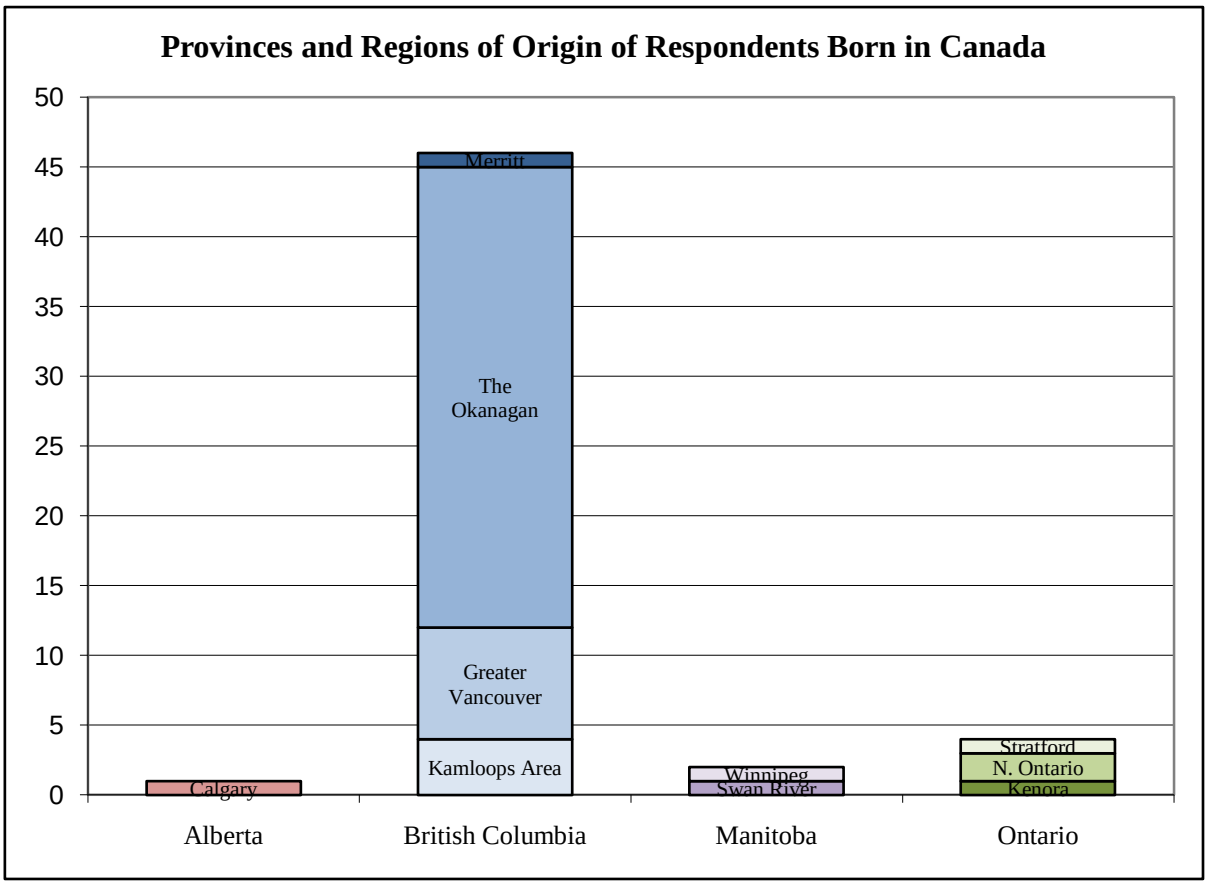

Figure 3. 3 Provinces and Regions of Origin of Respondents Born in Canada

tendency to have been born and raised in the Okanagan suggest that the average participant has a history of farming in the valley, and in general is familiar with the many interwoven factors that affect water availability and use. This comes as a result of having witnessed the changes that the valley has undergone and their consequences. However, greater input from farmers from more diverse nationalities and backgrounds may have been beneficial, as agriculture in the valley has prospered in part due to immigration, and continues to be characterized by a strong international presence. While demographic factors, such as age and length of involvement in agriculture, will largely establish one's experiences, knowledge, and opinions surrounding agricultural practices and preferences in regards to water, factors such as crop type and farm size are also significant determinants.

The extent to which respondents engaged in agriculture varied from small scale hobby farms of less than ten acres to large operations making use of several hundred acres of land. Many farms fell in between these extremes, utilizing 25 to 60 acres of land to engage in farming either as a full time occupation, or part time with a secondary job on the side. A number of respondents with smaller to mid-sized farms were retirees who had either reduced their agricultural production as they became older, or engaged in small scale farming as a hobby when they stopped working in another field. Table 3.3 details the average, maximum, and minimum amounts of land owned, leased, rented to others, and managed for others by respondents. 74 participants owned the land that they farmed, while 22 leased land, often in conjunction with owning land of their own. Three respondents managed land for others, all of which were involved in viticulture and were responsible for overseeing winery operations. Five respondents rented land out to other people. The average amount of irrigated land that was owned by respondents was 27.87 acres, with a maximum of 711 acres and a minimum

	Acres Owned	Leased Land	Rented to Others	Managed for Others
# of Responses	**74**	**24**	**5**	**3**
Average Acres	**58.16**	**865.34¶**	**68.96**	**121.67**
Average Irrigated Acres	**28.90**	**18.61**	**68.1**	**121.67**
Max. Acres	**1500**	**20075**	**300**	**250**
Min. Acres	**1.5**	**1.5**	**2.4**	**15**

Table 3. 3 Land Ownership

¶ This number is artificially inflated by the one respondent who leased over 20,000 acres of land. The figure associated with the average irrigated acres is a better representation of the average amount of land being leased.

of 1.5 acres. The difference between these two figures demonstrates the wide variation in farm sizes, with an average that appropriately represents smaller to mid-sized farms, which were the most common.

As was previously stated, tree fruits and grapes were the most common crops being

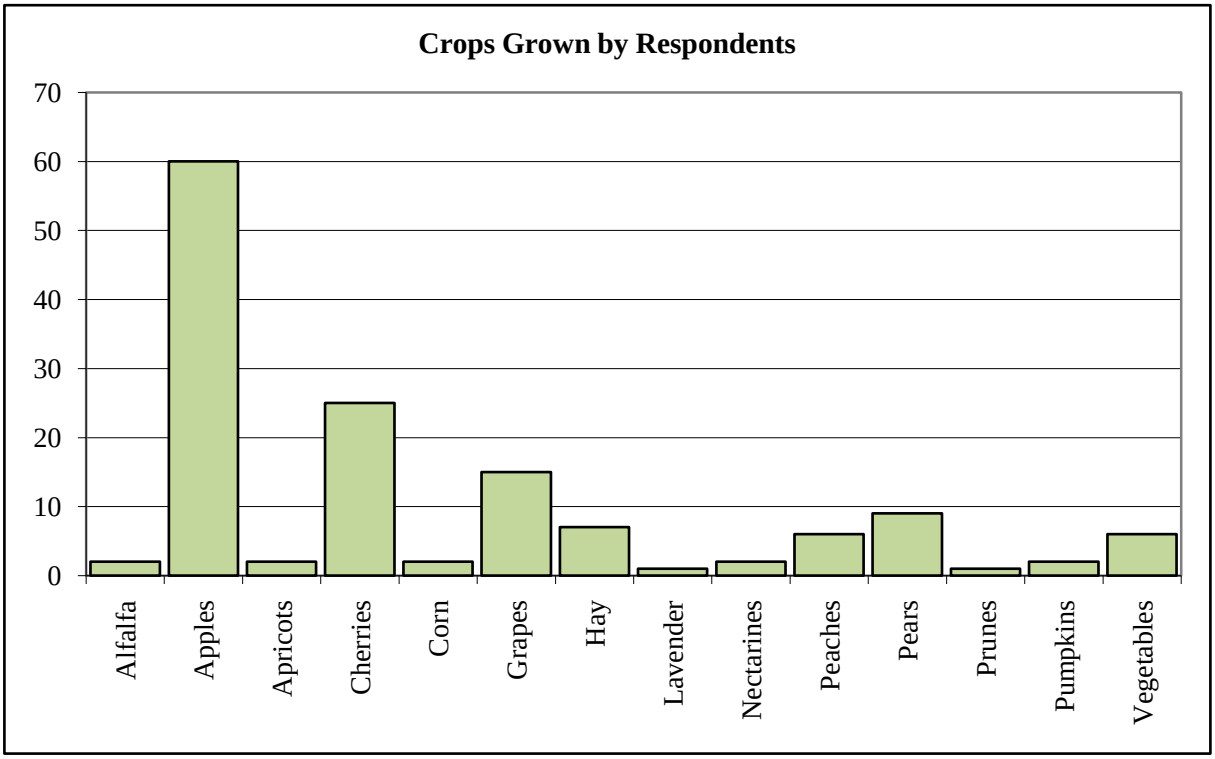

Figure 3. 4 Crops Grown by Respondents

produced by respondents. However, a more detailed description of the kinds of crops that are being grown will demonstrate the wide variation in production, which has been attributed to the Okanagan valley in the past (Reitsma 1986). Figure 3.4 depicts all of the crops that respondents stated that they were growing at the time of the interview, even if only a small proportion of their acreage was devoted to this. On the other hand, Figure 3.5 illustrates all of the crops that respondents stated were their primary crops. By looking at these two figures, it becomes clear that apples were the most commonly produced crop, followed by cherries and grapes. However, it is also clear that respondents were involved in a wide array of production activities, and were often growing other things in addition to their primary crops.

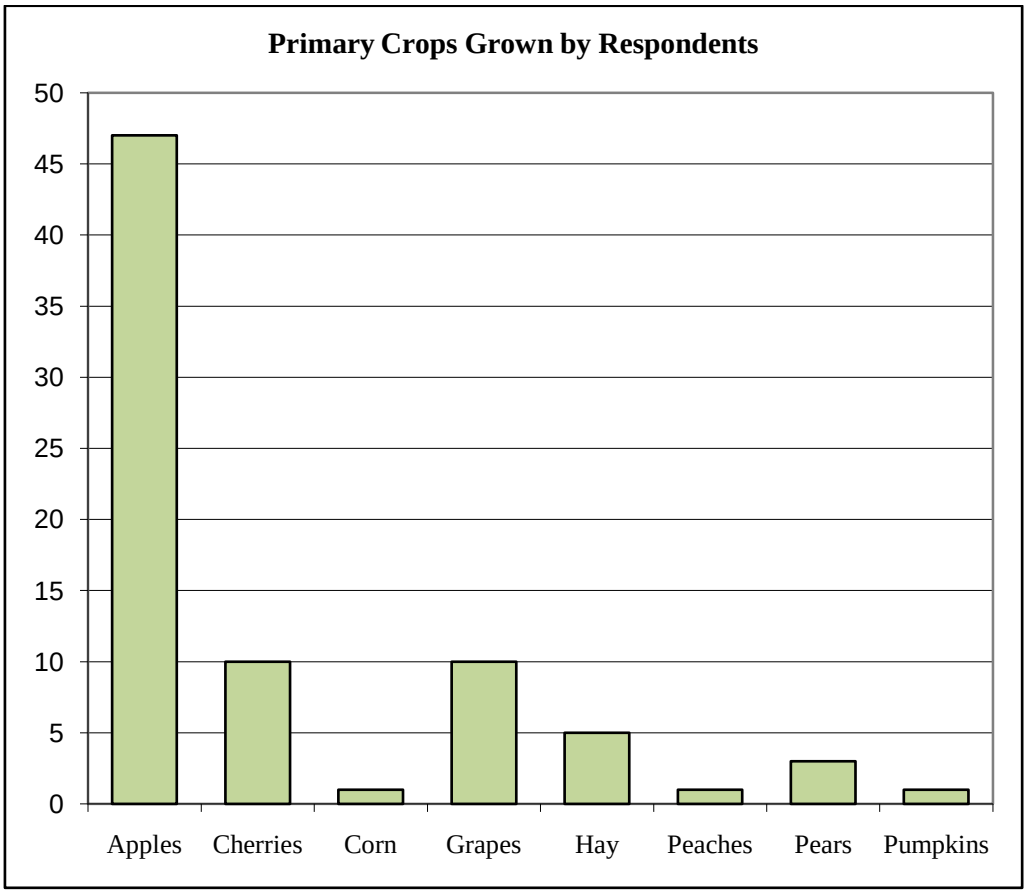

Figure 3. 5 Primary Crops Grown by Respondents

3.4 Focus Group

The data that were collected throughout the interview process were supplemented by comments made during a focus group session, which was conducted upon completion of the interviews with Okanagan irrigators. It was originally desired that a preliminary focus group session be completed at the outset of the interview process in order to engage the agricultural community in the research process by having farmers provide input into the design of the interview. After completing approximately 15 interviews, this first set of respondents was contacted about participating in a focus group session to discuss their feelings about the interview process, and any changes or additions to the interview schedule that they felt were necessary. However, the timing for this meeting did not work out well for the irrigators since it happened to coincide with a very busy time for most people on the farm. As a result, only one person would have been able to attend the session, and so it was cancelled. Instead, the interviews were modified slightly based on comments that the first set of irrigators had made during their individual interviews.

The second focus group meeting was held upon completion of the individual interviews in order to present the preliminary results of the study to a group of prior respondents and measure their level of agreement with the findings (see Appendix C). Furthermore, this session was designed to encourage discussion regarding how Okanagan irrigators as a group experience water shortage, and how they feel about alternative strategies aimed at addressing this problem (West Berkshire Council 2005, 2). Focus groups allow for participants to draw off of the statements of one another, and often a "far larger number of ideas, issues, topics, and even solutions to a problem can be generated through group discussion than through individual conversations" (Berg 2004, 124). For the purpose of this

study, the use of focus groups served a dual purpose. Primarily, the focus group was useful for obtaining more detailed, qualitative information regarding the outlooks of Okanagan irrigators, including their perceptions surrounding the preliminary results that were presented. Furthermore, since this project addresses the capacity and willingness of farmers to work together to share or co-manage water resources, the focus group session was useful for evaluating the group dynamic, and how farmers might work together to come up with means of dealing with the problem of water scarcity.

Invitation to participate in the focus group sessions was extended to farmers who had been interviewed from the Kelowna area, and who had indicated that they would be willing to be contacted for further contributions relating to the study at a later date. The focus groups were limited to respondents located in or around Kelowna in order to reduce the amount of travel that participants would have to undergo in order to attend. 14 farmers from the original sample received a phone call requesting their presence at the second focus group session. While nine confirmed that they would attend the meeting, only four ended up making it on the actual day. While the first portion of the session was structured as a presentation of some of the main findings stemming from the interview process, it was emphasized to the participants that the session should flow more along the lines of a group discussion, and that they were encouraged to put forth any comments that they may have had as they arose.

Participants were asked for their initial reactions to the findings, followed by a series of questions surrounding their interpretation of the term ‘sustainability’ and how this concept should be incorporated into water management practices in the valley. Furthermore, the opinions of participants were sought regarding water governance in the Okanagan, and if it

was felt that this encourages sustainability under the present design. Participants were also introduced to a case study from Australia where farmers have developed a water trading system that operates through an online exchange, which is facilitated by the local irrigation districts (Murrumbidgee Horticultural Council Inc. n.d.). Subsequently, they were asked a series of questions about their perceptions surrounding the usefulness of such a system, including any risks or benefits, and if they felt that a similarly structured water exchange would be appropriate for the Okanagan.

3.5 Data Analysis

The process of exploring and interpreting the data that were collected involved three stages: inputting and managing the information in an online database, examining the data through graphical representations and content analysis, and forming conclusions which were tested and compared with statements made during the focus group session. This approach conforms with the format outlined by Miles and Huberman (1994) whereby the data analysis process must work through three stages in order to arrive at conclusions that are objective, reliable, replicable, and valid both from the researcher's perspective, as well as that of the participants. The three stages can be summarized as data reduction, data display, and conclusions and verification (Berg 2004, 39). This approach was utilized for the purposes of this study in order to develop larger themes that were recurrent throughout the interview process, and then break these themes down into component parts based upon both specific, quantifiable responses, as well as answers to more open ended questions and additional comments that were made by respondents. While the focus group session should be seen, in one sense, as a tool for collecting data, its primary function was to compare the preliminary

findings with the opinions presented by focus group participants in order to enhance the overall confidence in the findings. Furthermore, focus groups were seen as an appropriate tool for an action research project, as they allow for collaboration between researchers and members of the community in question in order to diagnose problems and develop solutions (Holter 1993, 299).

The first step in examining the data involved sorting the interview notes and entering responses into an online database. The form that the data was entered into was identical to the forms which were brought to the interviews and completed with respondents. Therefore, processing the data was simply a matter of transcribing the interview sheets into the online system. Any comments that were made surrounding certain questions, or that were made external to the formal interview questions, were entered into a box at the end of the form called 'notes and comments'. If an observation was made in regards to a specific question that was asked of the respondent, this was noted alongside the comment. Care was taken to document comments as they were presented by respondents. However, since they were not recorded and transcribed verbatim, observations should be seen as being paraphrased by the interviewer. Following the entry of an interview into the database, it was possible to verify the information that had been submitted by returning to the start page and choosing to view the data as a list of records. This command displayed each interview in individual, numbered boxes, with responses to the questions being displayed sequentially. The number that was assigned to each interview through the online database system was recorded on the paper copy of the interview notes in the event that future verification might be necessary. The hard copies of the interview notes, which include the signed consent forms, have been securely stored on the UBC Okanagan campus.

The second phase of data analysis involved an exploratory assessment of the responses. Information that was entered into the database could be exported to various computer programs which served as analytical tools. The two programs that were used to examine the data were Microsoft Excel and Statistical Package for the Social Sciences (SPSS). At the outset, responses to each of the questions in the 'Attitude' section of the interview were graphed in Excel in order to determine if there appeared to be an inclination to subscribe to any of the theoretical positions with which each question had previously been associated. Once certain themes became obvious, these were explored in conjunction with other data that was collected, such as irrigation systems that were being employed or drought management preferences. Comments that were made beyond the structured questionnaire were compiled into a document and printed for further analysis. Comments were highlighted and flagged for the following topics: approaches for dealing with shortage; trading or exchanging water; concerns surrounding agricultural viability; governance alternatives and local co-operation; and solutions. SPSS was used to graph these comments, as well as responses to any other more open ended questions or questions which elicited multiple responses.

The final phase of data analysis involved arriving at conclusions and verifying these findings. Once the main themes had been identified, these were verified by analyzing the responses to questions relating to these themes in order to determine the degree to which the opinions and practices of irrigators supported these ideas. Drawing upon the logic employed by Schorb (2006), bar graphs were utilized to display findings related to specific questions as they were considered to be an effective tool for visually displaying the results. Additionally, some data were displayed in tables when it was too complex to be displayed graphically.

These results were broken down thematically and presented to the focus group participants via a power point presentation, at which time they were asked to comment on their impressions of the results, and if they accepted these as representative and accurate. Finally, the focus group discussion was transcribed, and comments were analyzed in the same fashion as the observations that were made during the original set of interviews, with dominant themes being highlighted and incorporated into the final results.

Chapter 4 - Preserving Okanagan Farm Culture: Protecting the Agricultural Base in a Shifting Rural Landscape

4.1 Introduction

The Okanagan Valley is characterized by an often controversial juxtaposition of rural and city settings, necessitating the recognition that urban and agricultural water operations and demands are inherently linked to one another, as stresses on the system from one sector will carry consequences for the other. A major theme that emerged from this research revolves around the position that farmers and agriculture in general occupy in the changing Okanagan landscape, and how a number of factors, including water security, are compromising the viability of agricultural operations, as well as the farm culture that has come to exist in the valley. Many of the statements made by respondents demonstrate clear evidence of a perceived divide between agricultural and urban water users. In general, the irrigators who were interviewed suggested that rural areas in the valley are being eroded, and it has become more difficult to survive in the agricultural industry. Despite this fact, many respondents expressed a desire to continue their involvement in agriculture, frequently referring to their satisfaction with the way of life associated with farming, as well as the connection that they feel with farming in the valley due to often lengthy family histories within this industry. Furthermore, many farmers framed their discussions around the idea that agriculture as a whole in the valley was worth protecting for its own sake, rather than approaching this topic from the perspective of a business owner seeking to maximize their returns, as one might expect. These kinds of answers provided evidence of a deep commitment by farmers to preserving not only their own livelihoods as farmers, but agriculture in general, and the lifestyle associated with farming in the valley.

It quickly became evident during the analysis of comments put forth by respondents that agricultural water shortage and drought mitigation should not be perceived of as standalone issues, but must be considered within the context of the specific conditions that affect and influence Okanagan farmers. It is these conditions that largely determined the capability and willingness of farmers to move towards more sustainable watering systems, holding as their ultimate goal the preservation of a vibrant agricultural sector in the Okanagan. A brief review of the history of farming in the Okanagan, which was discussed in greater detail in chapter one, alongside a consideration of the way that the rural consciousness and sense of farm culture can influence environmental decision making, will precede the presentation and discussion of perceived threats to agriculture in the Okanagan, and how these might be addressed through sustainable planning that acknowledges the existing rural/urban interplay.

The Okanagan valley is often associated with the many orchards and, more recently, vineyards, which are immediately visible to visitors and residents alike. However, it is important to remember that agricultural development in the Okanagan has occurred over the course of a long history, as outlined in chapter one, which began with the original Syilx communities, which would eventually be displaced by European settlers, and later evolved from predominantly ranching to orchards, and within the past 25 years or so, vineyards (Belliveau, Smit and Bradshaw 2006, 367). Furthermore, following the original establishment of an orchard industry in the Okanagan which arose largely in response to the efforts of local land development companies, agriculturalists in the Okanagan have often proceeded by forming cooperative associations, dealing with items such as marketing, shipping, and water distribution (Dendy 1981). This has resulted in many user operated

institutions, including irrigation districts, playing a role in maintaining the agricultural base in the valley. Hence, it is only natural that many of the irrigators in the valley, who are often third or fourth generation Okanagan farmers, feel a sense of investment in and commitment to agriculture. Furthermore, every participant in this study was producing on a family owned and operated farm as opposed to larger, corporate owned businesses, a factor which undoubtedly enhances the personal affinity towards their farms, and agriculture in general, that many of the irrigators expressed.

Today, agriculture continues to play a major role in the Okanagan, which is home to 90% of the orchards and 95% of the vineyards in the province of British Columbia (Embley, Hall and Cohen 2001, 10), in addition to the ranches that continue to exist in the valley, particularly north of Vernon where the cooler climates are more suited to this type of farming (Pidwirny and Gow 2001). Despite this strong agricultural presence, domestic users are placing increasingly heavy demands on agricultural watering systems due to rapid population growth in urban areas of the valley, and in many instances, are now being supplied by systems that were originally built for irrigation (Black Mountain Irrigation District 2004; Glenmore Ellison Improvement District 2002-2003; Greater Vernon Services n.d.; Ruzesky and Carter 1990, 59; Town of Oliver 2003).

Preserving the agricultural base that exists in the Okanagan Valley was conceptualized by participants as important both as a means of securing their livelihoods, as well as protecting the cultural connections that farmers feel for agriculture. In their exploration of rural change, Marsden et al. (1993) discuss a conception of locality that is "constructed out of a constellation of social relations" (139). This position, which lends credence to the idea that the motivations and aspirations of farmers are tied not only to

economic objectives, but also to social and cultural concerns (Morris and Andrews 1997, 91), is relevant within the Okanagan, particularly within the orchard industry, which is characterized by smaller, family run operations focused on generating a product that is specialized within Canada due to the climatic and geographic conditions in the region (Embley, Hall and Cohen 2001, 10). Ward and Munton (1992) demonstrate the connection that all of the social, cultural, and economic factors that exist in a given locality have to the decisions that farmers are prepared to make in regards to environmental planning, suggesting that these conditions are place specific, and that this variation is often a determining factor in the values that are associated with a location, and preferred management practices (127). Hence, farmers' construction of the rural landscape, which is determined by both the physical setting as well as the various social and cultural components that make up the individual's agricultural consciousness, will serve to legitimate decisions and preferences in regards to natural resource management (Morris and Andrews 1997, 93), or more specifically for the purposes of this study, water conservation measures. A discussion of the features that participants identified as important for preserving the agricultural base in the Okanagan, not just for the purposes of production, but also to maintain a certain way of life, will provide valuable insight into the factors that will hinder or facilitate the acceptance of various water conservation measures.

4.2 Identifying Risks: Agricultural Vulnerabilities and Concerns

The farm owners and operators that were interviewed for this study were asked to rank the risk factors that they considered important in terms of their management activities, and where water shortage ranked amongst these concerns. Additionally, comments that were

made throughout the course of the interviews regarding perceived threats, which may not directly factor into personal risk management considerations or strategies, were recorded. Figure 4.1 represents the responses that were given when asked to rank the most important risks that farmers are facing in their management activities.

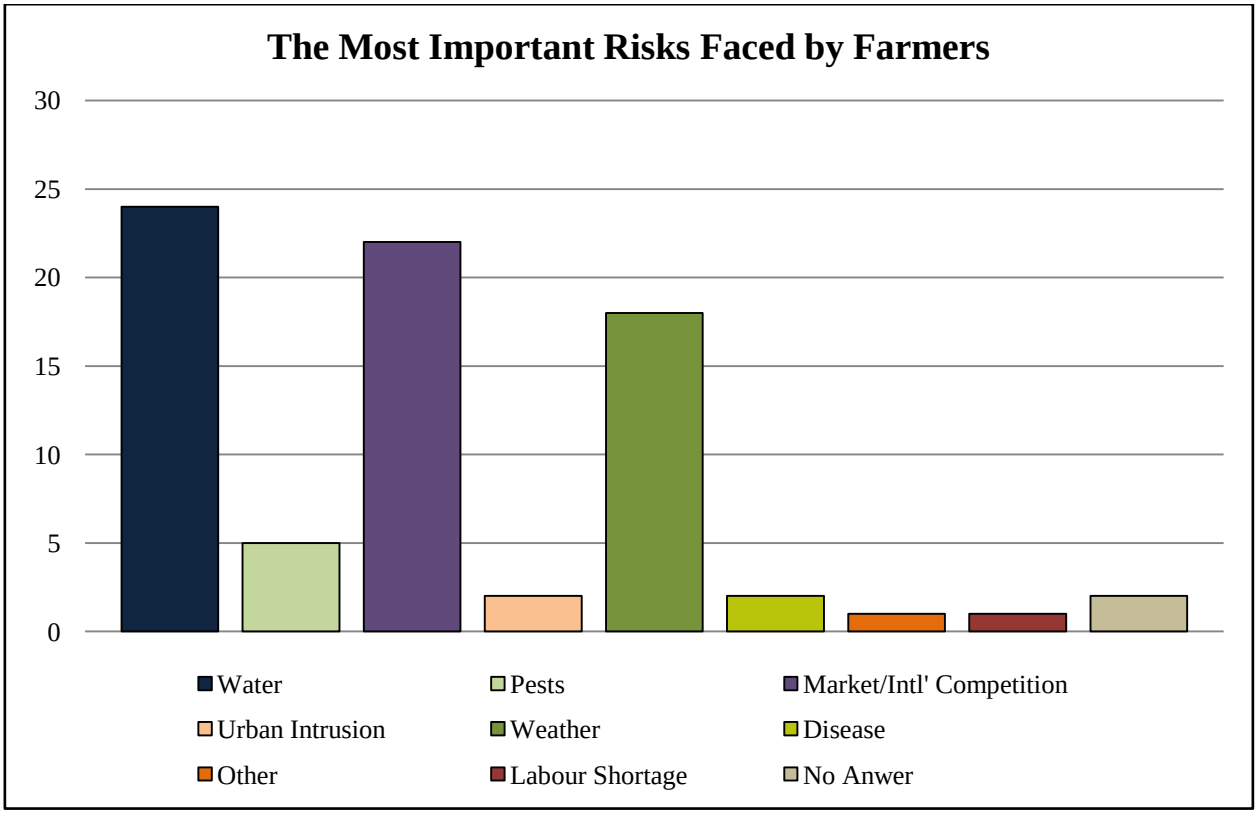

Figure 4. 1 The Most Important Risks Faced by Farmers

Concerns surrounding the continued availability of water for irrigation ranked the highest, with approximately 31.1% of respondents citing this as the top risk that they must manage for. However, it should be noted that respondents' answers may have been influenced by the fact that the topic of the interview was water shortage in the valley. Furthermore, many of the irrigators suggested that, while this was something that they were aware of and factored into their farm management decisions, they generally had not been affected by any serious shortages to date. The second most prevalent factor that was cited

was market conditions and international competition, with 28.6% of farmers indicating that costs associated with production and the price that they will receive for their product are major considerations. Weather related risks, including frost and hail, were mentioned by 23.3% of participants. While these kinds of perceived risks pertain specifically to an individual's management activities on his or her farm, it is interesting to note that many of the comments offered during the interviews in regards to agricultural concerns were framed on more of a macro level, addressing the viability of farming, and the preservation of the current agricultural structure in the Okanagan, as opposed to personal concerns related to profit maximization. Hence, it becomes apparent that, while farm related decision making is affected by the balancing of operational risks (Schorb 2006, 4), it should also be seen as being a multi-scale, multi-level process which involves a consideration of the conditions that influence agricultural activities, such as the global, national, regional, and personal arenas, an idea which is elaborated upon by van der Ploeg et al. (2000) in their discussion of the shifting rural paradigm.

Comments that were made regarding the state of the agricultural sector in the Okanagan, extraneous to the question that specifically asked farmers to rank the risks that they manage, reinforce the ideas portrayed in Figure 4.1, while also introducing several other concepts that are seen as threatening agricultural viability and affecting the decisions that farmers are prepared to make. A common sentiment was one of scepticism around the motives of parties operating outside of agriculture, such as developers or municipal representatives. This scepticism was heightened in light of perceived uncertainties surrounding agriculture in the valley, particularly in regards to future climatic conditions and water security. Remarks such as 'it is too risky to sell water because once you give it away,

you will never get that water back,' and 'why would [the municipalities] let farmers benefit […] when they could be making money themselves?' (Interview 20) reflect the general attitude that the farming community must exercise caution when embarking upon any activities, including moves towards sustainable resource management, that might allow developers or municipalities, expressed as proponents of urbanization, to expropriate land or natural resources that have historically been dedicated to farming. This idea was linked to a belief that was expressed by a number of participants that 'helping other famers is important, community is important. This used to be stronger' (Interview 39).

Another prevalent issue that was raised was that of the difficult financial position that farmers currently find themselves in, and how this pressure has been worsened by international competition. Many farmers indicated that they were unable to make a living solely on the farm, and must rely on outside sources of income, as the revenue that they were able to generate through agricultural production has diminished greatly within the past 20-25 years. This issue was often mentioned alongside another recurrent observation that the Agricultural Land Reserve (ALR) places farmers in a difficult position, as they are locked to the land, but often do not feel that their future rights to resources such as water are secure in the Okanagan. This was framed as a provincial issue, whereby they 'put the ALR in place, but then aren't helping farmers'(Interview 30), particularly in the way of subsidies that are frequently seen in other countries such as the United States.

A final issue that was frequently discussed was the topographic and climatic variability that occurs throughout the valley, making it difficult set operational standards, both in the present due to inconsistent soil types, and for the future as a result of unknown weather conditions. Crop type, including the age and variety of plantings, will also affect

farming practices, as well as the water conservation measures that a farmer is able to pursue. One respondent's question, 'What does allocation even mean for drier years?' (Interview 44) demonstrates the effect that uncertainty has on perceived agricultural viability in the Okanagan. Similarly, another respondent noted that 'there's so much variation, an authority can't say what works' (Interview 52). Considerations surrounding local topography and climate were often expressed alongside opinions regarding the overall state of the environment in the Okanagan, and how to achieve equilibrium between meeting the demands of domestic water users, agricultural irrigators, and the local ecology. This idea of finding a 'balancing point', whereby the demands for water from all stakeholders must be weighed and prioritized, was recurrent throughout the interviews.

Taking into consideration both the risks that farmers mentioned in the question asking them to rank these factors as they relate to their management activities, as well as the comments that were made regarding the threats to agriculture in the Okanagan, several key topics emerge surrounding the general theme of preserving the farm culture that exists in the valley. These include urbanization and the erosion of the agricultural community, market conditions, trade liberalization and international competition, which has been considered separately from market conditions due to the prevalence of comments surrounding this topic, the effects of the ALR, and the local geographic and ecologic setting. A more in depth discussion of each of these topics based upon the findings of this study will shed light on the implications that these issues specifically, as well as the broader theme of preserving the agricultural base in the Okanagan, have on practices surrounding water conservation and management.

4.3 Urbanization and the Erosion of the Agricultural Community

Aside from increasing the demand for fresh water (Iyer 2003, 258), urbanization and population growth commonly push a region's residents further away from the city centre, elevating the potential for conflict between urban dwellers residing on or near the rural fringe, and those who inhabit and often make their livings in the countryside. The rapid population growth that is occurring throughout the Okanagan valley, which is often characterized by the construction of sub-divisions in areas that were formally predominately agricultural (Henderson and Bridge 2005, 143), was cited as a concern by many of the farmers who were interviewed, both for the implications that this kind of growth has on the water supply, as well as the ways that the urban population are infringing upon rural systems

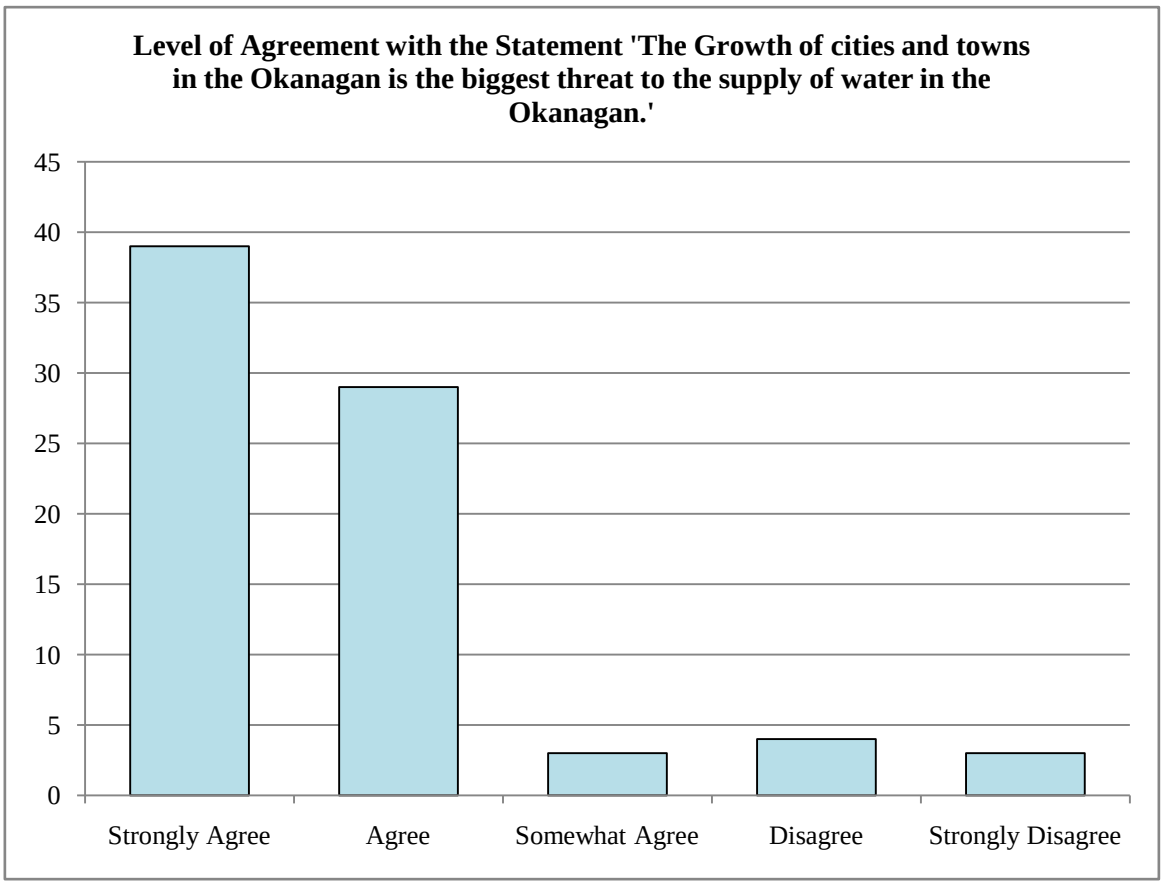

Figure 4. 2 Perceived Impact of Urban Expansion

and ideologies. The concern that respondents felt about population growth is made apparent through levels of agreement with the idea that urbanization is jeopardizing Okanagan water supplies (Figure 4.2).

87.2% of farmers confirmed that they either strongly agreed or agreed that the growth of cities and towns is the biggest threat to the supply of water in the Okanagan, implying not only an inherent concern surrounding the effect that urbanization is having on water as an ecological resource, but also the implications that this may have on the agricultural system. This point was reiterated through comments that were made, such as the 'neighbours here are largely residential. They have a tremendous impact on [our] supply during peak seasons. Sprinklers have low pressure because of residential use' (Interview 83) And 'affluence has lead to increased demands. Consumption is way up now, not to mention lawns. There's becoming a critical food shortage, agriculture is needed for survival. We should have smaller lawns, less bathing – we are so demanding in our personal use, it is out of balance' (Interview 24). These kinds of sentiments were mirrored by one focus group participant, who made the following observation regarding urbanization in the valley:

> I think, you know, you look at people and their pools as an example there. I mean there's an awful lot of water that gets wasted that way, and when you go to urban areas and you see all the neighbours are all hosing out their driveways there and it's all running down the road. Well I think, you know, if they started off with areas like that and trying to make those more sustainable, I think farmers are pretty good just by the nature of the business and that, as a profession, but I think that definitely it has to be,

> the urban side has to be where the focus needs to be first.
>
> (Focus Group Respondent 1).

The threat that many respondents associated with urbanization in the valley often corresponded with feelings of powerlessness or loss of voice when urban and suburban dwellers outnumber farmers, despite their relative newness to the area and lack of historic involvement in settling the land and creating the water systems that they are now drawing upon. The following comment provides an example of this concern:

> Any time there are water concerns, the farmer is always outnumbered. [They have] one voice for 13 acres [when you] could get 500 names for 13 acres of homes. When decisions are being made, farmers don't have voice, they're outnumbered, and with any problem a new subdivision can easily get 500 signatures. There has to be protection for agriculture so it's not so unbalanced
>
> (Interview 49).

These findings align with a study conducted by Walker (1997) whereby it is determined that, in areas located within the urban/rural fringe, "central elements of the farmers' philosophy have been rejected by the newcomers. The leadership of farmers in the larger rural community has been challenged" (Walker 1997, 326). He suggests that this undermines the social system that exists amongst farmers in more secluded rural settings, compromising the ability of agricultural operators to adopt sustainable practices when they are not as freely able to talk with one another, and co-operatively implement mutually beneficial ideas and

innovations. Farmers may then adopt certain strategies that are inherently unsustainable as a

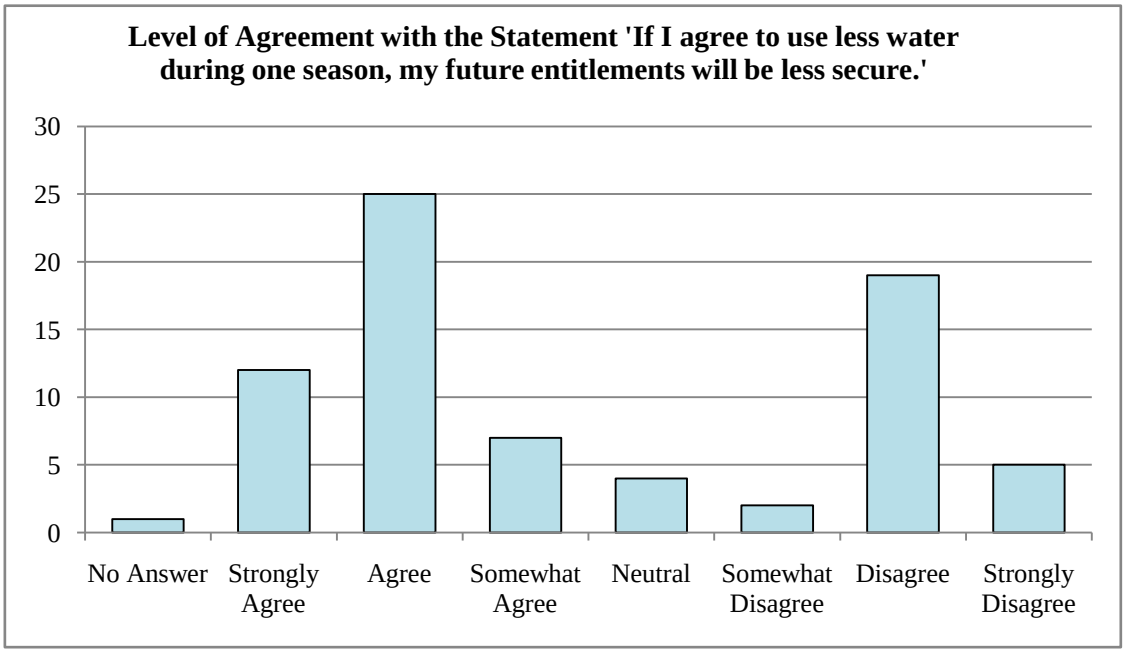

Figure 4. 3 Security of Future Entitlements

means of securing the control that is otherwise being given up to expanding urban centres, as is demonstrated through the tendency to agree with the statement illustrated in Figure 4.3. It is significant to note that, of the farmers who disagreed with the statement that using less water during one season would render future entitlements less secure, many added the caveat that they only disagreed because they would not agree to such a thing until they had contractually ensured that this would not occur.

The sentiment that urbanization is causing a number of problems for farmers in the Okanagan resulted in a general attitude that protecting agriculture in the valley must be a primary concern, and that farmers should have their water supplies guaranteed because of the severity of the damage that a lack of water can have on crops. Figures 4.4 and 4.5 illustrate the tendency to agree that water that is saved through efficient irrigation practices should be

retained for agricultural uses, such as watering crops, and that water that is needed for the

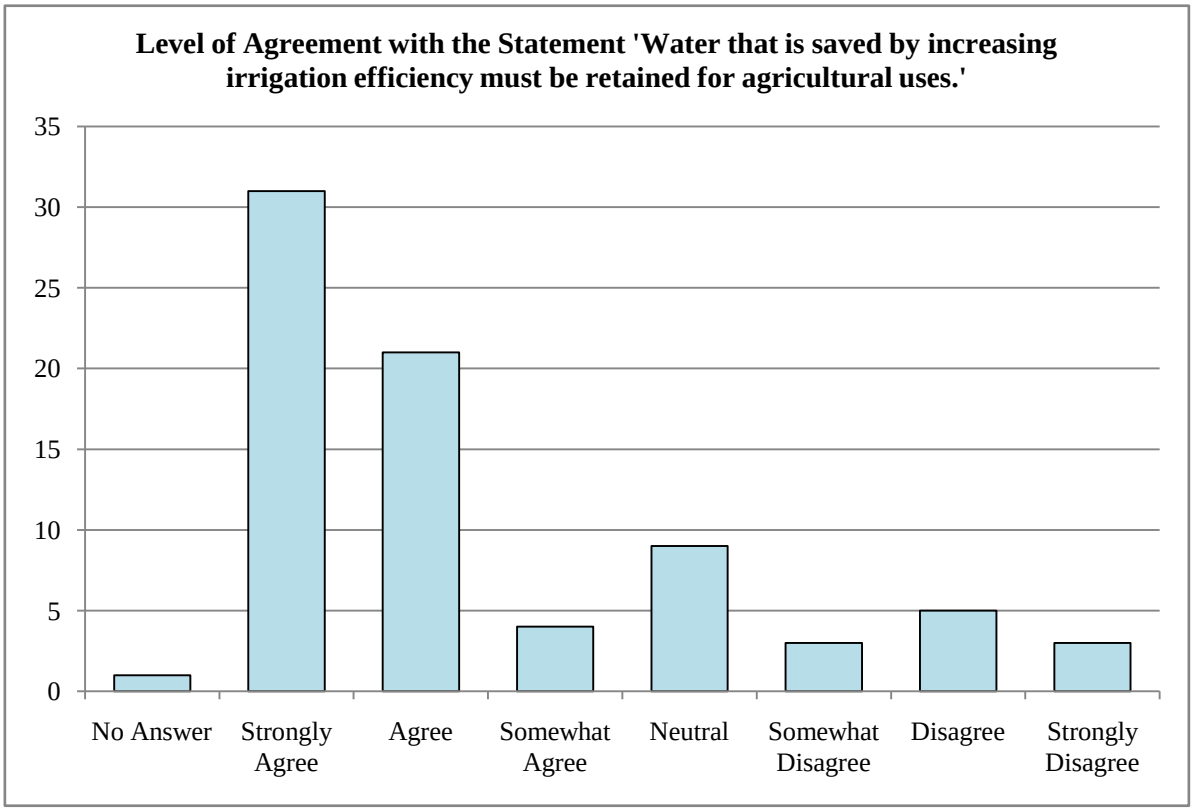

Figure 4. 4 Retaining Water for Agricultural Uses

environment should first be drawn from non-agricultural supplies. This is likely the case because many of the respondents feel that they are already using the minimum amount of water that they can get away with, often consuming only a fraction of their allocations. Furthermore, tree fruits, which were grown by the vast majority of respondents, are not seen as being a water intensive crop, and vineyard operators, who represent the second most prevalent crop type in this sample, often made reference to the use of deficit irrigation when growing wine grapes, noting that ‘you get a higher quality grape with less water, lots of flavour’ (Interview 62). Allowing unlimited growth in the valley is therefore seen as a threat to agriculture because farmers have already restricted their water use, and any further

restrictions that might come as a result of urbanization, particularly in drought years, could

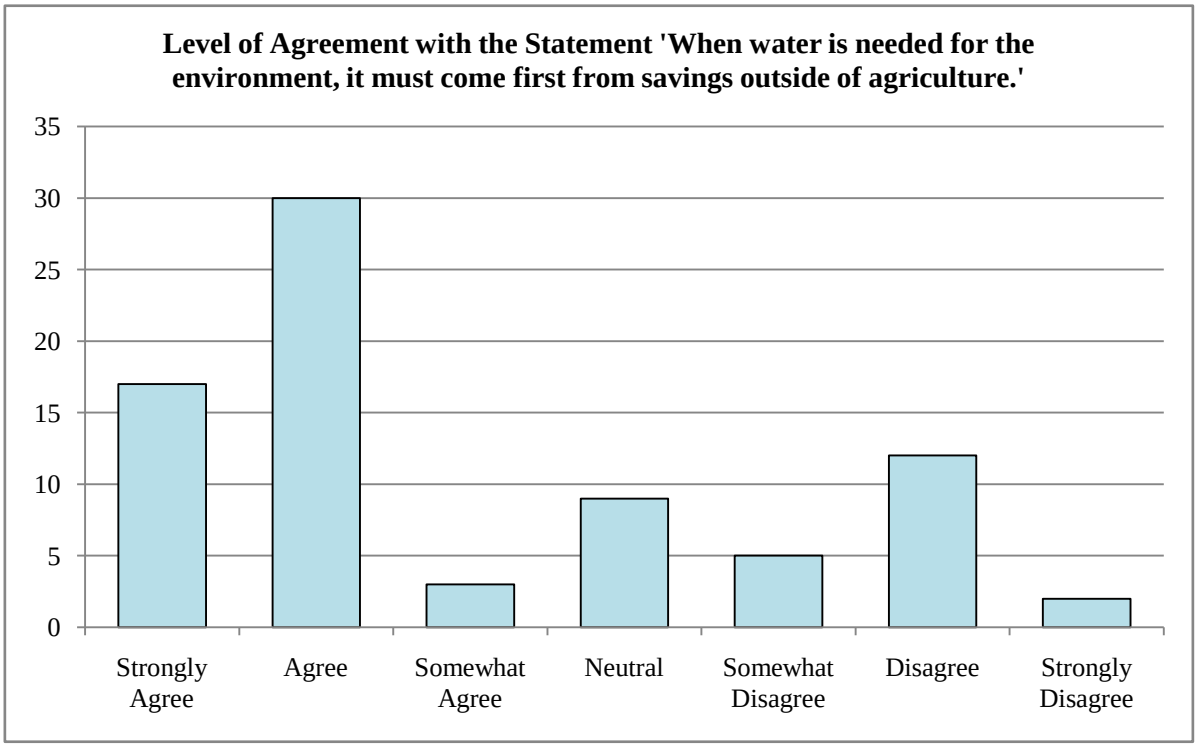

Figure 4. 5 Obtaining Water for Environmental Demands

be extremely damaging to the crops that are grown here, particularly tree fruits and vines (Canada. Agriculture and Agri-Food Canada 2003). However, a number of respondents from the ranching community also noted that a substantial investment of time and labour would be required to re-prepare the land for hay or alfalfa in years following significant water shortages. As one respondent succinctly noted, 'agriculture should never give up their water rights permanently because we need food. Even though [I] do not use [my] full allotment, [I] would never give up the right to it' (Interview 26). While a portion of the farms in the valley are devoted to growing crops for amenities such as wine, a number of respondents suggested that ensuring access to water even for these types of activities was of importance, because this would ensure that the land would remain productive should the need to grow crops for direct consumption arise. This statement speaks to the idea that was expressed by a number

of respondents that a precautionary approach must be taken to urban development, and municipalities must not allow for more homes to be built than can be supported in drought years.

4.4 Market Conditions

Economic security, whether this is real or merely perceived, will influence the kinds of decisions that actors are able to make, as well as their willingness to take risks, such as investing in innovative technologies and practices aimed at enhancing sustainability. 28.6% of respondents ranked 'market conditions', along with international competition, as the top risk that they must manage for, as well as 18.75% of famers who mentioned a second ranking issue. Furthermore, many of the respondents indicated that they were struggling due to elevated costs of operation and the low rates that they are receiving for their produce. Figure 4.6 demonstrates the degree to which farmers are often putting in a greater effort than they are being financially rewarded for within the agricultural sector in the Okanagan. The bars displayed on this graph represent the amount of household income that irrigators stated came from the farm business. The bars have been broken down according to the amount of hours per week that respondents stated that they and their family members spent working on the farm. For example, the first bar represents all of the individuals who said that very little of their household income came from the farm, while the different colours, which correspond with the legend to the right, illustrate the fact that while many of these people are devoting less than 20 hours per week to their farms, there are a number of individuals who are working for as many as 60 hours per week on the farm.

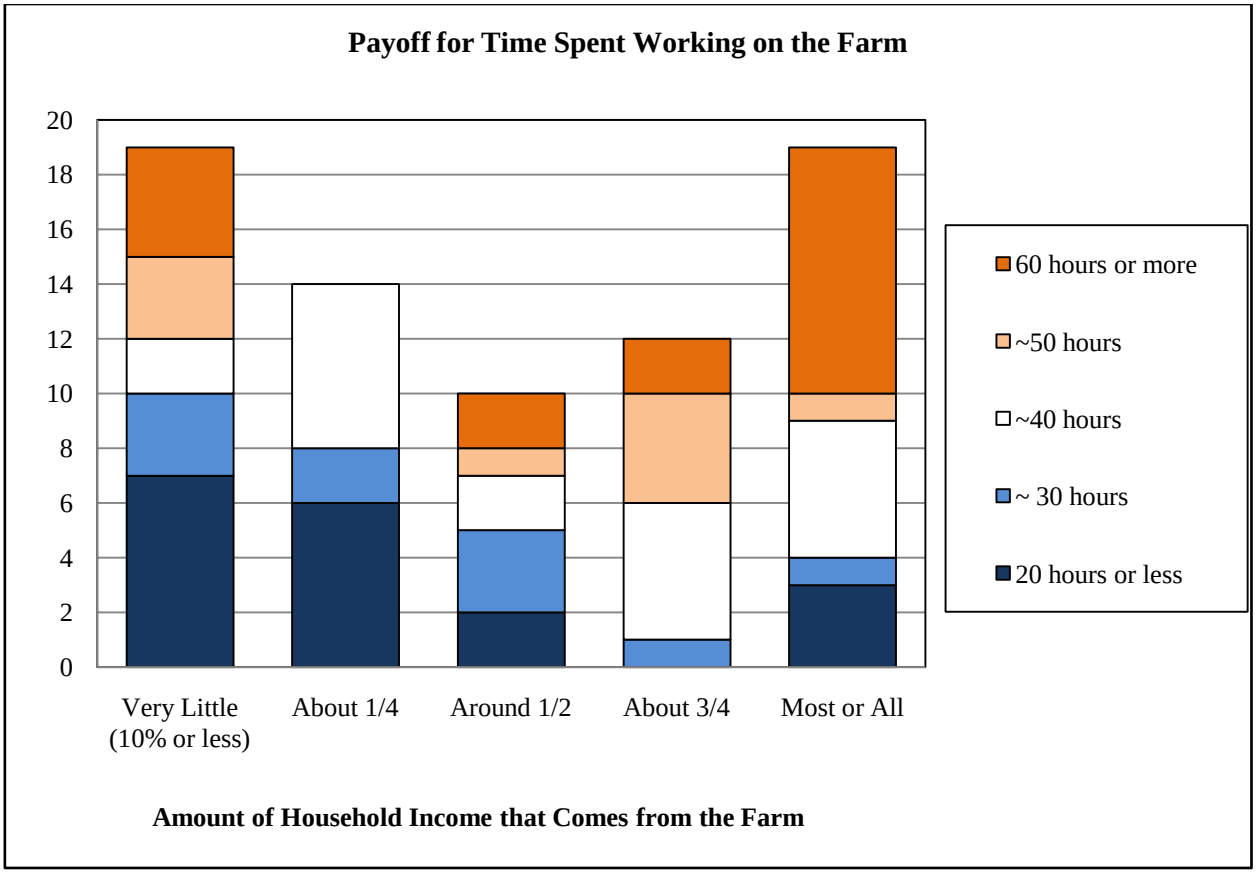

Figure 4. 6 Payoff for Time Spent Working on the Farm

These results illustrate the fact that the percentage of household income that comes from the farm does not necessarily relate to the hours worked, as a number of respondents stated that they and their families were working full time hours or greater, despite the fact that the farm was not the main source of income. While there could be a number of reasons for this, such as investing a large amount of time into a new farm that has not yet begun to turn a profit, the conclusion that farmers are often working long hours to keep afloat in a business that does not always contribute significantly to household income coincides with comments made by respondents regarding the effort and payoffs that arise out of agricultural endeavours. In fact, several of the farmers who were interviewed stated that the most considerable profits that they have made within recent years have occurred when their crops

suffered hail damage, as the insurance payout was more than they would have otherwise received for their produce.

High costs of production and low returns are making it difficult for farmers in the Okanagan to continue in agriculture, let alone take the risk of upgrading their irrigation equipment to more efficient and sustainable options or agree to alternative management structures that are seen as potentially carrying additional costs. In their history of apple orchards in the Okanagan, the Okanagan History Vignette describes a set of conditions that are forcing many farmers to pull out of tree fruit production, noting that there were over 10,000 hectares planted in fruit trees in the 1970's, while there were only 7,200 hectares in 2001. It is suggested that "part of this reduction is due to the fact that the prices fruit farmers are getting for their apples are not rising with their costs. For example, in the early 1900s, orchardists earned a few cents for each pound (.45 kilogram) of apples. In 2000, they were only getting 5 or 6 cents a pound for some varieties." (Okanagan History Vignette n.d., 86). These figures were confirmed by a number of respondents when asked about the revenue that they receive for their crops. Similarly, one respondent who was involved in the Okanagan ranching industry stated that the price that ranchers are receiving per pound of beef is presently around 1970 levels, sitting at about $1.00/pound. The issue of low rates of return that orchardists are getting for their tree fruits in the Okanagan is compounded by the fact that, aside from an advance that farmers are given for their fruits, they do not actually receive any payment or even know how much they will be getting for apples marketed through BC Tree Fruits Ltd. until the following year (British Columbia. Ministry of Agriculture, Food and Fisheries 2004), a concern that a number of respondents cited when trying to make decisions about whether or not they should invest in making any kinds of upgrades,

especially the 68% who stated that they have not received any government funding for recent improvements that they may have made to their irrigation systems. It should be noted that this situation seems to be somewhat different for vineyard owners and operators, as they are producing an amenity crop that is marketed in a different way than a crop such as apples.

4.5 Trade Liberalization and International Competition

Intimately connected to the issue of poor market conditions is increasing international competition, particularly in the tree fruit sector, which has allowed for a greater number of imports into the country, heightening competition for producers in the Okanagan (Schorb 2006, 32). Many of the respondents mentioned this issue as a major factor affecting both the decisions that they are able to make, as well as the viability of Okanagan agriculture in general. Comments such as 'we are in a dead duck industry, growing apples here is too competitive' (Interview 57), and 'farms run a negative for many years when they first start. Especially because there are no tariffs on trade' (Interview 39) are illustrative of the effect that imports from outside of the country have on prices in the Okanagan. While imports from a number of countries were mentioned, such as China and Chile, there was a particular emphasis on Washington state, and it was noted by several respondents that growers from south of the border have been flooding Canadian markets.

Dumping from Washington state, which would occur when "a product is exported at below the cost of production" (Mitham 2005) was seen as particularly problematic for Okanagan farmers as they do not receive the same degree of subsidization as American farmers, making it impossible for them to remain competitive. According to one interview

participant, ‘Canada receives the least subsidies in the world’ (Interview 18). A number of respondents stated that they would be averse to any initiative that would benefit Americans downstream, including programs to preserve water, which would be perceived of as making a sacrifice which will ultimately help their greatest competitors. This kind of attitude demonstrates one reason why farmers may not feel that water conservation measures would be prudent when, according to this logic, they should be watering more if this would help them to produce higher yields and prevent excess water from flowing into the hands of producers from Washington state. A number of respondents suggested that enhanced support from the Canadian government in the way of increased tariffs on trade or some kind of price guarantee could help this situation.

4.6 The Effects of the Agricultural Land Reserve (ALR)

Within British Columbia, an Agricultural Land Reserve has been established in order to set aside zones throughout the province where agriculture is considered a priority use, and other kinds of land uses are restricted (Agricultural Land Commission n.d.). While respondents did not express an overall dislike of the ALR program, they did cite a number of issues that have stemmed from the creation of the ALR, and how this has affected both the farm culture that exists in the valley, as well as decisions relating to farm management. Amongst these are the ways in which the ALR has changed their opinions regarding water management in the valley, causing them to lean more towards the side of self preservation as opposed to taking chances on a system that may be more efficient, but could yield damaging results for the agricultural sector. As is depicted in Figure 4.7, 71.4% of respondents either strongly disagreed or disagreed that there are sufficient water resources in the Okanagan to

meet the needs of all users to at least the middle of the century, suggesting that the majority of farmers believe there will be water shortages within the near future. The fact that they are essentially locked to agricultural land, which requires water in order to remain productive, has created some significant concerns about the situation that farmers may find themselves in down the road. Comments such as 'we have an ALR, so it is important that there is water to farm it' (Interview 63) and 'the ALR changes the way [the] questions were answered because now [I] am locked to the land, and must think of [my] own survival' (Interview 19) demonstrate the way that the ALR has created a greater divide between residential water

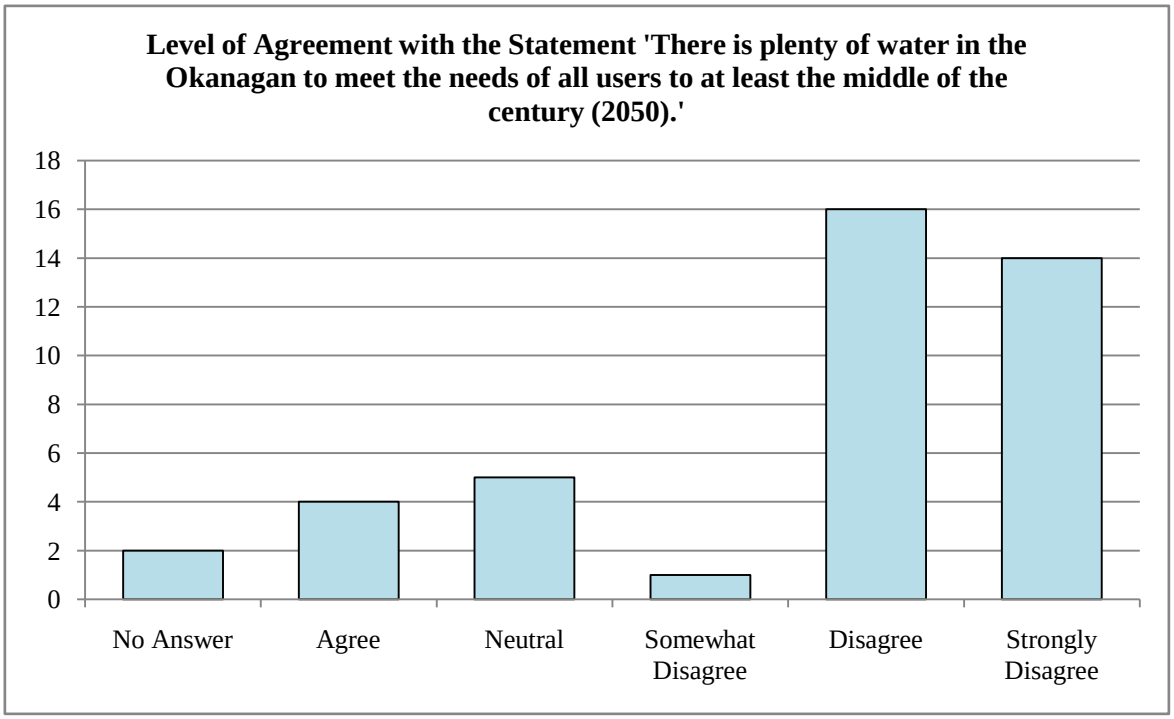

Figure 4. 7 Water Availability in the Okanagan

users and farmers, as well as potential reasons why irrigators may feel compelled to consider their own needs prior to initiatives aimed at environmental protection. Several respondents suggested that policy should be put in place in order to make the ALR stronger, and in order for the land reserve to protect agriculture, it must be accompanied by some kind of guarantee that there will always be water available as a priority for these properties. While a number of

respondents expressed concerns about the way that the ALR could affect personal circumstances and profit margins, perceived shortcomings of the ALR were also discussed within the context of the larger agricultural community that exists in the valley. One respondent stated that 'governments are always changing the ALR program, and they shouldn't do it this way. It's dangerous for a country to give up all its agriculture' (Interview 39), referring to the fact that policy surrounding the ALR appears weak, as applications can be made to pull ALR land out of the reserve in order to accommodate other uses. Table 4.1 portrays the net changes in hectares in the amount of ALR land in the Okanagan between the

Regions	2007	2006	2005	2004	2003
Central Okanagan	0	-74	0	-7.3	-8.6
North Okanagan	-26.5	-2.5	-49	2.6	-4.1
Okanagan-Similkameen	-1	6.3	-225	-54.9	-17.2

Table 4. 1 Net Change in ALR Land in Hectares

(Agricultural Land Commission 2008).

years 2003 and 2007. It is clear that, at least in the Okanagan, far more land is coming out of the ALR than is being added, which may in part be influenced by the soaring housing market here, which has resulted in a zero rental vacancy and average house prices in Kelowna that are higher than Toronto or Calgary (Mack 2008).

The ALR seems to represent a contradiction for farmers who are, on the one hand, concerned about how they will protect their agricultural land in the event that there is a shortage of water, but at the same time, may not view the ALR as a particularly effective tool for keeping the agricultural base intact. The ease with which land can be drawn out of the ALR has resulted in agricultural land prices that have kept up with the soaring housing

market in the valley, with agricultural land selling for more than $100,000 an acre in some instances (British Columbia. Ministry of Agriculture and Lands 2007). According to one respondent, 'if you're paying more than $30,000 an acre, you're not going to survive' (Interview 19). This has made it incredibly difficult to establish new farms in the Okanagan, and has resulted in yet another shift in the agricultural base whereby new farmers are more inclined to establish wineries or smaller farms that can be marketed as agri-tourism in order to generate additional revenue from their properties. Suggestions to improve this situation included establishing a water reserve that must exist alongside the ALR, which was also proposed in the Okanagan Basin Water Board's Water Stewardship Strategy. In this report, it was suggested that an agricultural water reserve be created to ensure that adequate supplies of water are provided to all land that is viable for growing crops in the valley (Okanagan Water Stewardship Council 2008, VIII). Additional suggestions made by respondents surrounding the topic of improving the ALR included making it more difficult to exclude land from the ALR, more clearly defining the types of activities that are considered beneficial to ALR land, and offering some kind of incentive such as a tax break to property owners who use their lands in a way that corresponds with the goal of agricultural preservation.

4.7 The Geographic and Ecological Setting

The way that agriculture has evolved in the valley, and will continue to evolve, is highly linked to the local ecology, a factor which will determine agricultural possibilities, and the kinds of decisions that farmers make in regards to managing their properties. In his seminal work, 'The Land Ethic', Aldo Leopold notes that "many historical events, hitherto

explained solely in terms of human enterprise, were actually biotic interactions between people and the land. The characteristics of the land determined the facts quite as potently as the characteristics of the men who lived on it" (Leopold 2001, 99). Respondents mentioned a number of ecological factors that are of concern, including the effects of climate change on water availability, the variability of soil types and how this affects crop water demands, and the suitability of particular crops to the region. Comments such as 'farmers need more [water] at certain times and less at others, you don't know what the spring will bring' (Interview 20) demonstrate the way that environmental unpredictability must be considered, and a precautionary approach taken in order to ensure that the needs of farmers will be met,

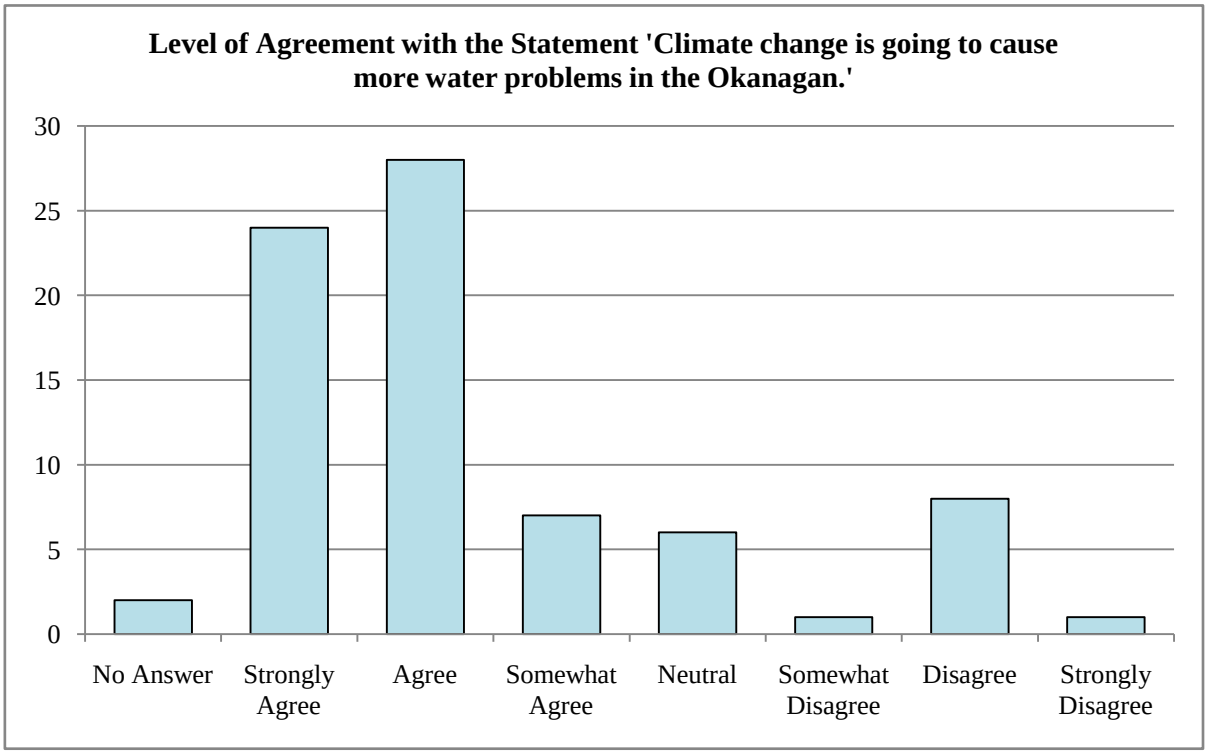

Figure 4. 8 Perceptions Regarding Climate Change

regardless of natural variations. This idea was reiterated during the focus group session, when one participant stated that "you have to maintain water on that parcel of land because the use could change. So if you've got drip irrigation for fruit trees, and then you change it

to a garden, you have to have that water available" (Focus Group Respondent 3). As a principle, this precautionary approach reflects the belief that "scientific uncertainty is not a sufficient reason to postpone control measures when there is a threat of harm" (Freedman 2004, 332).

The precautionary approach, and the role that this has in preserving the agricultural base in the Okanagan, directly relates to perceptions regarding climate change. Figure 4.8 depicts the attitudes of respondents regarding the effects of climate change in the valley. 67.5% of the farmers who were interviewed either strongly agreed or agreed that climate change will cause more water problems in the Okanagan, suggesting that this could lead to increased irrigation water demands and decreased available supplies, jeopardizing agricultural sustainability in the valley, particularly in light of the growing urban population in the Okanagan which will need, at the very least, to have their basic needs provided for. While a number of respondents did not believe that climate change was, or will be, responsible for weather patterns in the valley, they did acknowledge that natural climatic variations do occur, and must be factored into their management activities.

A number of farmers also mentioned the varied soil types in the valley, and the issue of crop suitability. Both the kinds of crops that are preferred and the amount of water that is needed, and often the watering systems that are put in place, are largely determined by soil types. Figure 4.9 depicts the methods that farmers stated they used for deciding when to irrigate. The top three most commonly cited determinants of whether or not to irrigate were 'plant condition', 'recent weather', and 'soil 'feel''. Of these, recent weather and soil feel directly relate to the geography of the area. A number of farmers commented that it is difficult to come to any universal conclusions about the amount of water that farmers should be using since this will vary greatly depending upon soil types, as well as factors such as

slope and elevation. According to several respondents, variation in the valley is common, with some farmers having dissimilar water needs for different sections of the same property. Furthermore, the kinds of crops that are being grown was discussed, particularly by grape growers who suggested that over watering is actually bad for grapes that will be used for

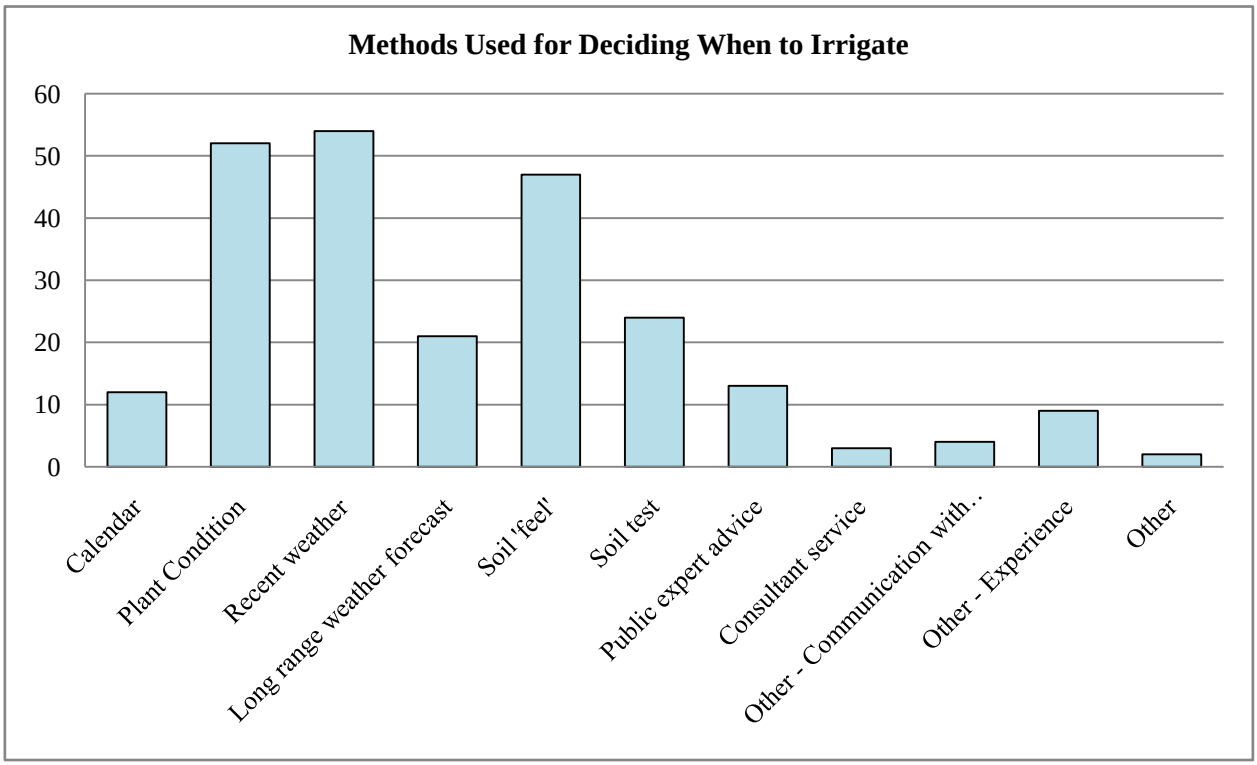

Figure 4. 9 Methods Used for Deciding When to Irrigate

wine, as this leads to a diluted flavour, and growers with younger plantings, who pointed out that they would need greater amounts of water for the first couple of years.

Acknowledging that every farm that is located in the Okanagan must exist within the climatic and ecological realities that prevail in the valley, a number of farmers made comments surrounding the idea of ‘achieving a balance’ between mitigating environmental stressors and drawing on ecological resources. A natural resource such as water serves important functions both for human beings, including for the purposes of irrigation, as well as for local ecosystems. Figure 4.10 depicts the attitudes of respondents regarding the

statement “ensuring that there is enough water for the environment must take priority over other water uses.” Attitudes surrounding this statement were somewhat mixed, with a number of farmers suggesting that it is difficult to choose one use over another, and that both must be factored in, as well as the needs of domestic users. Several respondents suggested that there is a bit of a gray area, as some environmental preservation is needed, but the amount is subjective, and agriculture should not be entirely sacrificed in order to keep all natural areas completely pristine, particularly in light of the fact that natural areas in the Okanagan have been greatly altered by human actions as it is, so it is difficult to say what ‘natural’ even is anymore.

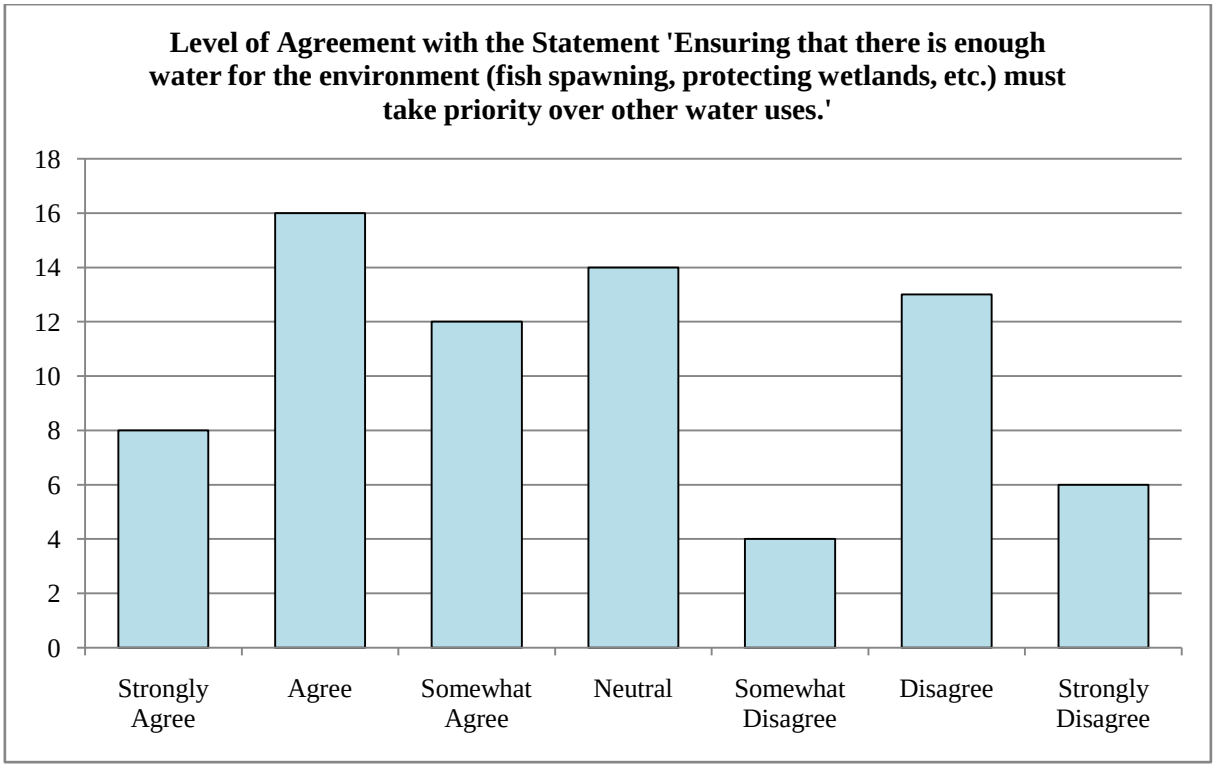

Figure 4. 10 Prioritization of Environmental Demands

4.8 Summary

Despite all of the pressures that farmers in the Okanagan are facing, there remains a dedication to this industry, with the average respondent being involved in farming in the valley for more than 27 years. The importance of appreciating the role that culture and ideology have on rural practices cannot be understated (Curry-Roper 1997, 101), including the way that farmers deal with factors that are perceived of as compromising rural sustainability. Within this context, especially in an area like the Okanagan where there has been a long history of agricultural involvement, it becomes evident that farmers are not merely acting to protect personal interests, but also on behalf of the larger agricultural community for the purposes of preserving the Okanagan farm culture. Risbey et al. (1999) note that the way agriculture adapts to change must be considered within the context of the larger environmental, social and economic changes that are prevalent in a region (Risbey et al. 1999, 138). Incorporating the position that farmers have an interest in preserving the agricultural base in the Okanagan for reasons related to the inherent value of and cultural connections that they feel for this industry, as well as motivations surrounding personal gain, it becomes apparent that considerations surrounding water use and allocation in the valley must factor in all of the issues that are outlined above, as well as the different levels on which farmers appreciate the agricultural industry. This is outlined by Ward and Munton (1992) who note that it is the changes to both the social structure in which farming exists, considered here as the shifting farm culture that exists in the Okanagan, as well as the economic circumstances on each farm that "constantly mediate the relationship between the use of particular techniques and regulation of the particular environmental consequences these may have" (Ward and Munton 1992, 127).

Discussing issues surrounding water management with Okanagan farmers generally led to a consideration of the numerous factors that are affecting agricultural viability in the valley. The decisions that farmers are making and would be willing to make in regards to both the watering systems that they utilize as well as any modifications to the current management structure must be framed within the context of the factors outlined above, with respondents holding as their ultimate goals the preservation of the agricultural community in the Okanagan, as well as their capacity to make a living in agriculture at the individual level. Urbanization, market conditions, international competition, the effects of the ALR, and ecological factors all influence the way that farmers conceptualize agricultural viability, and the future of farming in the Okanagan. Therefore, decisions surrounding water will be affected by the way that any restructuring interplays with these important features.

Chapter 5 - Governance, Management Systems, and Policy Making

5.1 Introduction

Changes in the availability of water in the Okanagan must be considered within the context of the institutional structure that dictates how water is allocated and managed in the valley. The water management system that is adopted within a region should be able to evolve to reflect the pervading geographic and demographic realities, and must be prepared to balance demands that are often in conflict with one another, such as the competing interests of agricultural and urban users, or users situated in unique micro-climates. The capacity to achieve sustainable patterns of water use can be enhanced or diminished depending upon the governance structure that is adopted and actions taken by policy makers, managers, and water users (Mondello 2006, 27).

The issue of water management was addressed extensively throughout the interviews due to the power that management regimes have to foster an 'enabling environment,' defined as a general set of conditions that encourage efficient patterns of consumption (Winpenny 1994, 32). Respondents were asked a number of questions regarding preferred governance models and mechanisms that might be employed to promote efficiency. These questions measured opinions regarding the water management schemes that are presently in place in the Okanagan, as well as attitudes surrounding market mechanisms, with a focus on water trading, and co-operative water systems and their place in the agricultural sector. Opinions surrounding these approaches to water management will be explored in depth throughout this chapter, with the addition of the idea of multi-level governance which, although not directly addressed throughout the interviews, emerged as a prominent theme. This will be preceded

by a discussion of the different objectives that may be adopted through the construction of a water governance model, and agricultural perceptions of how these goals should be prioritized.

Any discussion of sustainable water governance requires a consideration of what it is that is meant by sustainability, and the particular goals to which this concept may lend support. Within the context of resource management, sustainable patterns of water consumption can serve environmental, social and economic interests (International Institute for Sustainable Development 2008), and the way that this concept is interpreted and pursued should be seen as socially and politically constructed, representing the values of the implicated stakeholders (Mowforth and Munt 2003, 18). It is not enough to say that an efficient and sustainable water management system is desired for the Okanagan without first approaching the topic of the different interests that exist in the valley, and how these ought to be balanced. Therefore, managing water in the Okanagan becomes an issue of defining the kinds of compromises that need to be made to allow for the preservation of the natural environment, the social and cultural associations that have been formed in the valley, and economic features, particularly those associated with growth. Keeping this in mind, an ideal water management system must recognize the requirement that sustainable development relates to entire systems as opposed to isolated components (International Institute for Sustainable Development 2008). This involves encompassing all stakeholders, while encouraging efficiency so as to maximize the potential benefit realized by all users as well as the natural environment. That being said, in situations that are constrained by present or the threat of future scarcity, priorities must be set, and certain sacrifices made.

The following discussion will represent opinions presented during the interviews about how to structure a water governance system that will most effectively balance competing interests and move towards efficient practices, while allowing for weight to be given to priority situations or uses, the definition of which will vary depending upon the individual. It is important to note that the farmers who were interviewed for this study occupy a unique position in the valley, as they represent a number of different factions of society, representing at times the aforementioned Okanagan farm culture, while also acting as both domestic water users, as well as both appreciators and developers of the natural environment in the valley. A discussion of current practices and management systems in the valley, including both decisions that are being made regarding water use on the farm, as well as the organizational structure of water allocation bodies, such as irrigation districts, municipalities, and water user communities, will highlight strengths and weaknesses of the current system.

5.2 Water Management in the Okanagan: Current Practices and Perceptions

In order to appreciate the functionality of current water governance systems in the Okanagan, an exploration of the different sources of water and the operational structure of water suppliers must be conducted alongside a discussion of on-farm practices. Presently, water in the Okanagan is allocated by 51 different purveyors, which include municipalities, irrigation districts, and water user communities (Cohen, Neilsen and Welbourn 2004, 201). Users may also receive their water through privately held licenses or groundwater sources. Figure 5.1 depicts the primary water sources that were cited by respondents. It must be noted that several farmers mentioned more than one primary source, and the total number of

primary sources identified will therefore be greater than the number of interviews conducted.

84.6% of respondents stated that they received their water from a purveyor. The next most frequently cited primary water sources were groundwater supplies from a private well, representing 10.3% of responses, and pumping privately from a stream, river or lake, which was mentioned by 8.97% of the farmers who were interviewed. Only four respondents mentioned having a backup supply, two of whom held private water licenses to pump from streams, rivers or lakes, while the other two mentioned having a private well on their property as a secondary source. To an extent, this distribution can be seen as a result of the way in which the sample for

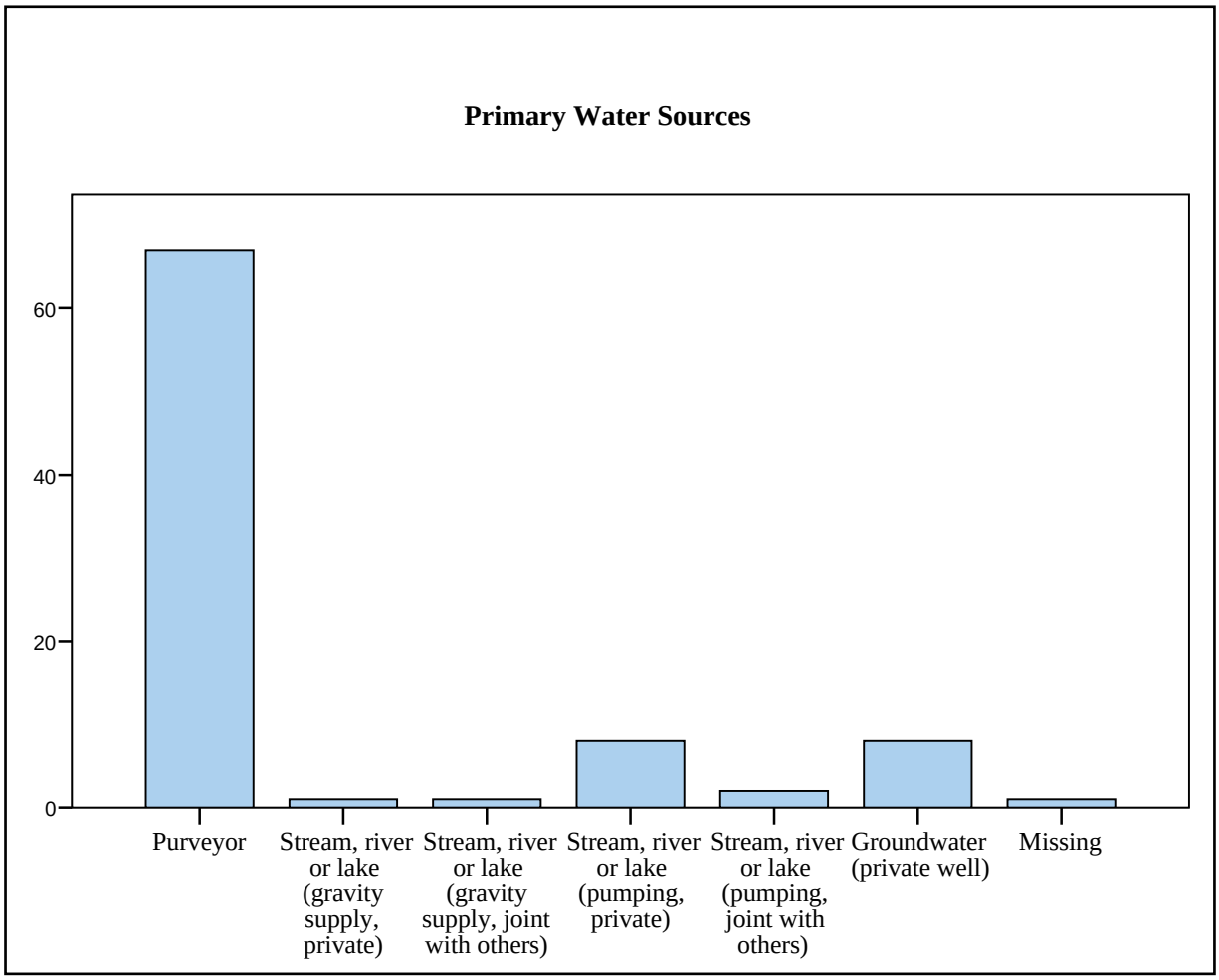

Figure 5. 1 Primary Water Sources of Respondents

this study was gathered, as described in chapter three. The recruitment process tended to draw greater participation from irrigators producing tree fruits, who are much more likely to receive their water from a purveyor than farmers with cropland or pastures. In fact, nearly all of the farms in the valley that are not covered by a water purveyor have cropland and pastures. Conversely, only a very small fraction of tree fruit growers in the valley are not covered by a purveyor (Cohen, Neilsen and Welbourn 2004, 202). Hence, greater representation outside of orchards may have altered these figures substantially. Nonetheless, several respondents who grew tree fruits did receive their water from a private source, the majority of which were located in Kelowna and the Keremeos/Cawston regions. Most of

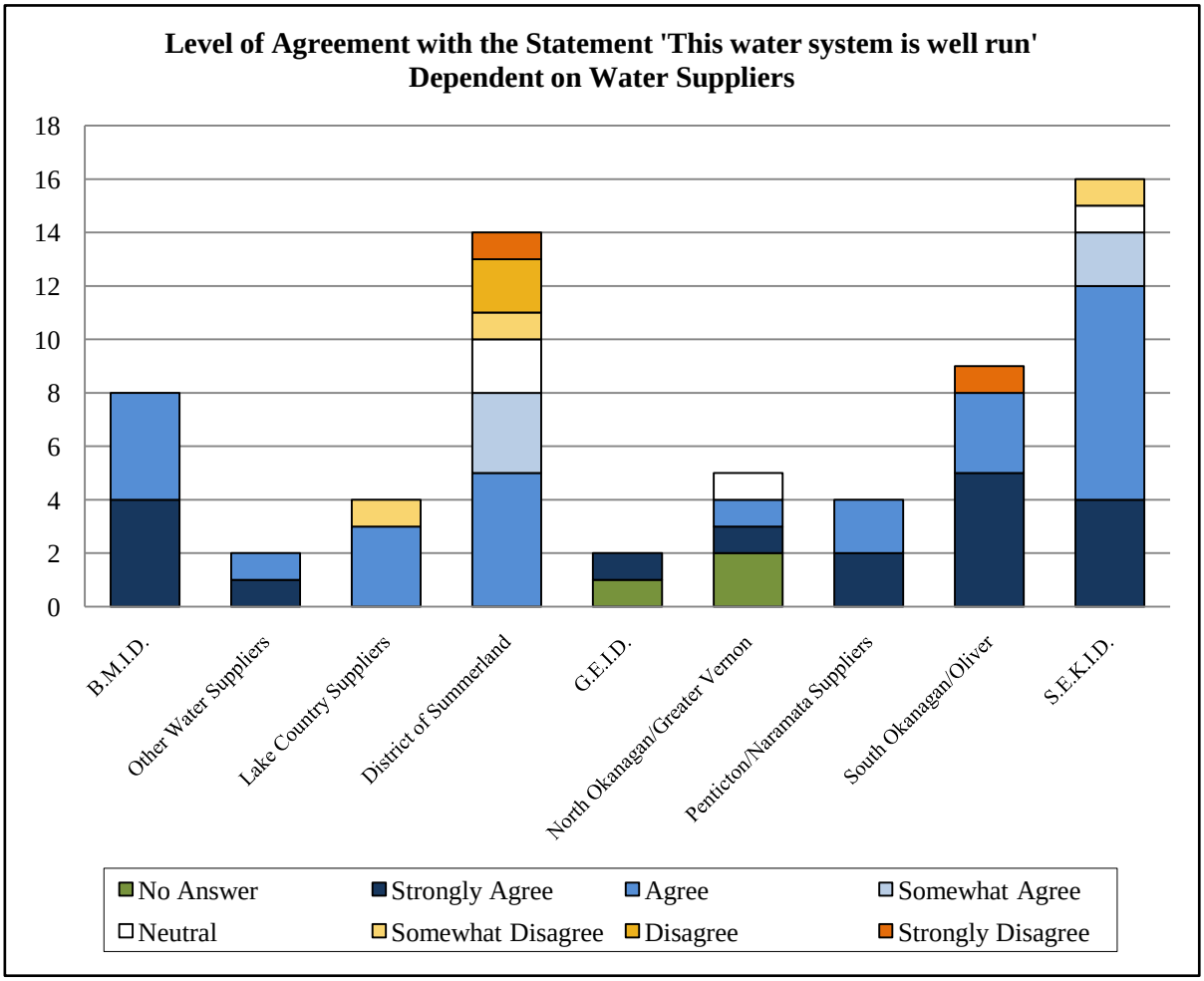

Figure 5. 2 Level of Satisfaction with Water Purveyors

these respondents grew other kinds of crops in addition to tree fruits, such as mixed vegetables or hay.

Since the vast majority of respondents stated that they receive their water from a purveyor, Figure 5.2 has been provided in order to demonstrate the level of satisfaction expressed with the different water suppliers that were cited. The most commonly mentioned water suppliers were the South East Kelowna Irrigation District (S.E.K.I.D.), which was utilized by 16 respondents, the town of Summerland, which supplied 14 farmers, the Black Mountain Irrigation District (B.M.I.D.), representing 8 of the respondents, and the town of Oliver, cited by 7 interview subjects. Other water suppliers discussed include the Glenmore Ellison Improvement District (G.E.I.D.), Greater Vernon Services, the Keremeos Irrigation District, the town of Lake Country, and the Penticton Irrigation District. Overall, a high level of satisfaction with the water purveyors was expressed, with 70.8% of respondents either strongly agreeing or agreeing with the statement 'this water system is well run,' and only 7.6% strongly disagreeing or disagreeing, the majority of which receive their water from the town of Summerland.

Despite generally high levels of satisfaction with the water suppliers, a number of respondents mentioned the concern that farmers are having less of a say in how these institutions are being run, causing a degree of apprehension about continued service that is able to meet the specific needs of farmers. Particularly in Vernon, a number of respondents mentioned recent changes whereby what were formally irrigation districts have been taken over by the city and, as a result, farmer representation has lapsed. According to one respondent, there is 'not one farmer on the board' (Interview 41) of Greater Vernon Services, which is seen as a serious problem. This issue was also cited for a number of the irrigation

districts, such as the Black Mountain Irrigation District, which have historically been designed for agricultural purposes and run by farmers, but are now responsible for serving residents of subdivisions which have sprung up within the rural/urban fringe. Figure 5.3 demonstrates the level of agreement with the statement 'Non-agricultural water users have too much influence on water use in this system', which was asked only of those respondents who receive their water from a water purveyor. The majority of respondents agreed with this statement to some degree, demonstrating a preference for water systems that allowed

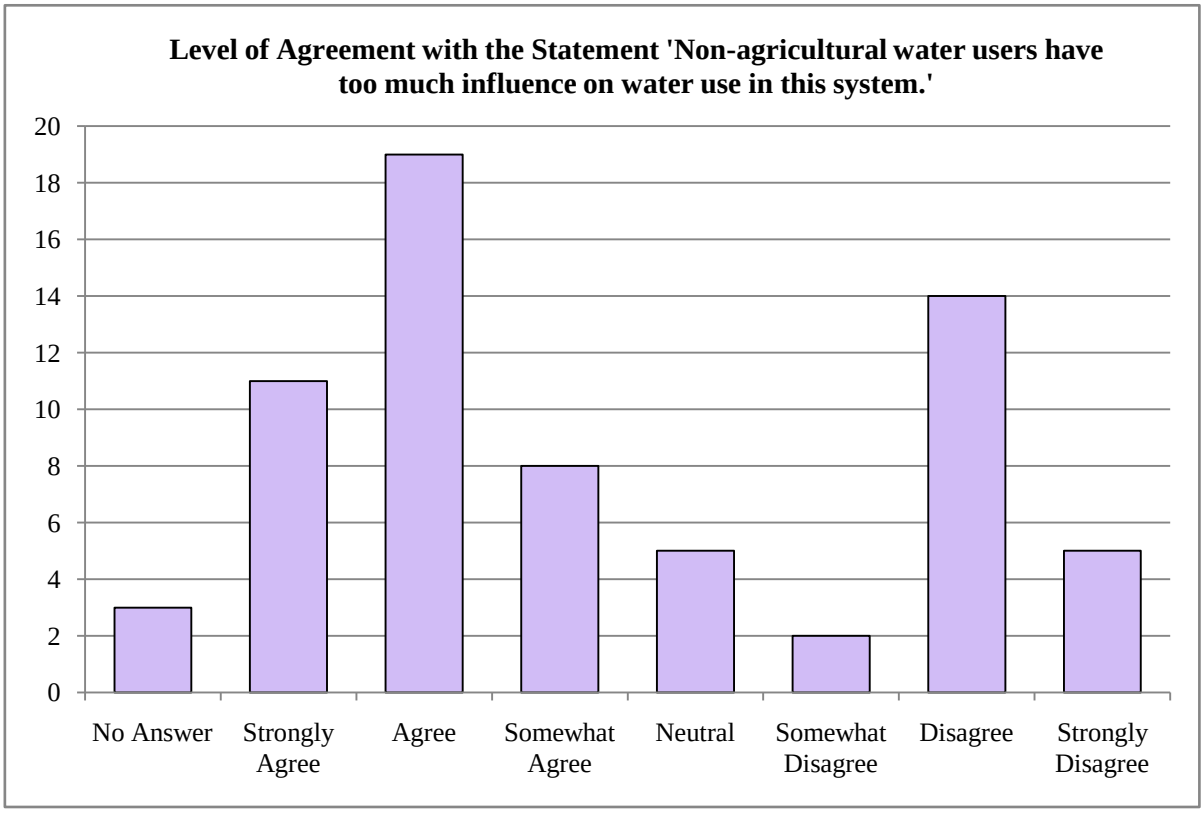

Figure 5. 3 Role of Non-Agricultural Water Users

for agricultural input, and citing a wariness of situations where municipalities have expressed an interest in taking over the role of water managers. This is exemplified by such statements as 'the cities should not get control of the water districts [as] taxes would go up' (Interview

35), and the general belief that the municipalities would not manage the water systems very well, particularly for agricultural purposes.

While cited levels of satisfaction with water suppliers is one way of gauging their success, the bigger picture of sustainability, which encompasses a number of different features and must consider the many factions of society that are implicated, demands an assessment of the way that water is being used on the farm in order to determine if the current system is actually encouraging efficiency. One way of evaluating this is by looking at the irrigation methods that are being used, and what it is that has encouraged respondents to move towards more efficient options. Figure 5.4 depicts the irrigation methods that are

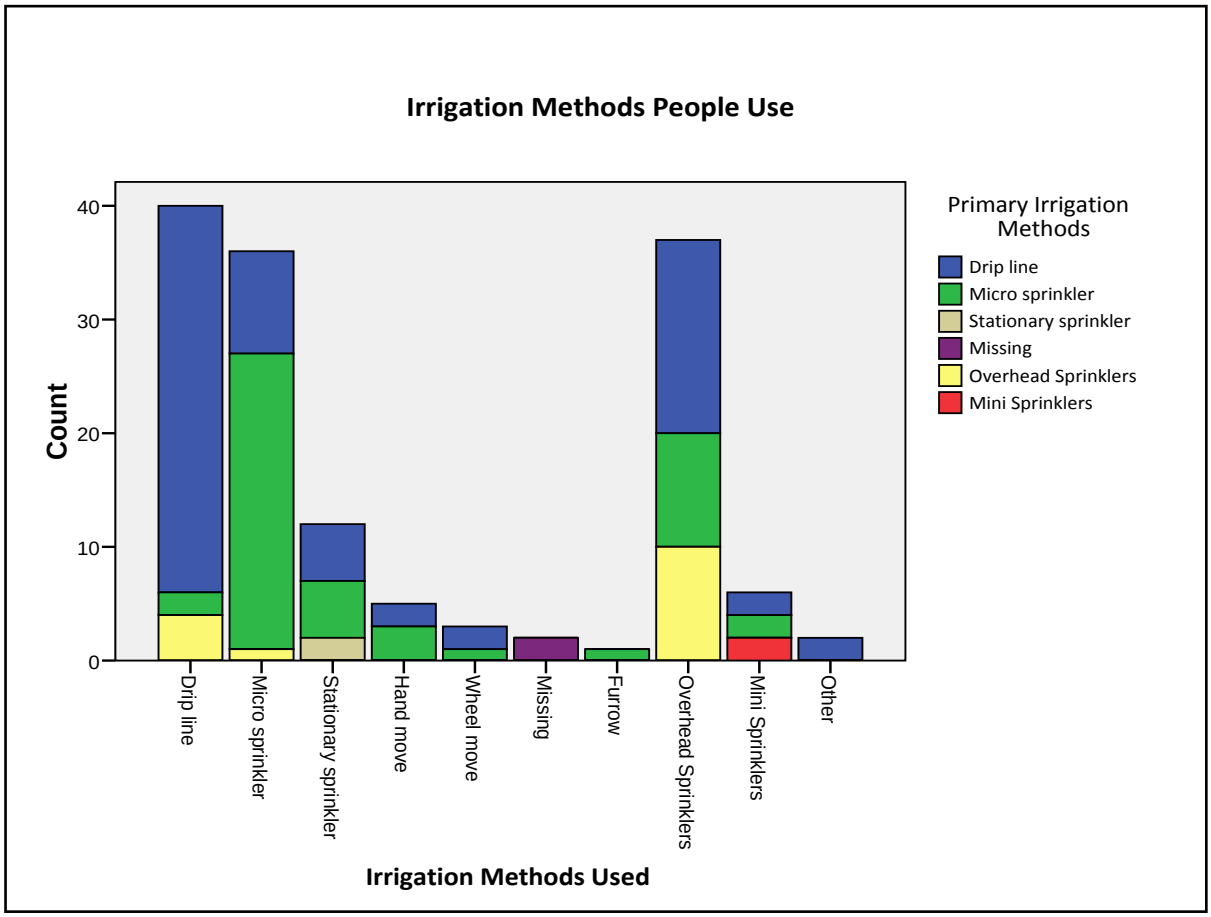

Figure 5. 4 Irrigation Methods Used

being used by the farmers who were interviewed. Since respondents often cited numerous methods, this figure has been designed to illustrate both the number of times that a certain system was mentioned, which is represented by the total count for each column, as well as the primary methods used, which was determined by the system that provided water for the largest portion of irrigated area on a given property. For example, drip lines were used by 40 respondents, and of the 40 people who used this method, approximately 34 stated that it was their primary source of irrigation water, while four used drip lines, but said that overhead sprinklers were their main method, and two cited micro sprinklers as their primary irrigation system. The three most frequently mentioned irrigation methods were drip lines, which were utilized by 54.1% of respondents, overhead sprinklers, which were employed by 50% of participants, and micro sprinklers, cited by 48.6% of farmers. However, it is interesting to note that of the respondents who mentioned the use of overhead irrigation methods, which are commonly accepted as being less efficient than drip systems (Ontario. Ministry of Agriculture, Food and Rural Affairs 2006), the majority are not using this as their primary watering system. In fact, many participants suggested that they have combined either micro sprinklers and overheads, or drip and overhead systems in order to water more efficiently, while still receiving the benefits of overhead irrigation for cooling or frost protection purposes.

In order to determine what it is that motivates farmers to adopt more efficient methods, and the degree to which local institutions affect this decision, respondents were asked if they had recently made any improvements to their irrigation systems, and the two or three main reasons why they have or have not done this. 25.7% of respondents had not made these kinds of investments, while 74.3% stated that they had made upgrades to their

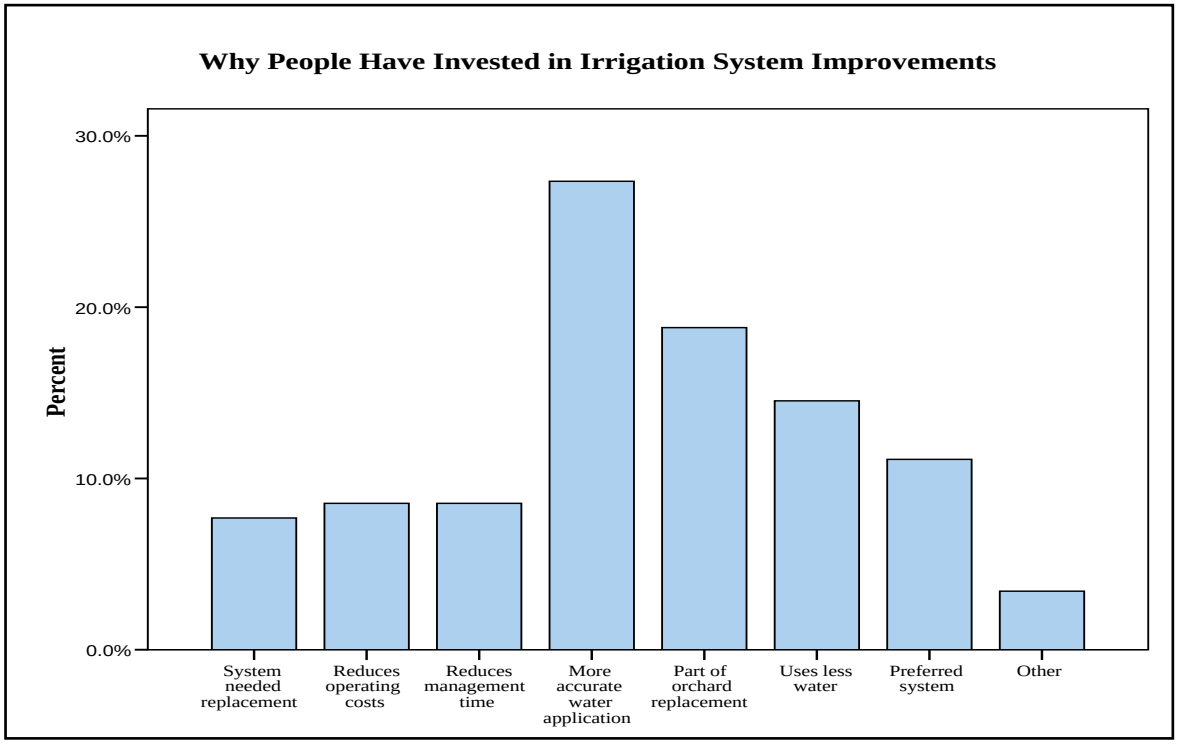

Figure 5. 5 Why People Have Invested in Irrigation System Improvements

irrigation system within the past 5 years. Figures 5.5 and 5.6 illustrate the reasons why

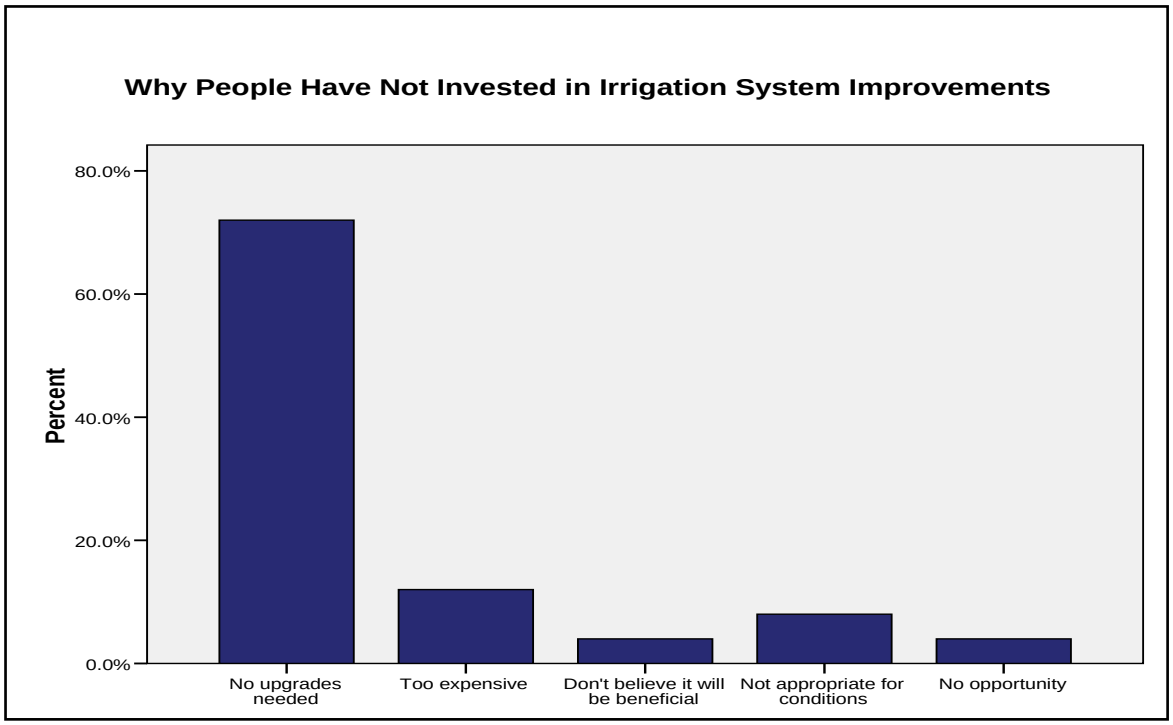

Figure 5. 6 Why People Have Not Invested in Irrigation System Improvements

respondents have or have not made these investments. The primary reasons that respondents cited for making improvements to their systems were that the new methods provided more accurate water application, that they installed a new system when they replanted, that the new methods used less water which was seen as beneficial for both personal and environmental reasons, and that the new system was better suited to the crops that were being grown or the soil types. The vast majority of farmers who had not recently invested in irrigation system improvements stated that no upgrades were needed, generally due to the fact that they had already installed devices which were efficient, or that they considered to be well suited to the crops that they were growing for reasons such as the output of water or the capacity to put their irrigation systems on a timer. The degree to which respondents

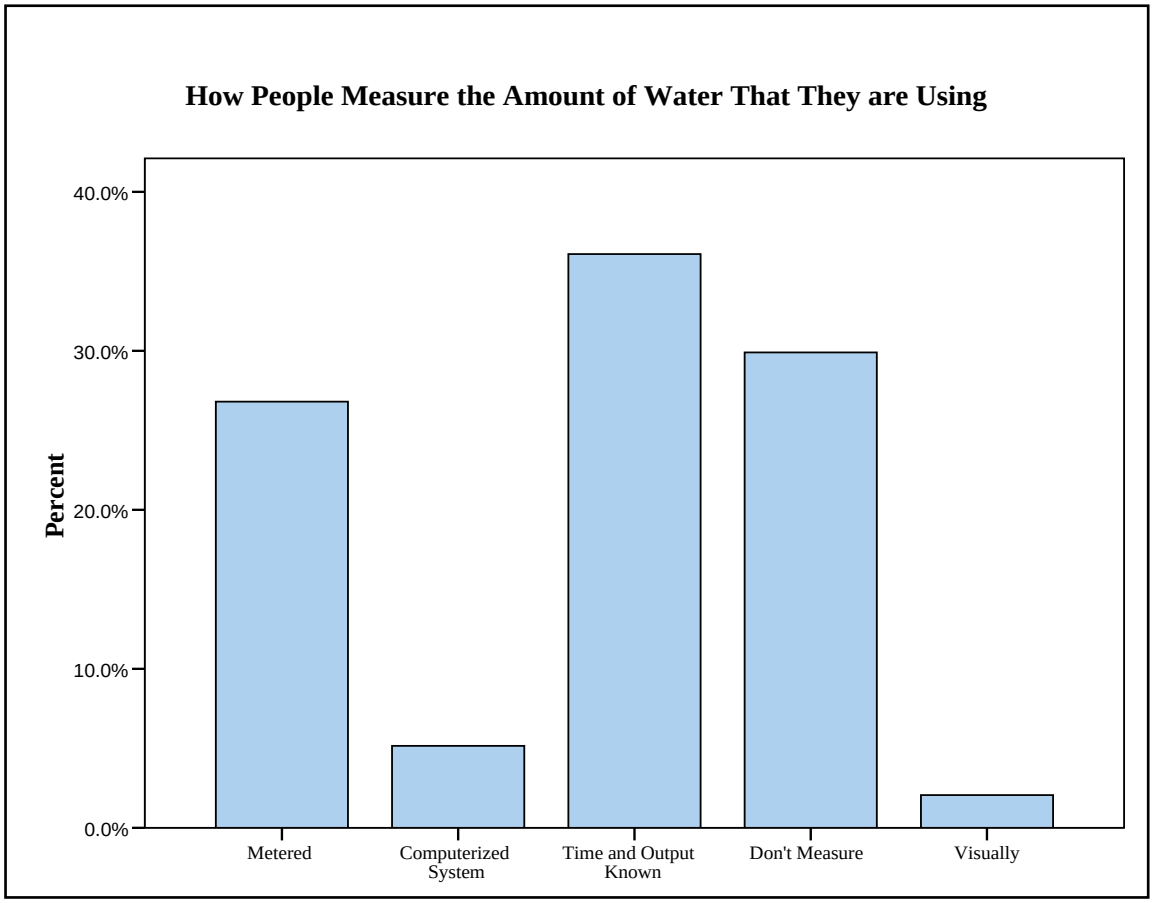

Figure 5. 7 How People Measure the Amount of Water That They are Using

demonstrated that they have generally been moving towards the use of more sustainable watering devises was complimented by the assertion by many farmers that they are presently only using a fraction of their allotment as it is, and therefore should not be expected to reduce further if a drought situation should occur. Figure 5.7, which illustrates the ways that respondents keep track of how much water they are using, demonstrates that, even though there is a general assumption of efficiency, the amount of water being used is often not measured at all, or is only determined by multiplying the amount of time that the system is running by the output of sprinkler heads, which would not account for any leakages or system imperfections that may occur.

Despite the relative approval that respondents cited with their water suppliers, a number of farmers still made comments such as 'there is no encouragement to save water' (Interview 65), and 'we are spoiled with our water here. [There is the] potential to do way more than we do here. Water shortage will become a serious problem if it is not looked after now' (Interview 32). In fact, it would appear that it is this concern surrounding future shortage, rather than incentives offered by supply companies, that have often encouraged farmers to install more efficient watering devices. Many farmers are not actually measuring the amount of water that they are using, and tend to upgrade their systems for reasons related to concerns about water conservation and general farm management rather than in response to factors relating to their present supply, such as reducing operating costs, or because they have faced past restrictions. Additionally, a number of farmers suggested that they had made improvements to their irrigation systems as a part of orchard replacement. Several of these respondents mentioned that they were able to receive funding at the time of replant that they put towards installing more efficient watering systems. Completing upgrades to their

irrigation systems at the time of replant was seen as much more convenient to many respondents, and the costs associated with doing this were not as prohibitive as they may have otherwise been.

While respondents were generally satisfied with the water services that they are presently receiving, there was a degree of apprehension about what the future will look like, and the stability of the water supply institutions that presently exist. This sentiment was reaffirmed at the focus group session when participants were asked if they felt that issues surrounding urban intrusion on rural water services was already an issue, or if this would become more pressing in the future. The response that this would be "probably more of an issue in the future" (Focus Group Respondent 1) demonstrates that many farmers are acting based upon apprehension about future water availability in the valley instead of in response to current circumstances. It is both this concern about how water supply institutions will evolve in the future, as well as the lack of encouragement to conserve by water suppliers, that demands the consideration of alternative approaches to water management.

5.3 Water Markets and Water Trading

Water markets and water trading are believed to have the potential to encourage more efficient water use, since water is given a value that is separate from the land and that which is saved can be sold or traded (Bjornlund and McKay 2002, 771). This concept builds upon economic theory that suggests that an efficient property rights structure must be exclusive, with all benefits and costs associated with ownership accruing to the property owner or owners, transferable, suggesting that the property can be exchanged between individuals, and

enforceable, implying that legal protection exists in order to ensure that the property will not be encroached upon by others (Tietenberg 2006, 63). A number of regions have achieved varying levels of success through experimentation with systems that have implemented these principles, including several western U.S. states (National Research Council 1992), south-eastern Australia (Bjornlund and McKay 2002), Chile (Galaz 2004), and southern Alberta (Nichol 2005). The way that water is transferred will vary greatly depending upon the framework that has been devised, and "may refer to something as simple as the ability of private parties to arrange transfers between themselves […] on terms they negotiate, which may include payment to the holder" (Christensen and Lintner 2007, 221). Furthermore, water transfers can be permanent or temporary in nature (Horbulyk 2007, 208), may involve large or small exchanges of water, and could occur between rights holders representing different segments of society, such as transferring irrigation water to urban centres. The primary goal of this kind of system is ultimately to increase efficiency by implementing market mechanisms designed to encourage prices that are a more accurate representation of the true value of the resource (Janmaat 2005, 214). Respondents were asked questions designed to elicit responses regarding perceptions about whether or not there is a place for water trading in the Okanagan, and if so, how such a system might be structured.

Opinions surrounding water trading appear to be influenced by the way that the concept is presented and conceptualized in the minds of respondents. Depending upon the context, farmers tended to either associate water trading with the commoditization of the resource, envisaged as private ownership by entities seeking to gain a profit (Bakker 2007, 188), or as an opportunity to work with fellow farmers in order to ensure that water was being transferred where the need was greatest in times of shortage. In particular, it is the

idea of financial gain that respondents seemed averse to, making statements such as ‘people with the most money will be able to continue, where those with the least money will sell their water’ (Interview 22), ‘it is too risky to sell water because once you give it away, you will never get that water back’ (Interview 20), and ‘it becomes a business and it is no longer for the good of the people and land’ (Interview 39). The attitude that water markets are dangerous, and will lead to the misuse of water and potentially the exploitation of farmers is depicted in Figures 5.8, 5.9, and 5.10 which respectively illustrate responses to the

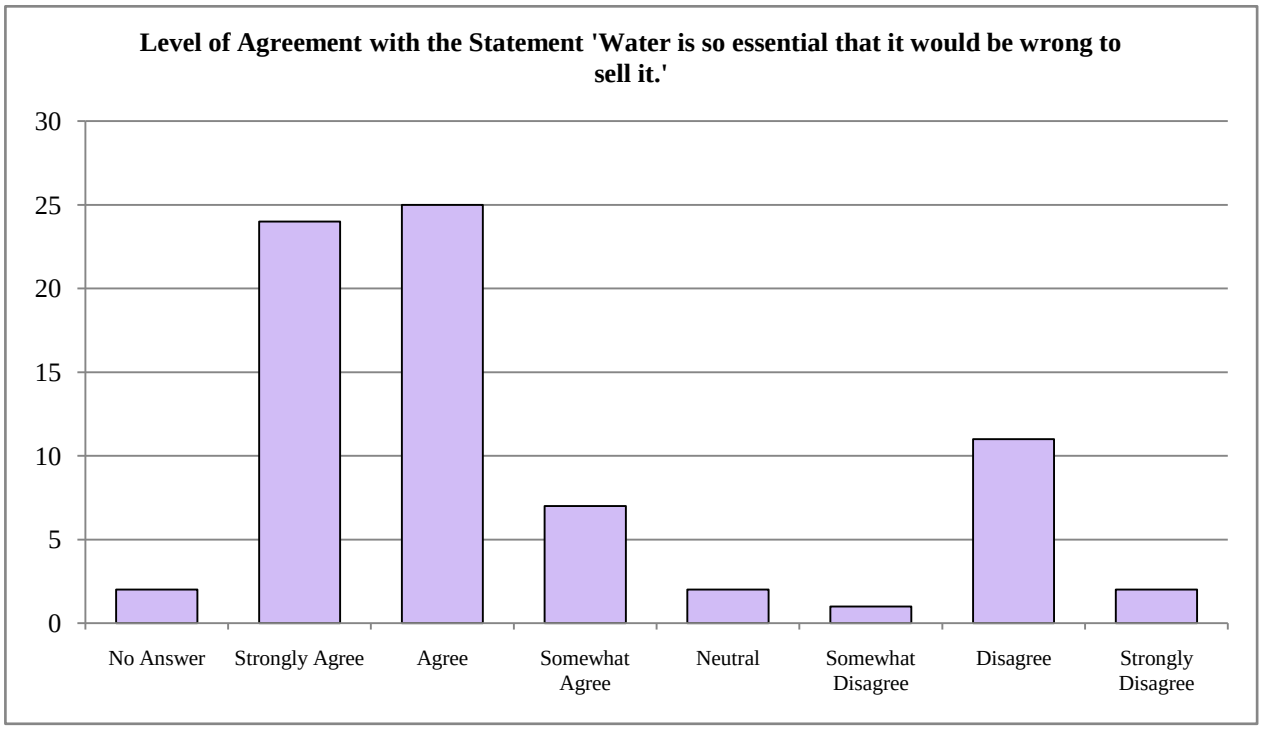

Figure 5. 8 Perceived Acceptability of Selling Water

statements ‘water is so essential that it would be wrong to sell it,’ ‘the option to trade water will lead to a higher price for water,’ and ‘water trading will become a tool for developers to secure their water needs at the expense of agriculture.’ The high levels of agreement with each of these statements is demonstrative of the common perception that open water markets will actually be detrimental to farmers, and that this is a hazardous road to go down. This idea was expressed by one focus group participant who does not receive his irrigation water

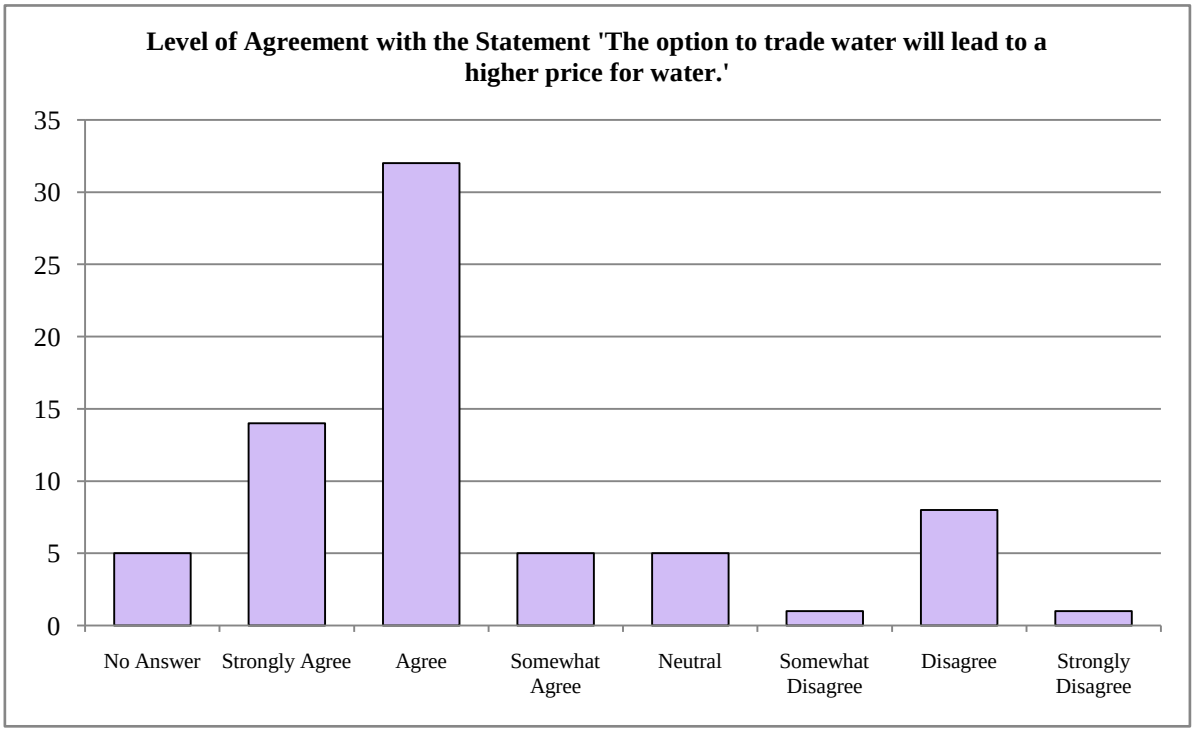

Figure 5. 9 Concerns with Water Trading 1

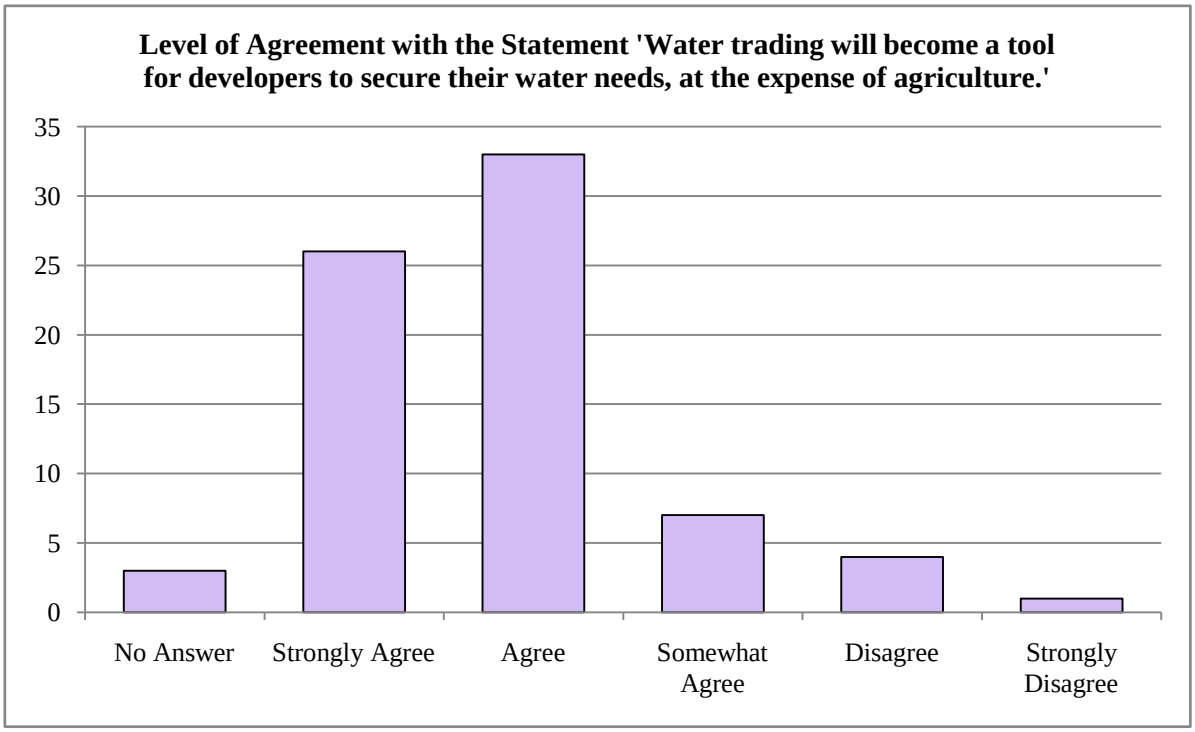

Figure 5. 10 Concerns with Water Trading 2

from a purveyor, but from his own private license:

> I would say, because we're not in a purveyor situation, I'd be worried about the purveyor next to us because if they're all of a sudden making money by selling their water, because we're below them, what happens if they start sinking wells because they're not getting enough run off up top, and all of a sudden the springs that we depend on run dry because they're taking that water? How am I supposed to prove that that's what they've done is, you know, that they've sucked up our water because they punched in three wells or something. So it's, it's pretty dangerous I think
>
> (Focus Group Respondent 1).

This concern can be seen as arising in part due to limitations associated with the prior appropriation system that has been adopted in the Okanagan, which asserts that water users are entitled to draw upon water supplies in accordance with the priority of their water license. This means that an upstream water user would be legally entitled to use their entire allotment even during times of shortage, regardless of the impact on downstream users (Gopalakrishnan 1973, 64). This would be particularly relevant if water trading were to be adopted in the Okanagan, as the incentive to trade away one's water rights would be even greater during drought years, as the profit making potential would be higher when water was scarcer.

Despite this general aversion to water markets, respondents made a number of affirmations suggesting that they would be interested in being able to trade water under

certain circumstances. Relatively high levels of agreement with statements such as 'if farmers are required to reduce their water use for the environment, they should be compensated for the impact on their business' (Figure 5.11) and 'people who waste water should pay more for it' (Figure 5.12) demonstrate support for the kinds of functions that water markets and water trading may be able to achieve. Furthermore, 75.3% of respondents stated that they would ask a neighbour with a secure supply to provide water to them should they need it, and 84.4% stated that they would offer to provide water should a neighbour run short, so long as they had a secure supply themselves. This is not surprising given the

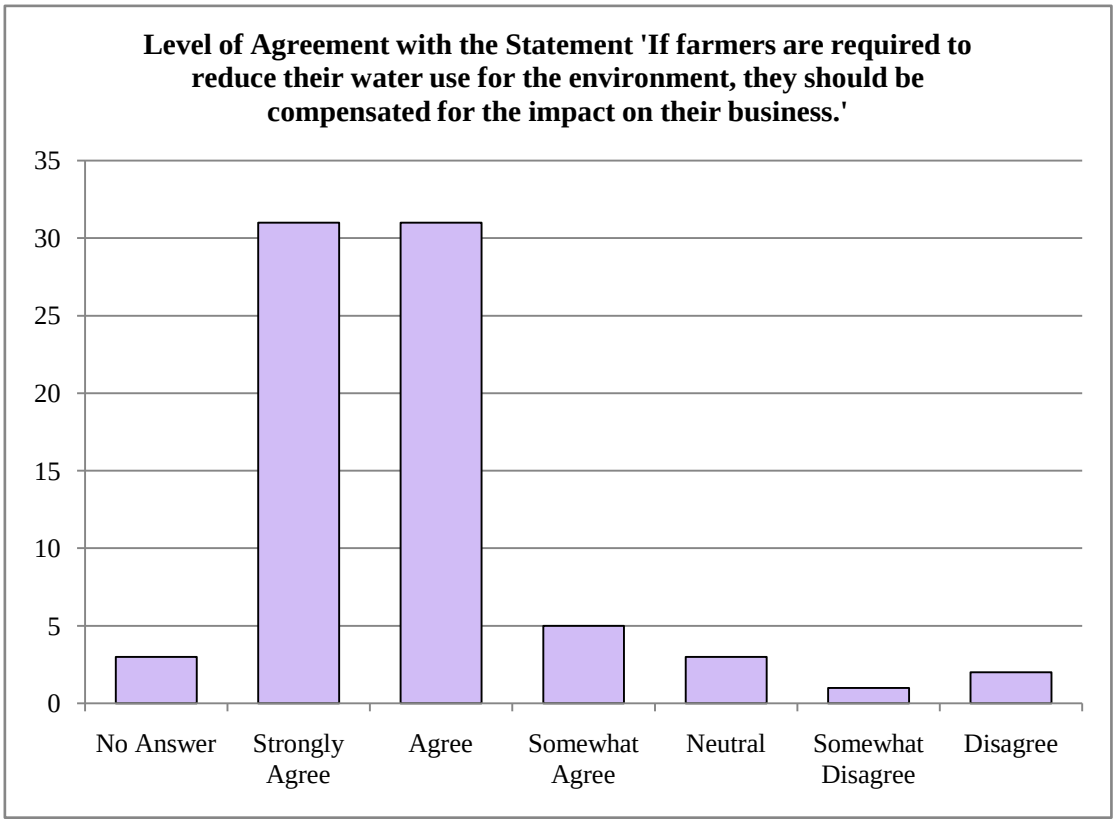

Figure 5. 11 Agricultural Compensation for Water Reductions

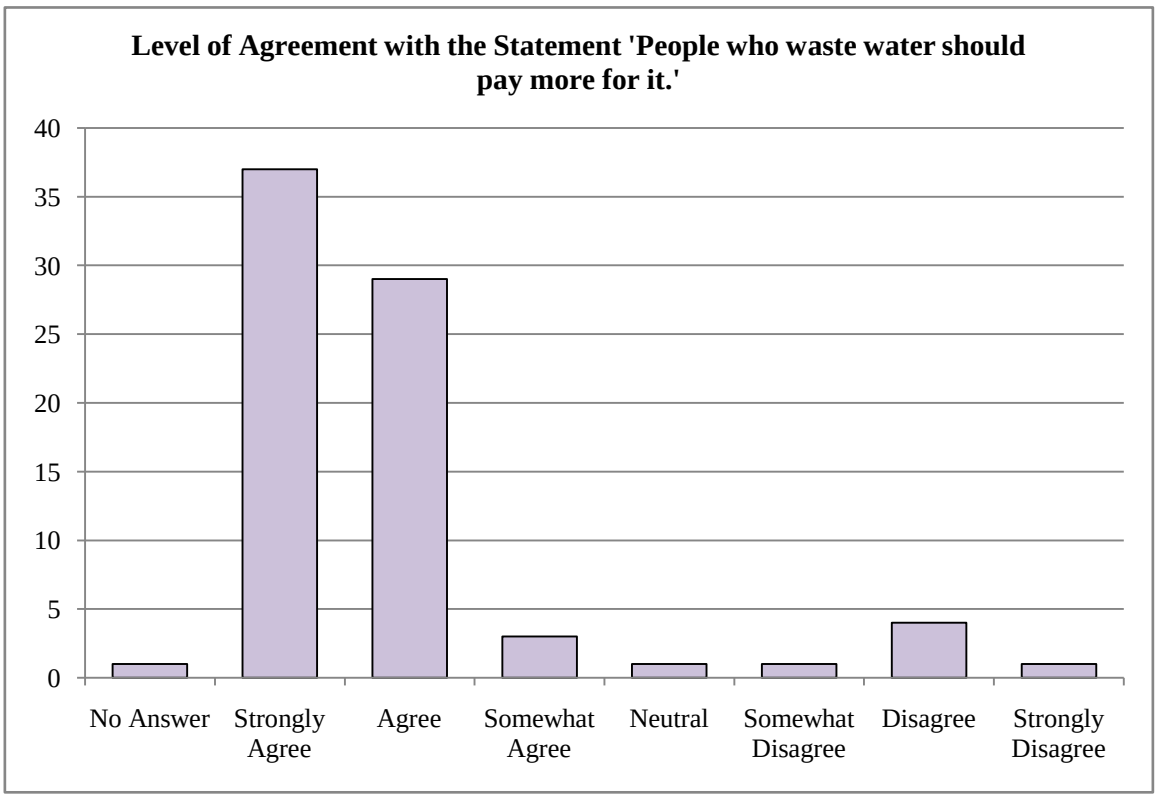

Figure 5. 12 The Price of Wasting Water

aforementioned inclination to embark upon activities that will support agriculture as a whole in the valley, which is reiterated through this heightened willingness to accept trading that is presented in a context that is seen as beneficial to the agricultural sector. This concept was explained by a focus group participant who noted that "with a developer you're trading that water away. That's more permanent whereas this, you may be just helping the neighbour out for a month or two until they get a well fixed or you know, something like that" (Focus Group Respondent 3). Figure 5.13 emphasizes the importance that is placed on helping another farmer, and is telling of the context in which farmers would accept water trading, particularly when viewed alongside Figure 5.10, which emphasizes the fear that water markets could benefit developers in the valley to the detriment of farmers.

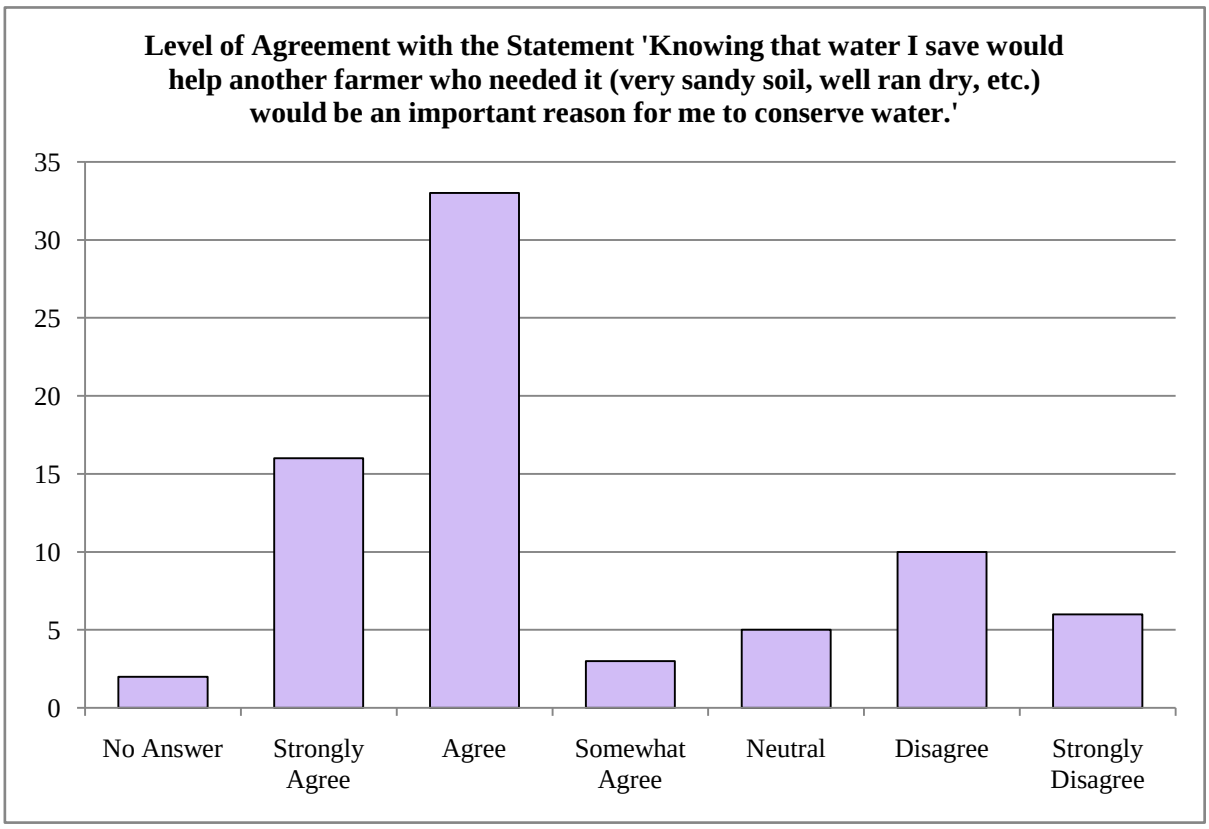

Figure 5. 13 Reasons to Conserve Water

The general attitude surrounding trading is that it is dangerous or risky if it involves transferring water out of agriculture, but that it could be useful for ensuring that water is directed towards the greatest need within agriculture. Hence, a number of respondents emphasized the requirement that any trading system would have to be confined to the agricultural sector, and should generally involve temporary transfers of water for a small fee, or some form of reciprocity. Comments such as you 'should be able to trade on a temporary basis, never permanent, but not sell' (Interview 55) and 'all water that was traded would have to stay in agriculture' (Interview 55) support this idea. However, it should be noted that the majority of respondents stated that they disagreed with the statement 'I would consider trading water only with other farmers that I knew well' (Figure 5.14). Many respondents suggested that they would not have to know someone well to trade with them, but that any farmer or neighbour with the need would be an appropriate trading partner. Furthermore,

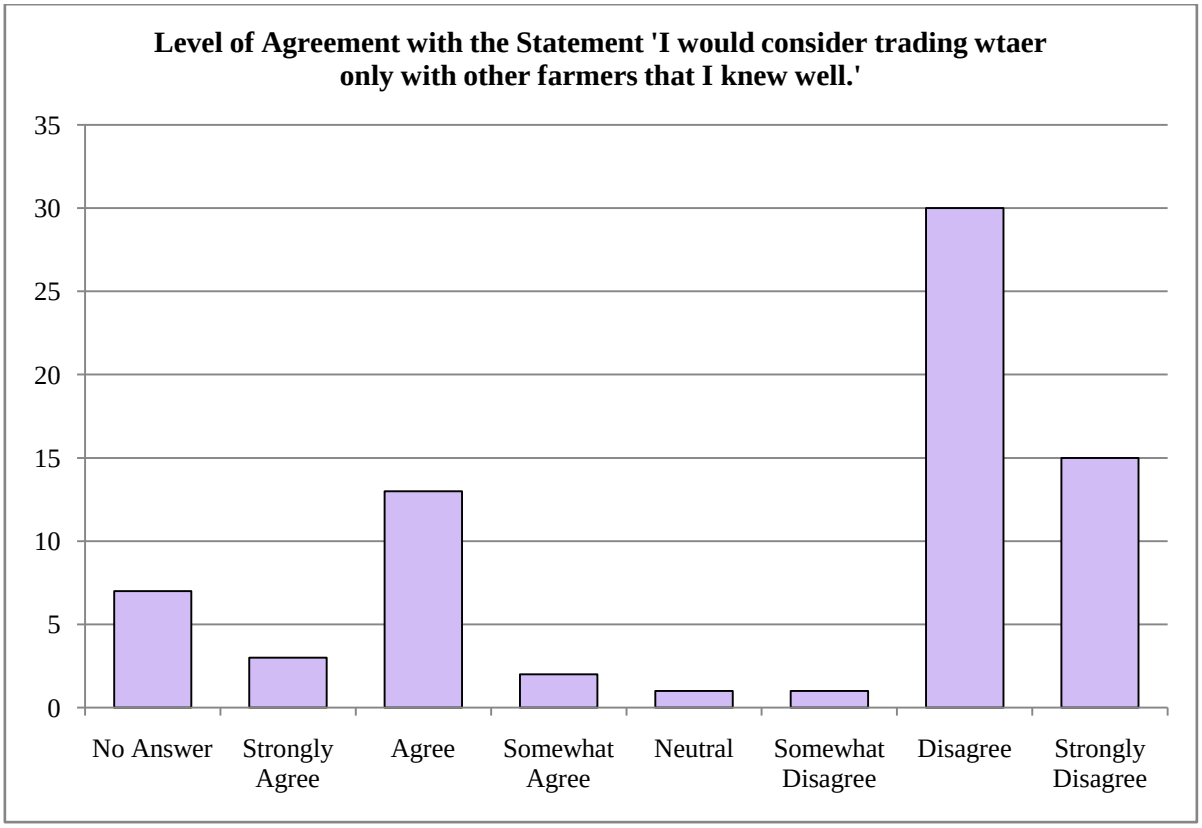

Figure 5. 14 Trading Water Within Agriculture

a number of farmers noted that having the capacity to trade could be useful for transferring water between different parcels that they or their families owned, particularly when soil types vary greatly from one area to another. One respondent made the comment that trading would be very useful in his situation 'because [my] parents own a farm on the other side of town that has much rockier soils, whereas [I have] very good soils, so they could use the water that [I] don't need' (Interview 71). These results reiterate the idea that farmers in the Okanagan identify with one another, sharing a set of cultural characteristics that are specific to the agricultural life style in the valley. Preferences for this kind of water sharing are consistent with the history of co-operative agricultural enterprises that have shaped farming in the valley today. Additionally, the motivations behind trading that many respondents expressed, such as helping out a neighbour in an emergency situation, may be entirely different within

an agricultural sector that is dominated by large corporate farms, as opposed to the family run farms which proliferate throughout the Okanagan.

In order to determine a workable trading structure for the Okanagan, both the scale of trades as well as the nature of the exchanges must be considered. Figures 5.15 and 5.16 respectively depict the compensation that respondents would expect to provide or receive in exchange for water that was traded with a neighbour, noting that 73.6% of respondents would expect to provide something to a neighbour who supplied water to them, while only 59.3% would expect their neighbour to compensate them. While many respondents suggested that they would expect financial compensation, there was an openness to a range of possibilities, such as knowing that the trade relationship would be reciprocal should the need arise, or bartering for whatever it is that was needed, such as labour or supplies. Taken as a whole, both the preference for trading exclusively within the agricultural sector, as well

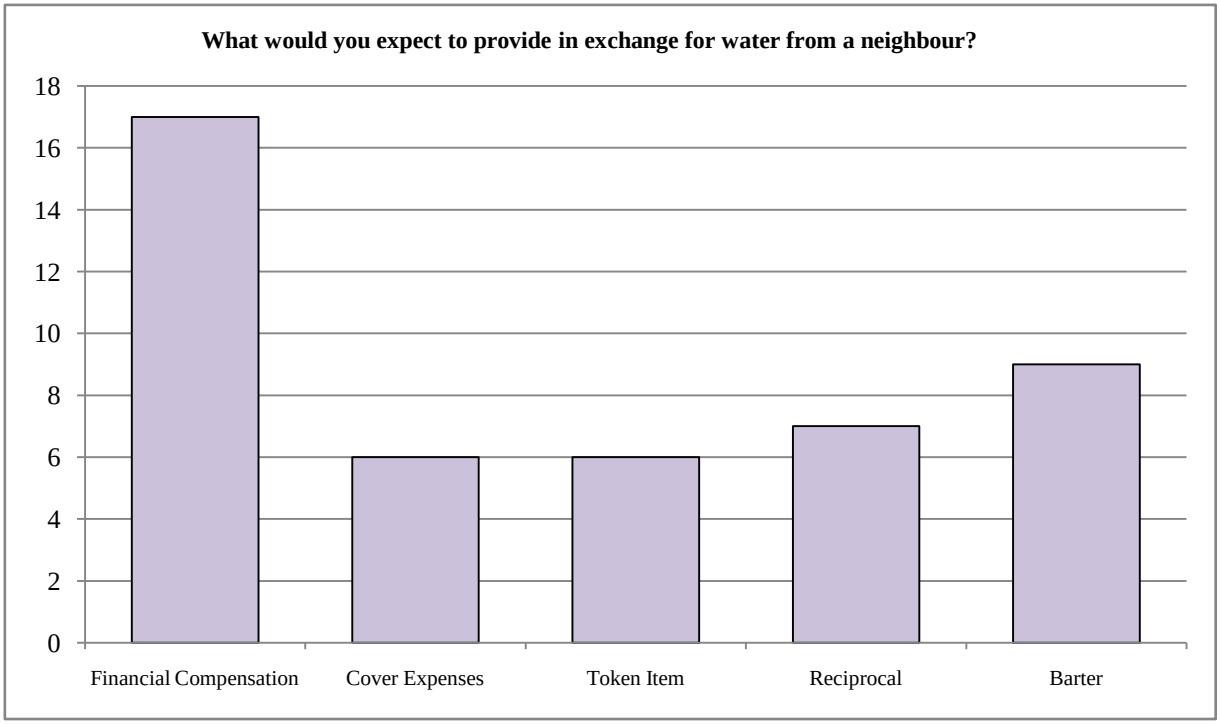

Figure 5. 15 Compensation for Water Provided by a Neighbour

as the demonstrated openness to conducting trades that are not strictly based upon financial compensation, suggest that this could be a useful tool to farmers, but that this should

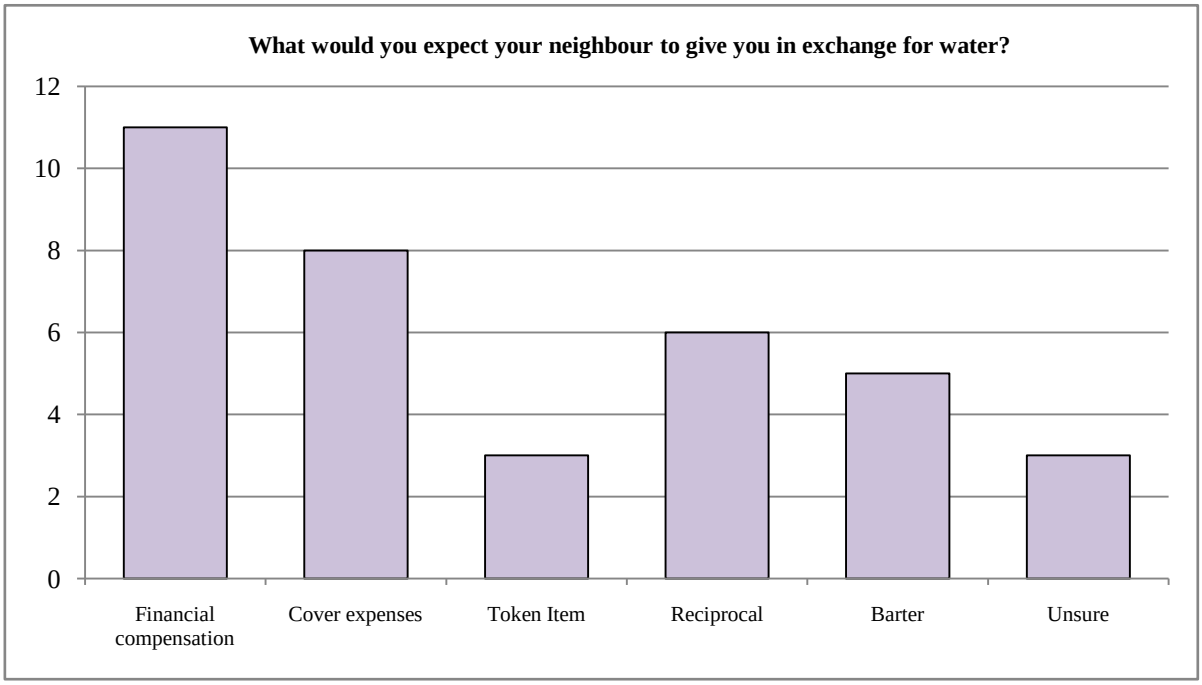

Figure 5. 16 Expected Compensation for Water Provided to a Neighbour

materialize in the form of more flexibility in the current system, leaving the door open for farmers to determine how and when this kind of measure should be employed.

5.4 Co-operation and Community Involvement

The benefits of co-operative, locally inclusive management systems have been recognized in many diverse locations, both within Canada and internationally. Involving community level stakeholders in the planning process can be a mechanism by which reconciliation is achieved between "the often conflicting needs, values, and interests of various stakeholders without further compromising environmental quality" (de Loë and Kreutzwiser 2007, 86). In part, this is the result of the goals that are inherent to participatory

and co-operative processes, which are also aligned with an action research perspective, such as well informed and creative decision making that integrates diverse perspectives, enhanced acceptance by local stakeholders of initiatives (Mostert 2006, 156), and the creation of a management regime with a vested interest in resource preservation, lending itself to collectively executed stewardship (Robbins 2004, 44). Examples of local participation in water management schemes can be found in the Norfolk Sand Plain region of southern Ontario, where irrigation advisory committees, which are run by farmers, have been established to promote effective local action that is appropriate for their communities (Shortt, et al. 2004), in Valencia, Spain where irrigators are organized into distinct irrigation communities, responsible for overseeing the management of water for their district (Maass and Anderson 1986, 28 as cited in Ostrom 1990, 73), and certain sections of south and south-eastern Brazil, where efforts have been made to mobilize local stakeholders and give preference to local solutions to problems surrounding water (Abers 2007). Due to the perceived success of local involvement in natural resource management, which was expressed formally at the International Conference on Water and the Environment in Dublin in 1992 through the creation of the Dublin principles, which assert that "water development and management should be based on a participatory approach" (United Nations 1992), respondents were asked several questions regarding the role that farmers have in managing water that is used for irrigation in the Okanagan.

The degree to which citizens engage in the process of designing, implementing, and managing water systems can vary from a situation where the public is given the opportunity to react and provide insight on decisions, to one of total self-control, whereby community members are independently responsible for water operations (Mostert 2006, 155). Comments indicating that the best approach to managing irrigation water in the Okanagan

would be one where ‘smaller groups of users [decide] how water is used and regulated amongst themselves’ (Interview 25), as well as the high level of agreement with the statement ‘management of the water used within agriculture is best done by the irrigators themselves’ (Figure 5.17) suggest that respondents feel that agricultural irrigators ought to have a strong role in managing the water that they use. However, it should be noted that a number of respondents recommended that, while irrigators should play a role in governing the water that they use, the existence of some authority or regulatory framework is necessary.

Looking at local participation as something that can exist in a graduated, scalar nature, the question of whether or not to involve community members in the planning process must entail not only a consideration of if this should occur, but also to what degree. A number of respondents mentioned that the systems that they are presently using are already somewhat co-operative in nature, such as the South East Kelowna Irrigation District and the

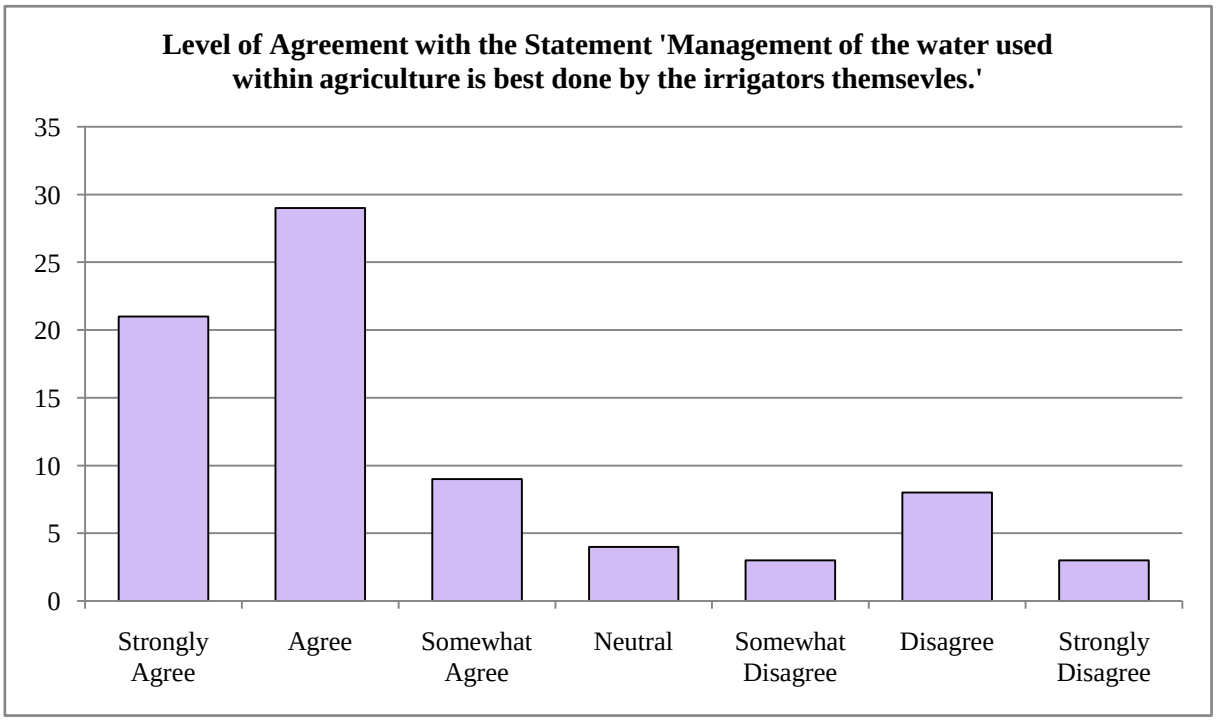

Figure 5. 17 Managing Agricultural Water

Black Mountain Irrigation District in Kelowna which were originally designed by growers, and continue to be operated to a large extent by farmers. While the kind of involvement that is capable within these kinds of water provision systems does allow for enhanced agricultural participation over a municipally administered system, some respondents operate under an even more co-operative system, whereby a small number of acres fall within water user communities and irrigation districts, with 6-10 farmers designing and maintaining systems that are used solely for their own irrigation purposes. Looking back to the stated levels of satisfaction with current systems, as well as comments made by respondents suggesting that farmer participation is critical, it would appear that systems that are operating under this kind

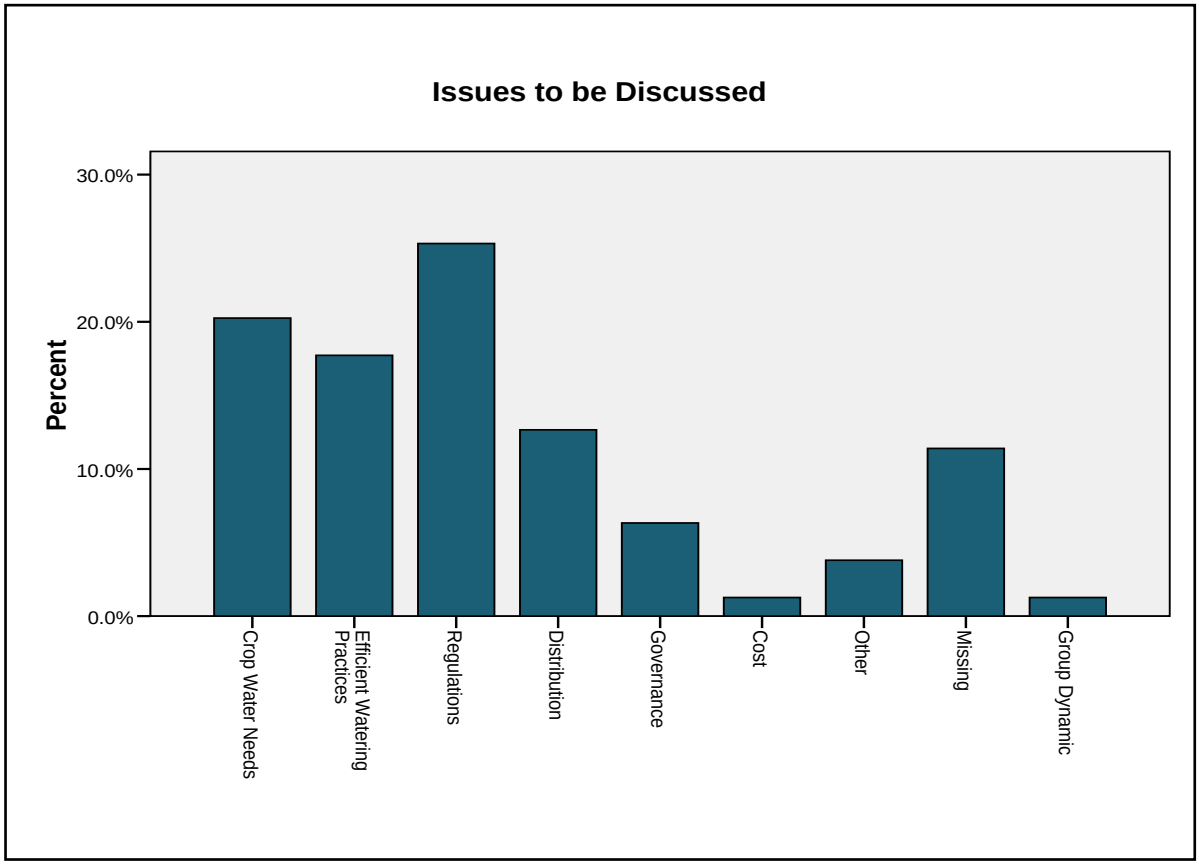

Figure 5. 18 Issues to be Discussed Surrounding Collaborative Management

of a framework should work to preserve the capacity for local collaboration and involvement, while those that do not allow for this, should pursue a structure that allows for greater citizen input from farmers, specifically surrounding the management of irrigation water.

In order to determine the degree to which farmers would be willing to work co-operatively to control water that is used for irrigation, respondents were asked if they would be interested in meeting with their neighbours to develop a co-operative approach to water management, should regulations be changed to allow for farmers to collectively hold the rights to their water supplies, and share these amongst one another. 64.8% of respondents who answered this question stated that they would be interested in attending a meeting to discuss this with their neighbours, while 35.2% were not interested in doing this. Nine respondents declined to answer this question, the majority of whom stated that their current

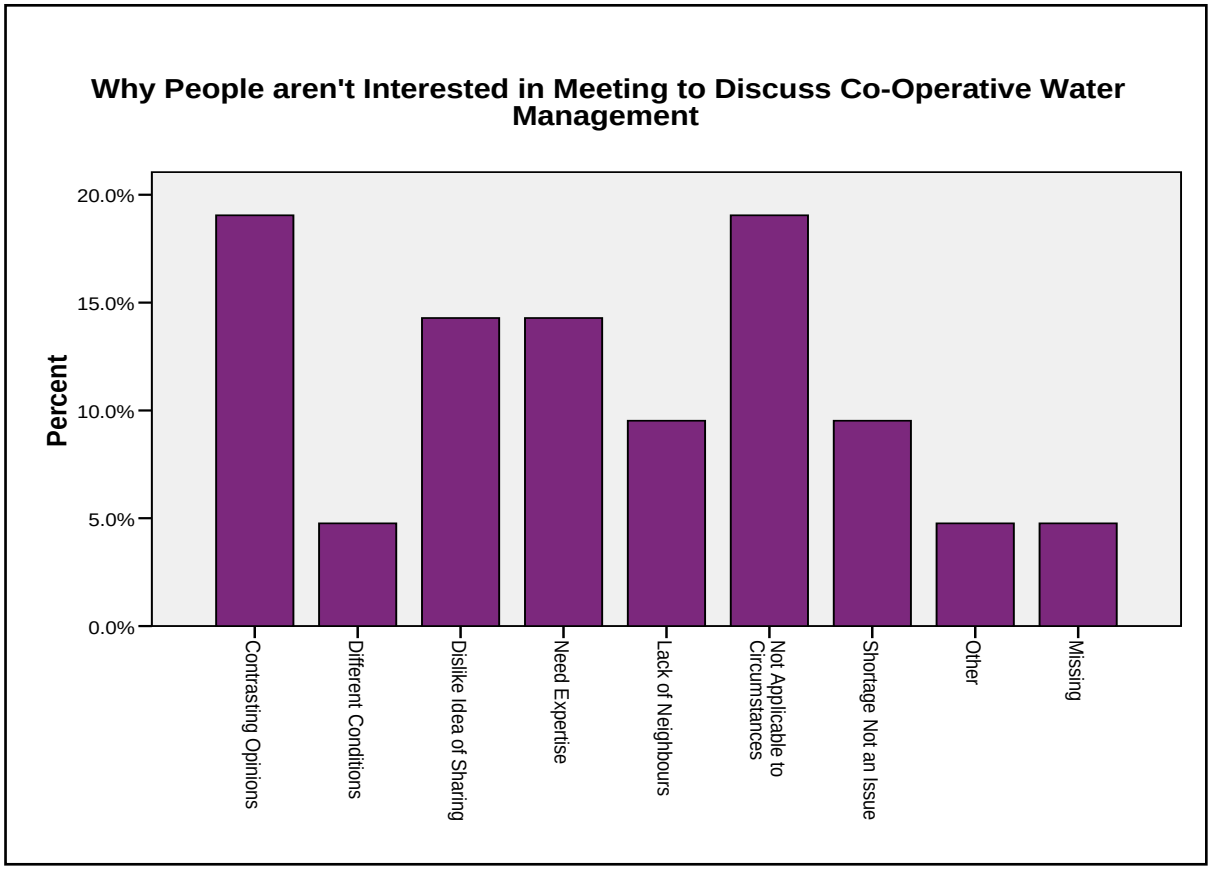

Figure 5. 19 Why People Aren't Interested in Collaboration

system already allowed for adequate user participation. Figure 5.18 illustrates the kinds of issues that respondents felt would need to be discussed at such a meeting, while figure 5.19 addresses the reasons that farmers would not be interested in attending such a meeting.

The main issues that respondents feel would need to be discussed surrounding a co-operative water management scheme in the Okanagan are the regulations that would need to be put in place, including how these would be monitored and enforced, different crop water needs and the timing of these needs and how more water could be directed towards the crops with the greatest demand, how to encourage efficient watering practices within agriculture, and how the water would be distributed. The primary reasons that farmers cited for not being interested in such a system are that agricultural water users will have too many conflicting opinions that would be difficult to manage, that a co-operative system would not be appropriate in the area where they farm, that they dislike the idea of sharing water and fear losing their allocations, and that some form of expertise is required to administer such a system, and therefore irrigators themselves would be ill prepared to manage their own water resources. Both the ideas that regulation and distribution of water would be important issues to discuss, as well as the sentiment that one may not want to be involved in a co-operative water management system because of diverse opinions that are difficult to reconcile, speak to the importance of establishing a set protocol for a collaborative approach to water management that outlines clearly the rules of conduct, and any penalties for violations. In part, these concerns can be associated with the issue of equity, which is often raised when a resource is held and managed commonly, whereby individuals want to feel secure that they are "getting a reasonable and fair return on their contribution to a collective undertaking" (Oakerson 1992, 52). Furthermore, the prevalence of comments suggesting that a co-operative management system would not be appropriate in their region, or that they are

already operating under a similar system to some degree, reaffirms the idea that participation occurs across a gradient, and that the level of community collaboration that is appropriate will vary depending upon the circumstances. Again, these preferences are reflected in the history of co-operative institutions in the valley which have, on one hand facilitated the development of the Okanagan's agricultural sector, while on the other, occasionally caused frustration amongst farmers when co-operative become too large for grower input. At the same time, many respondents recognized that this is necessary in order to meet the needs of the many farmers in the valley, while remaining competitive.

5.5 Multi-Level Governance of Water Resources

Comments made by respondents surrounding water governance in general, and water trading and co-operative water management regimes specifically, demonstrate that taking an interdisciplinary, multi level approach to water governance will be important for ensuring that the ecological function of the larger watershed remains intact, while still meeting the needs of different water user groups at the local level (Iyer 2003, 72). Sustainable water planning must equitably and efficiently balance the needs of all users, while ensuring that environmental demands are being met (Calder 1999, 151). Hence, it becomes apparent that certain user groups or administrative bodies are more suitable to address the issues that occur across both geographical levels, such as planning for the entire basin versus decision making surrounding smaller sub-watersheds, and different demographic user groups, such as agricultural irrigators versus domestic users situated in urban centres. This issue is particularly relevant in the Okanagan valley, as reformations encouraging stronger authority over practices that will affect water on a basin wide scale are presently being encouraged,

which may include increasing the regulatory capacity of the Okanagan Basin Water Board, which is described in detail in chapter one. At the same time, the importance of stakeholder collaboration and equitable decision making has been emphasized for ensuring that water is managed sustainably and equitably in the valley (Okanagan-Similkameen Task Force. 2008, Appendix D1).

The opinions of respondents surrounding the different management techniques that were discussed in the interviews suggest that there is not one approach that will be beneficial across the entire Okanagan, but that an integrated and adaptable system is desired. Participants made a number of comments suggesting that, while farmer input is essential where irrigation water is concerned, other stakeholders must be involved too, including domestic users, both to provide insight regarding their particular needs, as well as to foster an understanding of agricultural needs, and the importance of meeting these demands. Additionally, many respondents recognized that decision making models must be open to user input, but that individuals are not always equipped with the expertise to determine how water should be managed, including the potential impacts that water related decisions may have on the larger watershed. Statements such as; 'the Okanagan Basin Water Board should control the watershed [and] municipalities and irrigation districts should look after distribution', as well as 'municipalities should manage the domestic side of things, and agriculturalists manage the farm side' (Interview 68) lend support to the idea that water management regimes must involve consultation with all stakeholders, and be open to expert opinion and recommendations. This multi-level governance structure has, to some extent, already arisen in the Okanagan, as a variety of institutions presently exist to deal with water management across a number of different sectors. Ideally, this kind of a system will enhance the capacity for smaller, community managed organizations to arise organically

when the need exists and circumstances permit, with decision making defaulting to the next highest level should it be impractical to co-ordinate on a smaller scale. In order for this to occur, all of the diverse user groups within the area must be fully recognized and mobilized, with a system of priorities being established according to the principles of equity and democratic decision-making (Calder 1999). It would appear that this kind of a system is aligned with the sentiments expressed by many respondents, as it has the capacity to allow for farmer input and management of irrigation water where it makes sense to do so, while providing an alternative in situations where collaborative management may not be suited to local circumstances, or expertise beyond that which is held collectively by irrigators is required.

Incorporating the perspectives of respondents on both co-operative management systems, as well as water trading, a picture of water governance in the Okanagan emerges whereby at the smaller, local scale, farmers wish to either maintain or enhance agricultural input regarding the use and allocation of irrigation water, while municipalities will have a role to play in managing non-agricultural water supplies, with an overarching watershed authority overseeing and regulating decisions that will affect the entire basin. Within this context, it seems that agriculturalists may support a form of casual trading amongst one another at the most local, farmer managed level for the purposes of ensuring that agricultural water users are able to meet crop water demands in times of shortage.

5.6 Summary

Within recent years, the importance of acknowledging the opinions and needs of local water users and organizations has increasingly been recognized in Canada when water policy

planning and implementation are put into practice (Ferreyra and Beard 2007). Overall, it appears that respondents tend to be satisfied with their current water providers when supplied by a purveyor, though a degree of apprehension is apparent regarding the capacity of these institutions to continue to meet the needs of farmers in the Okanagan in the future. Throughout the interviews, two mechanisms, water trading and co-operative water management, were explored in greater depth in order to foster an understanding of how farmers feel about these kinds of systems, and if they might be useful within the Okanagan, both as a means of encouraging efficient water practices, and as a mechanism to protect agricultural interests in the event of a serious shortage. Upon examination, it becomes evident that certain aspects of both water trading and co-operative management are viewed more favourably than others by the farmers who were interviewed. Many respondents were leery of the idea of water trading when it was conceptualized as a market where water is bought and sold, and the potential for profit exists. However, the majority of participants did not seem opposed to sharing water with a fellow farmer if an extreme situation were to arise, and assistance was required in order to protect crops. Similarly, respondents appear to view certain aspects of co-operative water management regimes more positively than others. While a high level of agreement was expressed with the idea that farmers should play an integral role in the management of water that is used for irrigation, the degree to which irrigators should have control over agricultural water resources, which are often being drawn upon by non-agricultural users, was questioned and the requirement in certain circumstances of both expertise, and an authoritative body were discussed.

Many of the opinions that were presented surrounding water governance in the Okanagan lend themselves to the idea of a multi-level system that has the capacity to incorporate aspects of both water trading and co-operative water management, while

addressing the issue of representational equity that was put forth by respondents who were concerned that non-agricultural water users were having too much influence on their water systems. Within the Okanagan valley, a multi-level approach to managing water will likely entail the strengthening of a watershed based authority such as the Okanagan Basin Water Board, alongside the involvement of both governmental and non-governmental organizations, towns and municipalities, and local user groups. The standard of management at the lowest possible level, as outlined in the Dublin principles, may be useful here, as this would allow for the most appropriate decision making body to take control at all levels, protecting and enhancing the capacity for agricultural involvement in decisions surrounding water that is used for irrigation. This kind of a system would have the benefit, if structured in such a way, as to allow for local level agricultural user groups to work together to share water as a means of assisting one another and providing each other with a backup, should the collective desire exist. At the same time, such a system has the capacity to be structured in such a way as to ensure that these kinds of trades do not expand beyond the local, agricultural level, resulting in the realization of the concern that water trading could become a tool for developers to secure their water needs at the expense of agriculture.

Chapter 6: Conclusions

Agricultural viability in the Okanagan is directly connected to the continued availability of adequate supplies of irrigation water. The history and pattern of land use and management in the valley, which includes co-operative agricultural initiatives and a prevalence of family farms, are demonstrative of a series of identifiable cultural characteristics which are valued by Okanagan farmers. It is clear that protecting the agricultural base in the Okanagan is not merely a matter of ensuring farm business profitability, but is rooted in a deeper desire to preserve an industry that has come to symbolize both the Okanagan, and the particular way of life adopted by farmers in the valley. It is only natural then that management preferences of Okanagan irrigators reflect this desire through their inclination towards solutions to the problem of water shortage that do not carry the potential to further degrade the agricultural base. As outlined through the political ecology perspective, Okanagan irrigators have come to recognize and describe political processes and institutional designs that have the potential to benefit certain segments of society, to the detriment of the agricultural community. Seeking to avoid these kinds of situations, farmers appear to be conceptualizing the idea of sustainable development within a framework that emphasizes sustaining the agricultural base, while recognizing that the needs of other stakeholders, including the natural environment also must be met. Should the issue of water shortage become more severe in the Okanagan, this will necessitate the establishment of a series of priority uses for the valley, amongst which agricultural needs must be given appropriate levels of consideration.

6.1 Agricultural Viability

The existence of a vibrant local agricultural sector is of benefit to residents of the valley for a number of reasons. Relying on crops which must travel from distant destinations necessitates the use of a variety of preservatives and additives, which are often associated with detriments to human health, while products from farther away are nonetheless generally accepted to be less fresh than local alternatives (Halweil 2002, 9). Purchasing locally grown produce has also been associated with benefits to the natural environment by some advocates who note that fewer carbon emissions are created by shortening the length of transport (Suzuki and Boyd 2008). Additionally, both the aesthetic value associated with orchards and vineyards, as well as the increased popularity of agri-tourism and winery excursions are among the factors that draw tourists to the valley, which represents an important component of the Okanagan economy (British Columbia. BC Stats 2006). Alongside these considerations, preserving the agricultural sector in the valley is important for the sake of farming itself, as both the heritage and sense of community associated with farming in the Okanagan are valued by the members of this community. Within a more global context, ensuring agricultural viability is also of importance in light of an escalating world population, which is expected to reach nine billion by the year 2050, and a trend towards urban expansion and shrinking rural populations (World Business Council for Sustainable Development 2008, 2). These factors suggest that the value of agricultural land will likely rise in the future.

In order to ensure that farming remains viable in the future, it is critical that agricultural needs are met, and that the health of local crops are not compromised. Particularly in light of the many different stresses that irrigators indicated were of relevance

to the Okanagan agricultural sector, there must be a guarantee that farmers will not be forced to cease production as a result of inadequate water supplies. This may involve the creation of an agricultural water reserve to accompany the land reserve that already exists, or more serious consideration being given to further housing development projects that are proposed in the valley and whether or not the water demands of a greater number of domestic residents, as well as agricultural irrigators, can all realistically be met should there be a drought year. A number of respondents indicated that overall, their concerns at the present time had less to do with what was being grown on agricultural lands in the valley, than with keeping that land base intact so as to ensure that this land will remain productive into the future.

6.2 Management Alternatives

In light of concerns surrounding agricultural viability, irrigators appear to be more open to alternative water management strategies that are seen as beneficial to the agricultural sector, while there was a general scepticism surrounding mechanisms that were perceived of as being potentially harmful to Okanagan farms. This is not to say that the respondents did not value other water functions, such as the role that water plays in the natural environment, but rather that they would be leery of any governance reforms that could make water unaffordable for irrigation or potentially divert water away from agriculture towards uses that were seen as luxuriant. These include such uses as watering golf courses and lawns, or filling domestic swimming pools. Often, reactions to questions surrounding management alternatives were highly responsive to the ways in which the questions were framed. For example, irrigators seemed to respond more favourably to the idea of sharing water with a

neighbour than to the concept of water trading and water markets. Although sharing water with a neighbour effectively represents a kind of trade, the discrepancy in reactions to these kinds of questions reflects this idea that farmers would be more likely to support governance reforms that carry direct benefits to agriculture over those that allow for competition between agricultural and other sectors.

In general, farmers did not seem to support the introduction of water markets in the Okanagan. This preference did not vary significantly from one end of the valley to the other. However, respondents from the ranching community, who typically received their water from private sources, were generally more in favour of water trading than representatives from the tree fruit and wine-grape industries. While opinions surrounding formalized water markets did not seem to vary considerably between the different types of farms, ranchers tended to more readily visualize the ways that water trading may be of use to them personally. Respondents from all agricultural sectors typically felt that enhanced local level collaboration would, in certain circumstances, be beneficial, and that farmers should play a role in managing the water that is used for irrigation. Within this context, some informal trading could be useful, but it is uncertain whether this would actually encourage sustainable practices. Farmers seem more motivated to install efficient watering devices by factors related to personal cost reduction and crop demands. Nonetheless, creating a sense of security within the agricultural community surrounding the availability of water for irrigation may lessen any concerns about where the water will go if it is not used by farmers, which could indirectly influence decisions about preferred water systems and irrigation scheduling. This will likely require that farmers continue to play a role in deciding how water is used for agriculture, or that their roles are enhanced where municipal administration of water

resources has led to reduced agricultural input. At present, it appears that an effective water governance structure, which aligns with the principles of multi-level governance and has the potential to be receptive to local level collaboration (Ferreyra and Beard 2007), is in place in the Okanagan, but that the roles of various stakeholders must be elaborated upon.

6.3 Recommendations

Effective and sustainable management of water resources in the Okanagan requires balancing the demands of multiple stakeholders, and a consideration of the natural environment. Before farmers in the valley will be receptive to any alternative water management decisions, they must first feel confident that their interests are being protected and that their water needs will continue to be met. Garnering this confidence will require a comprehensive understanding of all of the features that are affecting agricultural stability in the valley. This includes a recognition of the fact that agricultural water demands are not fixed, but will vary depending upon a number of different criteria, including climate, crop type, and soil conditions. For this reason, it is recommended that proposals by the OBWB to create an agricultural water reserve to accompany the land reserve be enacted. If agricultural irrigators feel secure that they will always be able to obtain at least the minimum amount of water needed to sustain their crops and generate sufficient revenue to remain in business, then saving water when it is possible will begin to look much more appealing. However, this may require an ideological shift away from situating agricultural production within the realm of normal competition, to one where we, as a society, collectively recognize the benefits of maintaining a strong agricultural base and actively seek to protect this. Essentially, the existence of a land reserve suggests that this idea has been recognized, and in fact, this may be sufficient throughout much of the province. However, given the limited water resources

that are available in the Okanagan, a water reserve is required in order for the land reserve to be meaningful and effective.

Agricultural acceptance of water trading will also likely be affected by the level of confidence experienced by farmers. Many respondents asserted that if water trading was to occur in the valley, it should be contained within the agricultural sector. This speaks directly to the fear that water will be transferred out of agriculture, leaving farmers with insufficient supplies to water their crops and thereby, further erosion of the agricultural community. At present, it is recommended that the municipalities and irrigation districts should not disallow water trading amongst farmers, but that this should remain an informal endeavour that is prescribed and performed by the farmers themselves, and kept within agriculture. Furthermore, permanent trades should be avoided in light of the precautionary attitude that many respondents expressed, as well as the potential for future disputes if water should become scarce. Again, the existence of a reliable agricultural water reserve may inadvertently enhance growers' acceptance of water trading, as this would ascertain that water could not be transferred out of agriculture, and that adequate supplies of water would be tied to all productive land in the valley. Endowed with the assurance that future supplies of water are guaranteed, farmers would likely feel more compelled to share water amongst one another as a means of helping another irrigator in an emergency situation or times of shortage. Furthermore, this could attach a more tangible benefit to saving water in the first place if farmers recognized that their unused water could potentially be directed towards alternate uses that were in support of agriculture. Should water trading grow in popularity within the agricultural sector, the requirement for some method of recording and monitoring trades may emerge. Ideally, the creation of this would rest with the farmers themselves,

arising organically from the system that they have created and the needs that they have identified.

If water trading becomes more common throughout the valley, a reconsideration of the system of prior appropriation will be required. Since this approach to allocating water may result in insufficient water supplies for some users, particularly if senior rights holders choose to capitalize on water shortage scenarios by selling their entire allocations, it would be necessary to reconfigure the water rights distribution system in the Okanagan in order to promote equitable access to water for all users. Complications surrounding the way that the prior appropriation system could impact upon water trades should not be seen as a market failure, but rather as an equity issue. If large scale water trading were to be implemented, rights holders under the prior appropriation system would simply be able to benefit from the rights that they are legally entitled to. However, this may not always be socially or environmentally just when certain users are unable to satisfy their needs, or water has been over-allocated, with the result that insufficient quantities are left to meet environmental demands. Addressing these issues may involve restructuring water rights in the valley so that allocation is more closely aligned with actual demand, which is based upon factors such as the amount of land that is under production and local soil and climatic conditions.

A final recommendation revolves around enhancing the agricultural voice in the valley. The way in which this is achieved will vary from one location to the next, but in general involves maintaining a strong agricultural presence on boards and governing bodies responsible for the administration of water. This would include agricultural representation within the OBWB, particularly in the event that the regulatory powers of this board be enhanced. Additionally, the co-operative history of agriculture in the valley should be

acknowledged by recognizing the importance of farmer operated water purveyors. In light of expanding urban centres and growing domestic demands, it is often tempting to advocate the amalgamation of municipal water suppliers and traditionally agricultural irrigation and improvement districts. However, the demands of irrigators are very different from those of household consumers, and are best managed by the farmers themselves, who possess an intimate understanding of the working of their irrigation systems and their crop water demands. For this reason, it is important that these organizations continue to play a role in allocating water throughout the valley.

In order to better understand the way that collaboration and water sharing amongst farmers might be achieved, it is suggested that an additional study be conducted targeting irrigators from different cultural backgrounds. While no statistics could be found on the exact break down of farmers according to ethnicity, a number of respondents proposed that over a third of the agricultural operators in the valley were immigrants from other countries, mainly India. If this estimate is accurate, then it would appear that these farmers are seriously underrepresented in the present research. Furthermore, a number of respondents suggested that they do not know many of their neighbours of different nationalities, and that this may be a barrier to collaboration, or even water sharing. There appeared to be a general feeling of uncertainty about the kinds of watering practices that farmers with different backgrounds were engaging in, and a number of respondents suggested that a kind of divide or sense of separateness existed between themselves and these farmers. An additional study targeting these members of the agricultural community would be of benefit because it may begin to break down this divide, encouraging greater community cohesion. Furthermore, it could reveal valuable insights into water conservation practices, as many immigrants to the

region may have already experienced drought and pervasive water shortages in their countries of origin. Finally, the potential for collaborative water management in the Okanagan valley could be better understood by speaking with members of the water user communities that exist throughout the valley, as these are essentially cooperative operations.

6.4 Closing Remarks

Sustainable water resource management requires a truly interdisciplinary approach, as the roles and perspectives of many different stakeholders must be considered within the context of the environmental, social, and economic realities that prevail in a given area. For any solution to the problem of unsustainable water management practices, there will undoubtedly be parties who feel that their needs are being neglected. Therefore, it is essential that a clearer picture of what it is that is meant by sustainable development for the Okanagan valley emerge. Considering both present and anticipated growth rates in the valley, it is critical that this be defined before it is too late, and urban needs begin to exceed available resources. If this is to occur, it is likely that agricultural operators will have no choice but to sacrifice irrigation water if it is a matter of meeting the basic needs of the domestic population. This situation can be avoided though if priorities for development are set which respect the natural limitations of the valley and offer support to local farmers.

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Appendices

Appendix A - UBC Research Ethics Board Certificates of Approval

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

CERTIFICATE OF APPROVAL - MINIMAL RISK

PRINCIPAL INVESTIGATOR:	INSTITUTION / DEPARTMENT:	UBC BREB NUMBER:
John Janmaat	UBC/UBCO IKE Barber School of Arts & Sc/UBCO Admin Unit 6 Arts & Sci/UBCO Economics	H07-00670

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

Institution	Site
N/A	N/A

Other locations where the research will be conducted:
N/A

CO-INVESTIGATOR(S):

N/A

SPONSORING AGENCIES:

Okanagan Basin Water Board - "Farm Drought Risk Management: Do Farmers Trade Water?"
UBCO Internal Research Funds

PROJECT TITLE:
Farm Drought Risk Management: Do Farmers Trade Water?

CERTIFICATE EXPIRY DATE: November 14, 2008

DOCUMENTS INCLUDED IN THIS APPROVAL:	DATE APPROVED:
	November 14, 2007

Document Name	Version	Date
Protocol:		
OBWB Water Management Grant Application	N/A	February 28, 2007
RGS (Internal) Grant Application	N/A	November 21, 2006

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

CERTIFICATE OF APPROVAL - MINIMAL RISK AMENDMENT

PRINCIPAL INVESTIGATOR:	DEPARTMENT:	UBC BREB NUMBER:
John R. Wagner	UBC/UBCO IKE Barber School of Arts & Sc/UBCO Admin Unit 1 Arts & Sci	H06-90172

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

Institution	Site
UBC	Okanagan

Other locations where the research will be conducted:
N/A

CO-INVESTIGATOR(S):

N/A

SPONSORING AGENCIES:

Social Sciences and Humanities Research Council of Canada (SSHRC) - "From Abundance to Scarcity: the Political Ecology of Water Use in the Okanagan Valley"

PROJECT TITLE:
From Abundance to Scarcity: the Political Ecology of Water Use in the Okanagan Valley

Expiry Date - Approval of an amendment does not change the expiry date on the current UBC BREB approval of this study. An application for renewal is required on or before: April 2, 2009

AMENDMENT(S):	AMENDMENT APPROVAL DATE:
	November 7, 2008

Appendix B – Irrigator Survey

Okanagan Irrigator Survey

We are very grateful that you are taking the time to help us with our research. The purpose of this survey is to record how Okanagan farmers manage for the risk of unusual water shortages - droughts. We are particularly interested in arrangements that involve cooperation between farmers to share water.

This research project is being supervised by Dr. John Janmaat, an economics professor at UBC Okanagan. In accord with ethical research practices, we are committed to respecting your confidentiality. The information you give us will not be used for any purposes other than this research project.

[S0Q1] Have you read and signed the consent form, which authorizes us to use the answers you provide for our research? ○ yes ○ no

Interviewer *If the participant has not completed the consent form, then be sure to get the consent form signed before continuing. If the consent form is not signed, then the survey cannot be used.*

Farm Details

[S1Q1] Land Information

units: ○ ac, ○ ha	Area	Area Irrigated
How much land do you own.		
Are you farming rented or leased land.		
Are you renting or leasing land to others.		
Are you managing land for others.		

[S1Q2] Crop Production

Please provide details on the crops you grow. Please begin with the crop that you consider the most valuable. Include both crops grown for sale and crops grown for later use (grass for cattle or grapes for wine).

	#1	#2	#3	#4	#5
Crop					
Area (units: ac, ha)					
Share Irrigated (percent)					
Water (units:)					
Peak Water Time					
Yield					
Revenue					
Revenue Share					

[S1Q3] Other Activities

Please provide details of any other important revenue generating activities on this farm. This includes animal production (beef, poultry, etc.) and marketing related activities (fruit stand, winery).

	#1	#2	#3	#4
Enterprise				
Annual Production				
Revenue				

Revenue Share				

[S1Q4] Role of Farm Income

1. Does anyone in your household earn income off the farm which contributes to household income? ○ yes / ○ no
2. What share of total household income is contributed by the farm business? (nearest 10%)?
   ○ 0 ○ 10 ○ 20 ○ 30 ○ 40 ○ 50 ○ 60 ○ 70 ○ 80 ○ 90 ○ 100
3. How much time, in terms of average hours per month, does this family contribute to the farm business? Include only family hours for which a wage is not paid.
4. How much time, as a share of total income earning time, does this family contribute to the farm business (nearest 10%)?
   ○ 0 ○ 10 ○ 20 ○ 30 ○ 40 ○ 50 ○ 60 ○ 70 ○ 80 ○ 90 ○ 100

2. Water System Details

[S2Q1] Which irrigation methods do you use? Please indicate the percent of your total irrigation for each method.

Method	Share	Method	Share	Method	Share
Drip line		Micro sprinkler		Stationary sprinkler	
Hand move		Wheel move		Stationary gun	

Moving gun		Center pivot		Furrow	
Flood					

[S2Q2] How do you measure the amount of water that you use?

[S2Q3] Have you recently (within five years) invested in any irrigation system improvements? yes / no

If yes, please describe them?

If you have not recently invested in any improvements to your irrigation system, what are the two or three main reasons why you have not made such an investment?

No upgrades needed	Will loose rights to saved water	Have plenty of water
Too expensive	Conservation will harm the industry	...

If you have recently invested in improvements to your irrigation system, what are the two or three main reasons you made this investment?

System needed replacement	Reduces operating costs	Deal on equipment
Reduces management time	More accurate water application	Part of orchard replacement

Are there any government funding programs that you took advantage of to help pay for the recent irrigation system improvements you have made.

Would you be more likely to make water savings investments such as these if you could sell the water saved to another water user? yes / no

[S2Q4] For each of the following water sources, please indicate how much water it would provide you in an average year, and whether it is a primary source or a backup/emergency source.

Source	Amount	Role
Purveyor (Irrigation district, water company, etc.)		Primary Back
Stream, river or lake (gravity supply, private).		Primary Back
Stream, river or lake (gravity supply, joint with others).		Primary Back
Creek, stream, river or lake (pumping, private).		Primary Back

Creek, stream, river or lake (pumping, joint with others).		Primary Back
Groundwater (private well).		Primary Back
Groundwater (jointly owned well).		Primary Back

[S2Q5] Do you have irrigation water storage? yes / no

If yes, what is the capacity of the following storage?

Upland storage reservoir.	
Main farm storage pond.	

[S2Q6] Do you personally own any water licenses or other legal water entitlements (not through a purveyor, etc.). yes / no

If yes, then please answer the following questions for each of the licenses or entitlements you own.

	#1	**#2**	**#3**	**#4**	**#5**
Quantity					
Date issued					
Date acquired					
Acquired with land?					

Newly issued?					
Purchased?					
Ever exhausted?	yes / no	yes / no	yes / no	yes / no	yes / no

Have you purchased land specifically to acquire the water rights? yes / no

Have you sold any water licenses, separate from land? yes / no

If yes, when and how much?

[S2Q7] Do you use groundwater for irrigation? yes / no

If you do, please answer the following questions for each well you own.

	#1	**#2**	**#3**	**#4**	**#5**
Capacity					
When drilled					
Licensed?	yes / no	yes / no	yes / no	yes / no	yes / no
Withdrawals limited?	yes / no	yes / no	yes / no	yes / no	yes / no

Ran dry?	yes / no	yes / no	yes / no	yes / no	yes / no

[S2Q8] Do you receive water from a water purveyor (irrigation district, water supply company, etc.) yes / no

For each irrigated parcel supplied by a purveyor, please provide the following information. Begin with the largest parcel.

	#1	#2	#3	#4	#5	#6
Purveyor						
Parcel Size						
Water Entitlement						
Ever Restricted?	yes / no	yes / no	yes / no	yes / no	yes / no	yes / no

Can you transfer part or all of your entitlement between parcels you own?

yes, permanently only, yes, temporarily only, permanently or temporarily, no

Can you transfer part or all of your entitlement to parcels owned by others?

yes, permanently only, yes, temporarily only, permanently or temporarily, no

[S2Q9] What changes, if any would you make to your operation if more water was available to you?

How much extra income do you think that this extra water would generate?

3. Information Sources

[S3Q1] Which of the following methods do you regularly use for deciding when to irrigate?

☐ Calendar,	☐ Plant condition,
☐ Recent weather,	☐ Long range weather forecast,
☐ Soil 'feel',	☐ Soil test,
☐ Public expert advice,	☐ Consultant service,
☐ Other: _____	

[S3Q2] Which of the following information sources do you use for general information about irrigation and farm management (beyond irrigation scheduling)?

☐ Trade magazines,	☐ Farm tours and workshops,
☐ Local research scientists,	☐ Government extension officials,
☐ Consultants,	☐ Newspapers,
☐ Radio or television,	☐ Internet,
☐ Other: _____	

4. Water Shortage Adaptation Options

[S4Q1] During 2003 there was a serious drought in the Okanagan. Did you undertake any of the following actions in response to the drought conditions?

- ☐ Nothing, water supply was more than adequate,
- ☐ Reached limit of water supply at end of season, did not change any practices,
- ☐ Irrigation scheduling adjusted, all crops still irrigated,
- ☐ Reduced irrigation on some crops,
  Crops: _____
- ☐ Stopped irrigating some crops,
  Crops: _____
- ☐ Heavy pruning and thinning to reduce water use,
- ☐ Purchased and installed new equipment (drip, etc) to reduce water use,
- ☐ Used previously installed backup supply (well, etc) for supplemental irrigation,
- ☐ Installed backup supply (well, etc) to enable supplemental irrigation,
- ☐ Received water from neighbours with backup supply,
  Was a payment made? ○ yes / ○ no
- ☐ Supplied water to neighbours from backup supply,
  Was a payment received? ○ yes / ○ no
- ☐ Other: _____

[S4Q2] Were there any government programs (advertising, education, payments) that lead you to reduce your water use more than you otherwise would have?

[S4Q3] Water shortage is always a risk in the Okanagan. Where is your operation the most sensitive to drought impacts?

[S4Q4] What risk factors, if any, would you consider more important than drought risk, in terms of your management activities?

a.	d.
b.	e.
c.	f.

[S4Q5] Have you ever received irrigation water from another farmer? ○ yes / ○ no

If yes, what was the reason you needed the water?

☐ Equipment breakdown.	☐ Own well, reservoir, etc. dry.
☐ Exceeded own license.	☐ Exceeded purveyor allotment.

☐ Other:	

Is this a regular arrangement? ○ yes / ○ no

Did you provide anything to the supplying farmer in exchange for the water?

☐ Nothing, understood to be a favor.	☐ In kind, lent sprayer, etc.
☐ Gift, use of boat, cottage, etc.	☐ Cash, to cover supplier's expenses.
☐ Cash, negotiated a price.	☐ Other:

[S4Q6] If a neighbour was in a position to supply water to you (having a well or other source, having recently replanted or growing crop that requires less water, etc.), would you ask your neighbour to supply you with water? ○ yes / ○ no

Would you expect to provide anything in exchange for this water? ○ yes / ○ no

If yes, what would you consider fair?

[S4Q7] Have you ever supplied irrigation water to another farmer? ○ yes / ○ no

If yes, what was the reason the other farmer needed the water?

☐ Equipment breakdown.	☐ Own well, reservoir, etc. dry.

☐ Exceeded own license.	☐ Exceeded purveyor allotment.
☐ Other:	

Is this a regular arrangement? ○ yes / ○ no

Did you receive anything from the supplying farmer in exchange for the water?

☐ Nothing, understood to be a favor.	☐ In kind, lent sprayer, etc.
☐ Gift, use of boat, cottage, etc.	☐ Cash, to cover extra expenses.
☐ Cash, negotiated a price.	☐ Other:

[S4Q8] If a neighbour was short of water and you had a secure supply, would you offer to provide water to your neighbour? ○ yes / ○ no

Would you expect your neighbour to give you anything in exchange for the water you provided? ○ yes / ○ no

If yes, what would you consider fair?

[S4Q9] Suppose that the regulations governing the water you use were changed to make it easier to share water with your neighbours. Would you be interested in attending a meeting with your neighbours to develop a cooperative water management plan? ○ yes / ○ no

What issues would need to be discussed, in order to develop a workable cooperative

water management plan? For example, crop water needs and timing of those needs, identifying opportunities to improve the efficiency of water use, establishing procedures to ensure that all participating stick to the plan, etc.

If you are not interested in such a meeting, why not?

5. Attitudes

Interviewer: The person you are interviewing may have strong opinions about the following statements. Do not engage in an argument about the merits or problems with water markets. Make it clear that we are seeking information and do not have a position.

In many situations there is nothing that can take the place of water. Many people are therefore concerned that the control remain with authorities concerned about the public good. At the same time, in various parts of the world there is not enough water available to meet the needs of farmers, household consumers, industry and the environment. In these situations, people are experimenting with various ways of encouraging greater conservation by current water users and thereby finding ways to make water available for other purposes.

In a number of US states, most of Australia, parts of Spain, Chile and even some irrigation projects in India, various types of water markets are being explored. The way that water is traded ranges from contracts to buy or sell water in the event of a drought, through short term rental of water licenses or trades of specific volumes within a season, to permanent transfers of water rights. In all cases, water markets have enabled farmers needing more water to acquire it from those who can manage with less. Often, these transfers were not taking place before the introduction of water markets. However, in a number of cases, farmers were able to arrange water transfers among themselves that enabled those in need to acquire more, without a formal market for water trades.

The Okanagan seems to have reached a point where conflicts between farmers, non-farm water users and environmental interests are becoming more common. Different people are exploring various options to address these conflicts. The following statements seek your opinion about how to address these conflicts, in particular

whether there is any role for permanent or temporary water transfers between Okanagan farmers.

[S5Q1] For each of the following statements, please indicate whether you (1) Strongly agree, (2) Agree, (3) Somewhat agree, (4) Are neutral, (5) Somewhat disagree, (6) Disagree, or (7) Strongly disagree.

	Strong 1	Agree 2	Some 3	Neutral 4	Some 5	Disag 6	Strong 7
There is plenty of water in the Okanagan to meet the needs of all users.	○	○	○	○	○	○	○
Climate change is going to cause more water problems in the Okanagan.	○	○	○	○	○	○	○
The growth of cities and towns in the Okanagan is the biggest threat to the supply of water in the Okanagan.	○	○	○	○	○	○	○
Household needs (drinking, bathing, etc.) are more important than supplying water for irrigation.	○	○	○	○	○	○	○
Water that is saved by increasing irrigation efficiency must be retained for agricultural uses.	○	○	○	○	○	○	○
When water is needed for the environment, it must come first from savings outside of agriculture.	○	○	○	○	○	○	○

If farmers are required to reduce their water use for the environment, they should be compensated for the impact on their business.	○	○	○	○	○	○	○
New residents of the Okanagan waste the most water.	○	○	○	○	○	○	○
Groundwater pumping is threatening those who rely on surface sources.	○	○	○	○	○	○	○
The amount of groundwater pumping needs to be regulated.	○	○	○	○	○	○	○
Water is so essential that it would be wrong to sell it.	○	○	○	○	○	○	○
People who waste water should pay more for it.	○	○	○	○	○	○	○
If I agree to use less water during one season, my future entitlements would be less secure.	○	○	○	○	○	○	○
The option to trade water would encourage more water conservation, and thereby benefit the environment.	○	○	○	○	○	○	○
The option to trade water would provide me with more options when there is a shortage.	○	○	○	○	○	○	○

Knowing that water I save would help another farmer who needed it would be an important reason for me to conserve water.	○	○	○	○	○	○	○
I would consider trading water only with other farmers that I knew well.	○	○	○	○	○	○	○
It will be very difficult to come up with a water trading mechanism that farmers will have faith in.	○	○	○	○	○	○	○
People who agree to buy or sell water are likely to back out of the deal later.	○	○	○	○	○	○	○
The option to trade water will lead to a higher price for water.	○	○	○	○	○	○	○
Water trading will become a tool for developers to secure their water needs, at the expense of agriculture.	○	○	○	○	○	○	○
Managing the water resource is best done by the water users themselves.	○	○	○	○	○	○	○
Protecting water for the environment is more important than supplying for human needs.	○	○	○	○	○	○	○

[S5Q2] If you receive water from a purveyor or other water supply company, please indicate whether you (1) Strongly agree, (2) Agree, (3) Somewhat agree, (4) Are neutral, (5) Somewhat disagree, (6) Disagree, or (7) Strongly disagree.

	Strong 1	Agree 2	Some 3	Neutral 4	Some 5	Disag 6	Strong 7
Non-agricultural water users have too much influence on water use in this system.	○	○	○	○	○	○	○
This water system is well run.	○	○	○	○	○	○	○
There are ways that I would like to use water which are not permitted in this system.	○	○	○	○	○	○	○
Many farmers are violating the rules of this water system.	○	○	○	○	○	○	○

[S5Q3] If you own any water licenses or similar entitlements, please indicate whether you (1) Strongly agree, (2) Agree, (3) Somewhat agree, (4) Are neutral, (5) Somewhat disagree, (6) Disagree, or (7) Strongly disagree.

	Strong 1	Agree 2	Some 3	Neutral 4	Some 5	Disag 6	Strong 7
I don't know how much of my entitlement I am using.	○	○	○	○	○	○	○
I worry that the government is going to reduce my entitlement.	○	○	○	○	○	○	○

Government rules around water rights are too complicated.	○	○	○	○	○	○	○
Government monitoring of water use is too weak.	○	○	○	○	○	○	○
Water rights owners should not be able to trade water separate from land.	○	○	○	○	○	○	○
There is not enough water in this system to fulfill all the licenses that have been allocated.	○	○	○	○	○	○	○

6. Demographic Information

[S6Q1] Gender. ○ Male / ○ Female

[S6Q2] In what year were you born? [ ]

[S6Q3] Where were you born?

Country: [ ], State or Province: [ ], Nearest town: [ ]

If you were not born in Canada, when did you move to Canada? [ ]

[S6Q4] How many people are there in your household? [ ]

Number 16 years of age or older: [ ], Number 6 years old or younger: [ ]

[S6Q5] Is there a family member you expect will continue in this business? ○ Yes / ○ No

[S6Q6] What is the highest level of formal education have you attained?

○ Did not complete high school. ○ Graduated high school.

○ Some college or university. ○ College diploma.

○ University degree. ○ University education beyond first degree.

[S6Q7] Do you have a computer. ○ Yes / ○ No
For which of the following activities is a computer used.

☐ Browsing the internet.	☐ Email.
☐ Crop price and other market information.	☐ Weather and growing condition information.
☐ Equipment (irrigation, feeding) management.	☐ Accounting and financial management.
☐ Other:	

[S6Q8] How many years have you been farming (in the Okanagan or elsewhere)?

[S6Q9] How many years have you been farming in the Okanagan?
If you have not only farmed in the Okanagan, where were you farming before coming to the Okanagan

Country: _____, State or Province: _____, Nearest town: _____

Interviewer: *The following, and final, question concerns household income. Be sure to remind the interviewee that we are committed to protecting their confidentiality. Do not offer them the option of declining to answer.*

[S6Q10] The next question asks for your household income level. Household income is an important factor in determining the choices that people can make. Your answer to the following question is therefore an important element in our research. We understand that you may wish to keep your income private. We are committed to protecting your confidentiality. The results of this research will not enable anyone to figure out what your household income is.

Please choose which of the following categories best describes your annual household income before taxes in an average year.

- ○ less than $50,000 per year,
- ○ $50,000 to $100,000,
- ○ $100,000 to $150,000,
- ○ $150,000 to $250,000,
- ○ $250,000 to $500,000,
- ○ more than $500,000
- ○ refused to answer

Interviewer*: If the interviewee chooses not to answer the income questions, you must then ask if it is OK for us to use the other information provided. If not, then the survey must be destroyed after the interview session is over.*

7. Notes and Comments

[S7Q1] Record additional notes and comments here:

Appendix C – Focus Group Schedule

Focus Group Agenda

Question 1: Do you have any initial reactions to the results that have been presented that you would like to share?

Question 2: Within the context of the Okanagan valley, what does sustainability mean to you? Where should the focus be for conserving and from which sectors should change emerge if this is necessary?

Question 3: What do you think are the most serious concerns facing Okanagan water supplies?

Question 4: Do you think that the way that water is be managed in the valley promotes sustainability?

Appendix D – Additional Questions for Second Set of Interviews with Ranchers

Family History

Where were your father and mother born? Where did they grow up? Where do they live now?

How did your father and mother make their livings?

How did your father's and mother's parents make their livings? Where?

How did your spouse's parents and grandparents make their livings? Where?

Do you have any brothers and sisters? Do any of them live in the Okanagan?

Do any of your brothers or sisters make their livings in ranching or agriculture?

Do any other family relatives (e.g. cousins) make their livings in ranching or agriculture?

Educational history

What high school did you attend? Did you complete high school?

Have you taken any other training or professional development programs or courses?

Work history

Have you made your living in another trade or profession other than ranching? If so for how long? Where?

When did you first begin to make your living as a rancher?

Please outline any important changes that have occurred to your pattern of land use during your lifetime in ranching.

How do you market your livestock?

How many employees do you hire at different times of the year?

Water Use

Have you ever obtained your water from another source?

How much do you pay for your irrigation water? How has the cost of water varied since you first began to make your living as a rancher?

During dry years do you sometimes have too little water for your needs? How do you cope with these shortages?

Have you ever had water restrictions imposed on you by your water provider (either voluntary or mandatory)? Do you feel that these restrictions were fair in relation to the restrictions applied to other types of use (domestic, industrial, orchard, etc.)?

Are you aware of any irrigation systems that make more efficient use of water than those you are currently using?

Are you aware of the relative cost of purchasing, installing and running any of these alternate systems?

Under what conditions would you consider converting your irrigation system to one that is more efficient?

Are you satisfied, overall, with the way in which water is managed in your community and the Okanagan Valley in general? If not, what are your main concerns?

What recommendations would you make to water managers (government, irrigation districts, etc.) for changes to current management practices?

Physical Environment

Has the physical environment in the areas where you ranch changed significantly during your lifetime?

If so, please describe these changes and their causes as you understand them.

Are you aware of any significant changes to riparian environments specifically (e.g. the areas immediately beside local creeks, rivers, springs or other bodies of water)?

What was the cause of these changes?

Are these changes a matter of concern to you?

If so, what do you feel should be done to manage or limit these forms of change?

Community

How has the community in which you live changed during your lifetime (e.g. population, economy, roads/highways and other infrastructural changes, community values)?

How do you feel about the changes that have occurred?

If you had your life to live over, would you make the same choice of how to make a living?

Will you encourage your children to make their livings this way? Why or why not?

Do you believe the ranching industry will survive in the Okanagan?