Food Security in the Kullu District, India: Perspectives, Policies and Learning in the Transition to Commercial Agriculture

by

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ABSTRACT

The transition from subsistence agriculture to crop commercialization can raise concerns about food security at the local level. Contributing factors and impacts of this transition and resulting local perspectives on food security issues are examined in the Manali area, Kullu District, Himachal Pradesh, India. The overall purpose of this research was to explore how the transition from a subsistence land-use system of agriculture to commercial cropping has impacted local perspectives of food security. The results indicate that although people feel food secure within the commercial cropping system, new areas of vulnerability to food insecurity has arisen. Climate change, market fluctuations, disease and an increasing reliance on chemicals are among the present challenges and concerns for farmers today. Also, although dietary preferences have changed, traditional crops still have value and importance within the new type of system, providing a sense of security in socio-cultural and religious ways.

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CHAPTER 1: INTRODUCTION

1.1 Background

Food security continues to be a vital issue globally. The concept has been defined and measured in a number of ways for decades. Since the World Food Conference in 1974, food security analyses have shifted from global and national levels to household and individual levels (Maxwell, 1996). One of the most common definitions stated by the World Bank (1986) refers to food security as 'access by all people at all times to enough food for an active, healthy life'. The FAO (2010) broadened this definition, stating that food security exists 'when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. In addition to the supply of adequate quantities of food, the focus has shifted to the creation of 'nutritional sovereignty' in which people are capable of feeding themselves self-reliantly with healthy and culturally acceptable foodstuff (Sagar *et al.,* 2004).

In terms of food, India has been described as one of the most diverse societies in the world (Nandy, 2004). Most discourses on food in India have traditionally centered on social and religious rituals (Nandy, 2004). Specifically, Hindu beliefs and culture have had an influential role in Indian cuisine (Dias, 1996), with the most notable example of this being the dominance of vegetarianism in the country. Today, Indian food is renowned in many parts of the world and foods like *dosa, samosa,* or *hydrabadi biryani* have become global (Ghosh, 2011). In India, cereals continue to be the staple food, providing over half the calories consumed, while pulses are the main protein supplement in the diet (European Commission, 2007). Rising incomes and the influence of

globalization have contributed to changes in the diet, with a slight decrease in cereal consumption and an increase in pulses, fruits and vegetables, milk, meat and edible oils (European Commission, 2007; Pandey *et al.*, 2013).

In ancient and medieval times, the subcontinent had depended on forest and common-land resources for their daily survival (Satya, 2007). Further, it has been noted that Indian societies were traditionally dependent on a close interaction between pastoral nomads, agriculturalists and forest dwellers. People fell back on common-land resources in times of famine, drought and natural calamities (Satya, 2007).

However, India also has had a long history of famine. As a result of widespread hunger between 1870 and 1920, the life expectancy in the country fell by 20 percent. During that period, the overall population declined by 10 percent and the net cropped area decreased by 12 percent (Satya, 2007). Some have argued that the famines at the national scale during the 19th century were not only caused by natural calamities but by artificial price inflations driven by colonial policies and the export trade to the world market (Satya, 2007). The last and largest famine before independence was the Bengal famine in 1943, where it is estimated that two to three million people died (Sen, 1999).

Since independence and the introduction of a multiparty democratic system, there have been no large-scale famines, even though there have been crop failures and major losses in purchasing power (Sen, 1999). Improvements in the nutritional status of the population have been attributed to a rapid growth in food grain productivity, dietary improvements and better access to healthcare (Banik, 2011). Amarty Sen (1999) argues that understanding the causation of hunger and starvation calls for an analysis of the entire

economic situation, not just an account of food output and supply. He further argues that a free press and the practice of democracy in the region have contributed greatly to bringing out information that has an enormous impact on policies for famine prevention (Sen, 1999).

Massive famines during the colonial period led to the complex system of food policies in the country that we see today. The most notable food policy - the public distribution system (PDS) - had its origin in the "rationing" introduced by the British during World War II (FAO, 1994). More specifically, the British implemented a system-sale of a fixed quantity of ration (rice or wheat) to entitled families (ration card holders) in specified cities and towns (FAO, 1994). Upon abolishing the rationing system after the war, India was forced to reintroduce it in 1950 as a result of inflationary pressures in the economy immediately after independence (Bhatia, 1985). In 1965, the creation of the Food Corporation in India and Agricultural Prices Commission consolidated the public distribution system in order to provide food grains and other essential items to vulnerable households throughout the country (FAO, 1994). Furthermore, the evolution of food policies such as the PDS has played an important role in attaining household food security and reducing the threat of famine in India today.

Through large subsidization programs, India has achieved food security in terms of reaching near self-sufficiency in food in most areas of the country. Yet there are still a number of challenges, including population growth, price increases, poverty, under nutrition and low productivity (Wadkar, 2006). Additional factors are an increasing demand for food in emerging economies, changing food habits, bio-fuel production and encroachment on productive agricultural land by rapid urbanization and industrialization

(Tiwari & Joshi, 2012). Subsequently, agricultural production is facing serious challenges from the depletion of natural resources with the loss of ecosystem services, and the potential impact of climate change (Tiwari & Joshi, 2012).

1.2 Purpose and Objectives

The purpose of this research is to explore an area that has recently transitioned from a subsistence land-use system of agriculture to commercial cropping, and to understand how this transition has impacted local perspectives of food security. Specific objectives are:

1) To explore local perspectives of food security;

2) To determine how government extension efforts, policies and research have impacted agricultural practice;

3) To examine learning outcomes related to agricultural knowledge and practice;

4) To make policy recommendations related to food security.

1.3 Research Design

The research is community-based and follows a qualitative, constructivist approach, including a review of pertinent research literature and fieldwork. A case study strategy of inquiry that included semi-structured interviews and participant observation (Creswell, 2009) was used. In terms of selecting a case study region, various parts of India are known for the food stuffs they produce, the sorts of food they eat and their food security situation. The chosen case study is the Manali area of the Kullu District, an area of apple

production where change in the agricultural system has taken place. The research was undertaken in the Kullu Valley in Himachal Pradesh (HP), as outlined in Chapter 3.

In relation to data collection, participant observation and semi-structured interviews were used. Participant observation was ongoing throughout the field season to obtain insights into local food habits, farming techniques and what people are currently growing and purchasing. For the interviewing process, purposeful sampling (Berg, 2004) was used to select participants. The interview schedule covered a variety of issues related to indicators of food security such as food access, availability and social acceptability.

By using qualitative data collection methods, I was able to identify location-specific indicators that are unique to this study area. More specifically, by examining the types of food grown that are unique to this region, cultural feeding practices and local seasonal patterns in crop type, I was able to gain a better understanding of local conditions for food security. The methods are detailed in Chapter 3.

1.4 Significance of the Study

Food security can be viewed as a complex and multi-dimensional phenomenon, with a focus on adequate nutrition but also including social purposes and cultural meanings (Gartaula *et al*. 2012). It has been argued that food security is too complex to ever be truly captured by a single indicator (Maxwell *et al*., 1999). As a result, measuring household food security in a reliable way remains a major challenge and the search for good, cost-effective alternative indicators is important (Maxwell *et al*., 1999).

Examining local perspectives of food security can lead to a better understanding of how people value and perceive food security (Gartaula *et al.* 2012). This indicator may be

used to reveal how a transitioning food system has changed people's knowledge of food, the positive and negative perspectives on commercial agriculture, and the perceived vulnerability and risk associated with this new type of food system. The findings can then be used in combination with indicators measuring food security to help better understand a multi-dimensional phenomenon and to direct food policy locally, at the state level and nationally.

1.5 Organization of Thesis

This thesis is organized into six chapters. Following the introduction, Chapter 2 presents the pertinent research literature related to various topics, including food security in the context of mountain environments, the use of local perspectives as a qualitative measure, food policies, and learning outcomes associated with food security. Chapter 3 outlines the research design and methods, including the case study strategy, data collection procedures and process of data analysis. Chapter 4 provides a detailed description of the study area, along with a brief history of food system changes in Himachal Pradesh. Chapter 5 presents the detailed findings regarding the use of local perspectives as an indicator for measuring food security, the impact of food policies, and the learning outcomes related to food security. Chapter 6 includes a summary of the research findings, conclusions and recommendations.

CHAPTER 2: FOOD SECURITY, FOOD SOVEREIGNTY, POLICY AND LEARNING

2.1 Food Security as a Concept

The concern over food security has been evident for centuries. In *An Essay on the Principle of Population* (1798), Thomas Malthus predicted that an increase of population is limited by the means of subsistence and that population growth would eventually supersede global food production (Winch, 1987). Similarly, the Club of Rome's report, *The Limits to Growth* (1972), examined variables such as world population, industrialization, food production and resource depletion and predicted economic and societal collapse by the end of the 20th century by (Turner, 2008). Still, agricultural production worldwide has grown more rapidly than global population growth, and there is presently more than enough food, at least in terms of macronutrients, available to feed the world population (Simon, 2012). However, it is important to note that the number of people suffering food insecurity is reportedly increasing, as is the proportion of the overall population suffering from insufficient food (Simon, 2012).

One of the central focuses in the assessment of food security has been to eliminate current hunger and reduce the risks of future hunger. At the world food summit held in Rome in 1996, the food and agricultural organization of the United Nations (FAO) reported that more than 800 million people, predominantly in developing countries, did not have enough food to meet their basic nutritional needs (Blakeney, 2009). The Rome Declaration, issued by the 1996 Summit, pledged to cut the number of hungry people in half by 2015. This goal was also included in the Millennium Declaration of the United Nations in 2000 (Blakeney, 2009). Yet in countries such as India, chronic hunger and malnutrition remain a major concern. Recent evidence reveals that India continues to

struggle to reduce nutritional inadequacy despite rapid economic growth, and more than 230 million people continue to go to bed hungry every night (Banik, 2011).

Amarartya Sen (1999) has stated that hunger relates not only to food production and agricultural expansion, but also to the functioning of the entire economy, including the operation of social arrangements that can influence people's ability to acquire food. Chronic hunger is a consequence of diets persistently inadequate in terms of quantity and/or quality (Sen, nd). For example, some individuals have chronic hunger due to their very low income and which leads to an inability to buy food for survival (Sen, nd). Seasonal hunger, on the other hand, is related to cycles of food growing and harvesting. Annual "hunger seasons" can occur when the previous year's harvest stocks have dwindled, food prices are high or jobs in the region are scarce (Vaitla *et al*., 2009). It is important to note the distinction between having enough food and having enough access to food. Seasonal hunger, for instance, can occur as a result of not enough food from previous harvests. It can also be a result of an inability to buy food from the market.

An important distinction between food insufficiency and hunger is that an individual can feel food insecure but still be consuming sufficient energy and meeting micronutrient requirements (Hadley *et al.*, 2011). For instance, a household can be insecure if individuals are concerned about accessing food in the near future (Hadley *et al.*, 2011). It has also been noted that food insecurity can (but does not necessarily) lead to malnutrition, observed in regions such as the United States where a person can be obese and undernourished in terms of micronutrients at the same time (Campell, 1991; Hadley *et al*., 2011). Hunger is therefore a potential - though not always a necessary - result of food insecurity.

The concept of food security encompasses different dimensions, including availability, access and utilization. The World Food Summit (WFS) (2009) defines availability as "the amount of food that is present in a country or area through all forms of domestic production, imports, and food stock and food aid". Food access can be referred to as "a household's ability to acquire adequate amounts of food regularly though a combination of purchases, barter, food assistance or gifts" (WFP, 2009). More importantly, it has increasingly been recognized that food commodities can be available but not affordable by people living in a community (Simon, 2012). OXFAM (2007) indicates, "Even in rural areas most people, especially the poor, rely on market systems to provide food and essential goods and services, but also for selling their produce". Lastly, food utilization can be defined as "safe and nutritious food, which meets dietary needs" (WFP, 2009). This dimension can be more broadly related to clean water, sanitation, health care, and the use, conservation and processing of food commodities (Simon, 2012).

Food Security can also be examined in a number of ways at national, household, community and individual levels. At the community level, various local organizations and NGOs in Europe, Canada and the United states have now begun to focus on building food security within their own communities. Community food security has been defined as "a condition in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice" (Hamm & Bellows, 2003). It has also been argued that an approach to increase community food security requires an understanding of how communities interact with resources in their social and physical environments over extended periods of time (McCullum *et al.*, 2005). Specific attention to food security at

the community level focuses on strategies that address broad systemic issues that can affect food availability in markets, accessibility, affordability, and the quality of food present in markets (McCullum *et al.*, 2005; Campell, 1991).

The FAO (2010) describes household food security as the application of this concept to the family level, with individuals within households as the focus of the concern. Bentley and Pelto (1991) argue that the household is a logistical social unit through which to view the question of access to food, and demands knowledge about household needs and consumption as well as an understanding of intra-household dynamics affecting procurement and distribution of food. Similarly, Pinstrup-Andersen (2009) notes that household food preferences may not prioritize food acquisition over the acquisition of other goods and services such as school fees and housing. Furthermore, key characteristics in the definitions of household food security include food access, sufficiency, security, time and perceptions (Maxwell and Smith, 1992).

Many variables can affect food security at the household and individual level. Factors affecting food insecurity can include demographic variables such as household size/composition, migration, ethnicity, region, and/or age and gender of the individual (Haddad *et al.*, 1994). As well, fluctuations in crop production, food supply and food prices, on-and off-farm employment, and patterns in morbidity are all examples of variables that have been used as proxy measures for food security (Balatibat, 2004). Haddad *et al.* (1994) note a variety of indirect variables that can be used to predict food insecurity at the household level, including land ownership, access to credit, and sale of assets including livestock.

2.2 Perspectives as an Indicator of Food Security

Maxwell (1996) observes that a country and its people are food secure "when their food system operates in such a way as to *remove the fear that there will not be enough to eat.* In particular, food security will be achieved when the poor and vulnerable have secure access to the *food they want.*" Food security has been described as a complex and multi-dimensional phenomenon, and it has become evident that a collection of indicators is necessary to capture the multifaceted nature of the concern (Migotto *et al*., 2006). This concept has evolved over decades, and three important overlapping shifts have occurred: (1) from global to national level to household and individual level; (2) from food first perspective to a livelihood perspective; and (3) from quantitative indicators to subjective perception (Balatibat, 2004).

Although the assessment of food security has traditionally relied on standardized quantitative measures, some have argued that this type of measure does not necessarily correspond with people's perspectives of food needs. Specifically, measuring this concern requires an approach beyond a quantitative assessment, and that variation across households and communities can be dependent on time, place and social group (Balatibat, 2004). Wolfe & Frongillo (2000) assert that the experience of food security can be measured directly in a comprehensive manner by assessing aspects such as food availability and access, and understanding how a person feels about it (e.g., anxiety, worry) and thinks about it (e.g., perceptions, social acceptability). Perspectives of whether food is insufficient, inadequate, unacceptable, uncertain or unsustainable can be a useful form of measuring food security (Wolfe & Frongillo, 2000).

One way of revealing perspectives of food security is through gaining an understanding of perspectives of risk and risk management. Patrick and Musser (1997) analyzed sources of and responses to risk among large-scale US corn-belt farmers and found that costs and human aspects were important sources of risk. Specifically, liability insurance, financial and credit reserves, and debt management were high sources of concern (Patrick & Musser, 1997). In New Zealand, Martin (1996) found that price and weather were ranked as the most important sources of risk among cash crop farmers and horticulturalists. Similarly, crop price variability, crop yield variability, as well as changes in government support payments were among the top-rated sources of risk in a cash-crop system in Norway (Koesling *et al.* 2004).

Another important consideration is the perception of agriculture as one's livelihood. In the Kolli Hills, India, Finnis (2006) observed that the cultivation of tapioca (cassava) as a cash crop is a conscious decision made by small farmers based on their perspectives of environmental insecurity. It was found that tapioca is not only used as a response to environmental changes, but that it also reflects household and community aspirations to become more "cultured", "civilized", and "developed" (Finnis, 2006). More importantly, such terms can encompass social perspectives of tribal people being essentially less cultured and more primitive in their social organization and farming methods (Finnis, 2006). In Nepal, Gartaula *et al.* (2012) point out that socioeconomic status can influence people's perception of agriculture and food security. In general, older people believe in having agricultural land for food security, while younger people believe in accessing financial capital through other sources in order to acquire food (Gartaula *et al.,* 2012). Changes in the perception of agriculture were principally caused by voluntary out-

migration for employment, urbanization, and the reluctance of the younger generation of people to farm (Gartaula *et al.*, 2012). These examples provide context surrounding the multiple perspectives of farmers who are heavily dependent on commercial agriculture.

2.3 Food Security in Mountainous Regions

Mountains occupy 24 percent of the Earth's land surface and are home to a large number of people (Price & Messerli, 2002). It is estimated that more than 700 million people, or 12 percent of the total world population, live in mountain areas. Approximately 75 percent of them live in rural areas, predominately engaging in subsistence agriculture (Akramov *et al.,* 2010). People living in mountain regions face many unique challenges. Food shortages and chronic malnutrition can result from social, economic, and political marginalization (Djoghlaf, 2008). Additionally, remoteness, isolation, and limited access to infrastructure such as roads can limit food security and economic development (Huddleston *et al.,* 2003). In many cases, food systems in these regions have transitioned from producing food for self-sufficiency toward cash crops and other land uses (Djoghlaf, 2008). Food security also can be affected on different levels when mountain communities rely on purchasing more costly food as a result of increasing costs of food transportation (Djoghlaf, 2008).

Recognizing some of these concerns, the United Nations General Assembly proclaimed December 11th as "International Mountain Day" (IMD) in 2003, and mandated the Food and Agriculture Organization (FAO) to lead the observance of the Day. The FAO (2012) states that the 'focus on mountains is an integral part of FAO's responsibility as the UN specialized agency is devoted to raising levels of nutrition, improving agriculture productivity and alleviating poverty and hunger around the world'.

Although mountains present unique challenges for conventional development, the Himachal Pradesh experience in moving from a subsistence agricultural system to a commercial crop system has been viewed as a model to be replicated elsewhere (Vedwan, 2001). In a region dominated by subsistence agriculture, low literacy levels and poor infrastructure, the state has accomplished many improvements in these aspects. Literacy levels in this region are now better than in most parts of India, there is relatively well-developed infrastructure in comparison to other parts of Himalaya, and the state has achieved almost complete rural electrification (Vedwan, 2001). Additionally, people of the area now have better access to health care, housing and communication facilities (Partap, 1999).

Although Himachal Pradesh has experienced many forms of progress since adopting commercial horticulture, concerns surrounding food security still exist. For instance, Partap (1999) notes that cropland scarcity is a concern that can have serious implications for food security and people's livelihoods in Himachal Pradesh. General trends in mountain agriculture include increased farming on marginal lands and soil erosion, declining farmland fertility, inadequate food production, and a shrinkage in the size of land holdings (Partap, 1999). It has also been noted that there are signs across the region that the overall productivity of many mountain crops is going down, with possibly the worst affected crops being cash crops such as apples and off-season vegetables (FAO, 2007). Thus, concerns about food insecurity remain and calls for a further investigation of the vulnerability of mountain communities with respect to food security exist (Huddleston *et al*., 2003)

2.4 Food Policy in India

As previously mentioned, India has had a long history of famine. Massive famines during the colonial period led to the complex system of food policies in the country that we see today. Since India became Independent, achieving national food security has been a major development policy goal (Singh *et al.*, 2006). Despite a decline in poverty from 51.3 percent in 1977-78 to 26.1 percent in 1999-2000, the issue of food insecurity is still prominent, as a large proportion of the population lives below the poverty line (Singh *et al.*, 2006). To address these challenges, the country implemented a National Food Security Bill in 2013 that aims to guarantee extremely cheap grains to the poorest families in India. The Food Bill states that every person belonging to a "priority household" will be provided with 7 kg of cheap food grains per month, while rice, wheat and coarse cereals will be available to the most vulnerable household at 6 cents per kg (NAC, 2011). It also states that "free or affordable" meals will be made available for destitute, homeless and disaster-affected people, as well as those "living in starvation" (NAC, 2011).

Although food security is being addressed through policy at the national level, the new Food Bill has been heavily criticized for concerns about how effective it will be in addressing issues of food security. One key issue related to food production is the problem of the number of farmers switching from growing food grains with low profit margins to growing cash crops, or leaving agriculture entirely for more secure money in other jobs (BBC, 2012). Specifically, the new Bill has not clearly described how the country plans to invest in agriculture or provide more incentives for growing food grains.

Another key issue is the question of 'last mile delivery', how to get the food out to close to a billion people spread throughout the country, including remote locations and urban centers (Sabha, 2012). In addition, the bill's focus on rice and wheat goes against a trend for many Indians, who are now diversifying their diet to protein-rich food such as dairy, eggs and poultry, as well as fruits and vegetables (Times of India, 2011). Lastly, it has been argued that the "local institution of self-government" should be responsible for delivering or failing to deliver on food security in terms of the Public Distribution System, rather than "local authorities" (Sabha, 2012).

2.5 Cash Cropping Systems and Rural Markets

Food crops differ from cash crops in that the producers themselves mostly consume food crops while cash crops are sold to a market. Literature on crop commercialization and market integration of small farmers in developing countries highlights disadvantages to cash cropping. These include a loss of indigenous knowledge and nutritional changes (Dewey 1981; Kedia 2004; Mehta 1996; Moore and Vaughn 1987). Others have noted the complex experiences of small-farmer households engaging in economic and agricultural development (Desmarais 2002; Netting et al. 1989; Govereh and Jayne, 2003; Shack et al. 1990).

An important consideration is that crop commercialization can be the result of conscious decisions based on individual and household aspirations (Finnis, 2006). For example, while exploring the synergies between cash cropping and food productivity in Zimbabwe, Govereh and Jayne (2003) note the potential for cash crop schemes to make available inputs on credit, management training and other resources that contribute to food crop productivity. In Oormudikadu, India, tapioca has been adopted as both a response to

environmental change and as a calculated economic strategy brought on by new transportation infrastructure (Finnis, 2006).

Crop commercialization can also be closely linked with the functioning and location of food markets. Due to the high cost of transportation and low agricultural productivity, rural food markets can be thin and isolated (Fafchamps, 1992). As a result, farmers are confronted with food prices that are volatile and highly correlated with their own agricultural output (Fafchamps, 1992). Conversely, as agricultural productivity increases and transportation costs fall, it has been shown that rural food markets become more integrated and depend less on what happens locally, thereby decreasing the rationale for food self-sufficiency (Fafchamps, 1992).

Another important consideration is people's desire to have greater market access. Henrich (1997) studied indigenous peoples in the Amazon, who were increasingly gaining access to land and environmental resources. He found that they actively engaged in the market by making economic decisions intended to expand commercial participation. Henrich's researched Machiguega Indians of the Amazon region who showed a desire to buy things from the market, such as cooking oil, antibiotics and blue jeans. These increased desires brought about an expansion and intensification of crop commodity production while seeking ways to gain greater market access (Henrich, 1997). Furthermore, researchers have noted that it is important to consider local-level agricultural decision-making processes in the context of market integration, while recognizing that crop commercialization can have heterogeneous impacts on people's livelihoods. These examples provide context surrounding the factors that may influence a participant's decision to engage in a commercial agricultural system in the study region.

2.6 Transitioning Agroecosystems in the Himalayan Environment

Traditional agroecosystems in the Himalaya are complex, in that crop husbandry, animal husbandry and forests constitute interlinked production systems (Maikhuri *et al.*, 2001). Inaccessibility, environmental heterogeneity and ecological fragility favoured the evolution of subsistence production systems sustained with organic matter and nutrients derived from the forests (Maikhuri *et al.*, 2001). Traditional livelihood systems in this region have been displaced by high returns/high risk systems, creating a dependency on exogenous forces such as the markets and the state (Vedwan, 2008). In recent history, the agricultural system in Kullu District has undergone similar change in transitioning away from a traditional subsistence system towards a commercial cropping system.

Trends in transitioning agroecosystems, such as declining crop yields, expansion of agriculture on marginal land (Eckholm, 1975; Toky and Ramakrishnan, 1983), loss of crop genetic diversity (Maikhuri, 1993; Maikhuri *et al*., 1991, 1996, 1997; Singh, 1997), soil erosion, and hydrological imbalances (Valdiya and Bartarya, 1991), have impacted regions in the Himalayan environment. In a study conducted on 150 villages in the Alaknanda catchment of the Central Himalaya it was revealed that native land species have been displaced by state-driven 'green revolution' measures such as the supply of high yielding varieties (HYVs), inorganic fertilizers, pesticides and irrigation at highly subsidized prices (Maikhuri *et al.*, 2001). The villages of Tung gram panchayat in the Great Himalayan National Park in Himachal Pradesh has similarly been exposed to a market-dependent food chain, a modern system of agriculture (increasingly monoculture), and the promotion of HYVs by the extension work of Himachal Pradesh Agriculture University and the Himachal Pradesh Department of Agriculture (Grassroots

Institute, 2012). A study conducted on introduced cash crops in Lahaul in Himachal Pradesh revealed that introduced crops required high monetary inputs such as inorganic fertilizers, and that a farmer's choice in growing a particular type of crop depended on the cash they earned (Kuniyal *et al.*, 2004).

A loss of agrobiodiversity not only reflects the loss of traditional practices but also a diminishment of the abundance of biodiversity within the natural environment. Biological diversity is a key factor in food security by not only providing native food varieties, but also performing nutrient cycling, regulating the microclimate, and detoxifying noxious chemicals (Brookfield *et al.*, 2002). Overall, the trend towards agricultural systems that favour monocultural cropping systems, the production of HYV's and chemical inputs has been evident in many communities in the Himalayan environment.

2.7 Dietary Diversity and Crop Commercialization

Indigenous plant species, often labeled as underutilized, minor, orphan or neglected crops, have traditionally formed a complex part of the culture and diets of the people who grow them (Padulosi *et al.*, 2002). In a study measuring the resource use efficiency of traditional crops in Lahaul, it was found that the energy output/input ratio of traditional crops was significantly higher than non-traditional crops in every village ecosystem (Kuniyal *et al.*, 2004). Besides being richer in caloric value, traditional crops required less energy input, and traditional crops were 1.1 times richer in energy in comparison to cash crops (Kuniyal *et al.*, 2004). Although there are significant benefits to growing traditional crops, many of these crops are visibly uncommon in commercial markets due to factors such as limited post-harvest shelf life, dietary intake issues, poor taste or unpleasant texture (Mayes *et al*., 2011). Many crops also suffer from poorly developed

markets and a lack of value-added production, which may limit their value for providing the poor with buying power to obtain their staple crops (Mayes *et al.*, 2012).

Dietary transitions refer to changes in the types of foods that households and communities are able to access and consume (Finnis, 2006). This is often the result of dietary delocalization, a process that removes food production from small farmer control by encouraging farmers to produce cash crops for markets (Pelto and Pelto, 1983). This type of transition may be accompanied by local dissatisfaction with local food taste and variety (Finnis, 2006).

In the Kolli Hills, India, Bohle (1992) found that market integration through crop commercialization has led to a dependence on purchased foodstuffs. Farmers in this area have been growing cassava as a cash crop. They subsequently moved away from growing millet varieties and now favour rice purchased at ration shops or local markets (Bohle 1992). Finnis (2006) points out that cash cropping does not necessarily mean that diets must change, providing that there are opportunities and means to purchase diverse foodstuff. Similarly, Little and Horowitz (1987) indicate that cash and food crops can be considered in terms of their interaction with each other, rather than viewing crop commercialization and food cultivation as a dichotomy.

It has been argued that underutilized crops can play an essential role in the process of increasing food security through decreasing yield gaps, increasing efficiency of resource use, changing diets and reducing waste, specifically in terms of the resilience of food production systems (Foley *et al*., 2011). Additionally, it has been noted that a shift away from an over-dependency on a limited number of crop species is crucial if climate change

and other pressures on food production, such as pests and disease, lead to long-term failures in crop production (Mayes *et al.*, 2012). Overall, dietary diversity, or the number of foods consumed over a given period, has a role in food security in that people are considered to be food secure if they have access to a variety of socially acceptable foods, not simply an adequate amount of food to feel full (Anderson 1990; FAO, 1996).

2.8 Food Sovereignty and Industrial Development

There is growing agreement that industrial food systems have presented a considerable number of challenges to communities around the world. Proponents of the 'Green Revolution' and other modernization schemes assume progress and achieving development in traditional agroecosystems as essentially requiring the replacement of local crop varieties for improved ones (Alteri *et al.*, 2012). To these proponents, the technological and economic integration of traditional farming systems into the global system is a positive step that enables increased production, income, and social well-being However, the transition towards modernized schemes has, in many cases, led to negative changes in agroecosystems, such as large-scale monoculture farming and a heavy reliance on fossil fuels that have all been linked to soil, water and air pollution, climate change and a loss of biodiversity (Levkoe, 2006). In addition, corporate-driven globalization and free trade policies surrounding food have had significant impacts on rural communities globally, resulting in farmer's organizations coming together around the concept of food sovereignty (Rossett, 2003).

Food sovereignty has been described as "the right of each nation to maintain and develop its own capacity to produce its basic food while respecting cultural and productive diversity. We have the right to produce our own food in our own territory. Food

sovereignty is a precondition to genuine food security" (Via Campesina, 1996 in Lee, 2007). The creation of this concept is often attributed to the international and peasant movement Via Campesina, an organization created in 1992 (Lee, 2007). It has been argued that food sovereignty differs from the food security concept in that it ignores how power relations determine favoured production, distribution and consumption patterns within the food system (Rudolph, 2012). Furthermore, Windfuhr and Jonsen (2005) assert "while food security is more of a technical concept, and the right to food a legal one, food sovereignty is essentially a political concept".

Although food security and food sovereignty concepts are represented as opposing paradigms of food production, Lee (2007) argues that there is nothing fixed or stable about either concept. Yet a fundamental difference between both relates to how to achieve goals for nutritional adequacy, culturally acceptable food and abundant food for all. Moreover, the concept of food security does not directly address the concern about where the food comes from or how it is produced (Rossett, 2003).

Closely linked to food sovereignty is the concept of industrial development. McMichael (2000) argues that throughout the developmentalist era, industrialization has transformed agriculture and degraded its natural and cultural base. Specifically, the concept of development has been associated with the rationality of industrialization, removing food from its direct link to local ecology and culture, using food as an input for urban diets and industrial processing plants (McMichael, 2000). As Vandana Shiva (1991) remarks: "The paradox and crisis of development arises from the mistaken identification of the growth of commodity production with providing better human sustenance for all".

However, there are now many counter movements to the industrial agricultural model evident throughout the world. The Center for Conservation of Traditional Farming Systems in Madhya Pradesh, India, for example, is engaging in sustainable agriculture by cultivating non-irrigated wheat varieties by traditional methods, modeling small farm and subsistence agriculture as the alternative to irrigated agriculture dependent on large dams (Nellithanam *et al.,* 1998). Although globalization processes have affected agriculture in parts of India, Muller and Patel (2004) argue that most Green Revolution technologies were not accessible to three quarters of Indian farmers until recently. Thus, trade liberalization has not benefited a majority of Indian farmers, because it is difficult for small farmers to be competitive on the world market (Muller and Patel, 2004).

2.9 Learning Theory and Food

Beyond subsistence, food can serve as an individual's social and cultural expression of self. It can also be an entry point into larger debates and discourse around a multitude of issues (Levkoe, 2006). As a result of views that globalized food systems are affecting environmental sustainability, a wide debate now exists around the relocalisation of food production and consumption (Fonte, 2008). Furthermore, the interest surrounding food has been increasing, as many people around the world now recognize how their choices influence the environment, themselves and their community. It has been argued that transformative learning can serve as a pathway for sustainability and help to build environmentally sustainable societies (Finger & Asun, 2001; McDonald, 1999; Mezirow, 1995).

Mezirow (1991) defines the major domains of learning as instrumental, communicative and emancipatory (or transformative) learning. Instrumental learning can be associated

with acquiring skills of knowledge to control the environment or other people; communicative learning is related to understanding what others mean when they communicate with you (e.g. feelings, values, or intentions); and transformative learning is associated with the processes of reflecting on individual and social dimensions (Mezirow, 2000). Mezirow (1991) illustrates, "while most adult learning is acquired through instrumental and communicative means, transformative learning requires a necessary element in processes of learning about and validating the environment, other people and ourselves."

Transformative learning (TL) centers on learning through a process of reflection that encourages change in an individual's understanding, perspectives and consciousness (Sims & Sinclair, 2007). A goal of transformative learning is to help individuals realize their potential for becoming more liberated, socially responsible autonomous learners, and to develop a better understanding of their experiences as a guide to action (Mezirow, 1995).

In the context of food, TL theory can serve as a framework for examining learning outcomes associated with food choice and alternative modes of production. For instance, ethical veganism has been used as a case study for transformative learning because changing one's diet required the learner to make an informed and reflective *decision* to act (McDonald *et al.*, 1999). This study revealed that transformative learning was a journey or process to adopt a new perspective on food and to interact with others as one learns how to apply the new perspective (McDonald *et al.*, 1999). In the Taita Hills of Kenya, TL theory was used to explore gendered learning outcomes and sustainable farming practices. The study found that participation in Farmers Field Schools was

important to learning outcomes associated with sustainable farming practices and contributed to participants becoming more willing to try new varieties, watch for pests and manage soil fertility on their farm (Najjar *et al.*, 2012).

Similarly, transformative learning outcomes have been explored among consumers of organic products in Atlantic Canada. When participants questioned and critically reflected on the conventional food system, transformative learning outcomes related to food were apparent in adult learners (Kerton & Sinclair, 2010). As well, when learning related to the food system spilled over into other aspects of sustainability, such as ethics or the environment, it was found that food could play a central role in learning that fosters sustainability (Kerton & Sinclair, 2010). By observing communities in the Kullu District, a participant's sense of personal and/or collection transformation can be explored in the context of sustainable food systems. Specifically, if participants are engaging in growing a diversity of crops, are consciously not relying on chemical inputs or are consuming more locally produced food outside of the market, they could be in the process of learning about and validating the environment, themselves or their community.

2.10 Chapter Summary

A transitioning food system from subsistence agriculture to crop commercialization brings up many concerns surrounding food security, food sovereignty and the impact of industrialization processes. Communities within the Himalayan environment have undergone recent changes in their agroecosystems by which HYV's, chemical inputs and predominately monoculture cropping systems have become common. As a result, changes to dietary diversity and the types of crops produced and consumed are important issues to consider. Understanding these changes in a mountainous region is important as

mountain specificities and rural food markets present unique challenges for food production. Although the new Food Security Bill in India aims to address these challenges, the process of approaching food security is complex. Understanding people's perspectives on food security has become an important and useful tool for measuring food security at the local level. Specifically, people's perspectives on whether food is insufficient, unacceptable, uncertain or unsustainable can reveal how people value and perceive food. Lastly, learning theory can help us to understand learning outcomes associated with food security and sustainable food systems.

CHAPTER 3:RESEARCH APPROACH AND METHODS

3.1 Introduction

I utilized a community based, constructivist approach for the study. A qualitative approach was the most appropriate for this research because it heavily emphasizes the importance of the participant's perspectives and experiences, and the meaning these hold in relation to a particular event or issue (Cresswell, 2009). A case study strategy of inquiry was used for the in-depth study of perspectives, policies and learning outcomes associated with food production in the Kullu District. Participant observation and semi-structured interviews were the data collection procedures used and the data was organized using Nvivo software to facilitate the analysis and reporting of the research findings, as outlined below.

3.2 Qualitative Research Approach

A qualitative research approach was selected for the study for many reasons. The key among these was that qualitative research is a process of holistically exploring and understanding the meaning of complex social and human problems (Cresswell, 2007). In addition, the approach fits well with my academic interests, since qualitative research usually takes place in a natural setting, allowing the researcher to conduct research on site and gain a deeper understanding of the people and the area where they live (Cresswell, 2005). It is important to note that previous NRI research in this region reveals that people have been found to be more willing to conduct research with researchers who work and spend time with participants in the field. Understanding people's food-buying experiences, choice in engaging in particular agricultural activities, or perceived worry or fear over food adequacy are important to any examination of food security. Furthermore,

qualitative research enabled me to understand people's experiences within an agricultural system that has transitioned from subsistence to crop commercialization, and how this affects their experience with food consumption and production.

3.3 Case Study Strategy

Cresswell (2007) defines case study research as a qualitative approach in which the researcher explores a bounded system (a case) or multiple cases over time. Furthermore, he indicates that a case study is a good approach when there is a clearly identifiable case with boundaries and when the researcher seeks to provide an in-depth understanding of the case. The case study is preferred for examining contemporary events where the relevant behaviours cannot be manipulated - in other words, when the research can rely on direct observation and systematic interviewing (Yin, 2003).

Similarly, case studies of communities can be viewed as a systematic gathering of enough information about a community to provide the researcher with understanding and awareness of what occurs in a community; why and how these things occur; and who among the among the community take part in these activities (Berg, 2004). By conducting case study research in this region, I will be able to explore how people view food and agricultural practices within a cash-cropping system, how it affects their livelihoods, and why they choose to engage in these activities.

3.4 Selecting a 'Case' for a Case Study:

The Kullu District, among other parts of the northwestern Himalaya, has been famous throughout India for apple production since colonial times. The new state of Himachal Pradesh embarked on a vigorous expansion of horticulture crops, particularly apple

cultivation, in the 1970s (Vedwan, 2001). Apples emerged as the most important crop in terms of total economic output, while subsistence agriculture slowly evolved into commercial horticulture (Vedwan, 2008) as has occurred in many other parts of India.

The Kullu District was chosen as a suitable case study region because it is an area that produces a significant amount of food, parts of it are relatively isolated and the subsistence food system has been replaced by a cash-cropping system. In addition, there has been a significant amount of NRI student research previously conducted in the region that provides baseline information and local contacts, among other benefits.

The fieldwork began with consideration of potential communities for the case study using the following guidelines:

- Sites where agriculture/horticulture is an important part of people's livelihoods
- Sites where there is a good level of willingness from local community members to participate
- Sites where apples or other cash crops constitute a major proportion of agricultural production
- Sites that are accessible
- Sites where there are food markets that facilitate the buying/selling of foodstuffs

Throughout the fieldwork, I visited a number of sites in the region that required extensive travel, including villages in Lahaul Valley. Due to the timing of fieldwork and road closures in the autumn related to weather conditions, it was decided to focus on three sites in the accessible area around Manali, outlined in Chapter 4.

3.5 Study Site

The Kullu District is located in the western Himalaya of India, in Himachal Pradesh (Fig. 1). The area covers 55, 673 km^2 (Shira, 2012) and lies between 31°21'N and 32°59'N and 76° 49' E and 78° 59' E (Vedwan, 2001). Himachal Pradesh covers 1.69 percent of India's total geographic area (FAO, 2007). The principal languages are Hindi and Pahari and the literacy rate is 84.78 percent (Shira, 2012). Similar to other mountain regions, this area is characterized by vertical zonation of the eco-climatic belts, with temperatures decreasing as elevations increase (Berkes *et al.*, 1998). The elevation ranges from 350 to 6500 m above sea level (Vedwan, 2001). The area has a snowy and cold winter and a moderately warm, wet monsoonal summer, with a mean maximum temperature of 25°C (Berkes *et al.*, 1998). Approximately half of the mean annual precipitation of 1,200 mm falls during the monsoon in July, August and September (Berkes *et al.*, 1998). The district of Kullu is situated in a wet temperate region that lies between 1801 and 2200 meters above sea level (Shira, 2012).

Figure 1: Kullu District is located in the western region of Himachal Pradesh state

The subsistence agricultural systems of the Himalaya produce a large variety of traditional crops, many of which are native to the area, that have been grown for a long period of time (Kuniyal *et al.* 2004). Farmers in Kullu have relied on long-established introduced crops such as maize, wheat, and rice (Vedwan & Rhoades, 2001). The Himalayan region is one of the 'centers of diversity' for amaranth, known as the 'most nutritious grain in the world' because it is high in protein, calcium and fiber (Navdanya, 2006). Traditionally, agriculture was heavily dependent on inputs from forests and

pastoralists to supply much-needed nutrients for maintaining the soils that were often shallow and poor (Vedwan, 2001).

In 2011-12, the total area under horticulture in Himachal Pradesh was 214,574 hectares, or 32% of the total cultivatable area (HP Dept. of Horticulture, 2013). In 2003-04, apples were cultivated on 84,112 hectares (Table 1). Today, there are 103,644 hectares of apples under cultivation. In 2011-12, 275,036 M.T. of apples were produced, while total food grain production during 2010-2011 was 1,579 thousand tonnes (Dept. of Horticulture, 2013). Horticulture, and specifically apple production, is important for the state's economy and is a primary source of livelihoods for thousands of farmers. Apples account for 90 percent of the fruit output with most of the production occurring in the temperate zone (1800-2200 m), encompassing the districts of Kullu and Shimla (FAO, 2007). Overall, apple production in Himachal Pradesh fluctuates widely. The production has declined since 2003-04, with the exception of 2010-11 when production was 892.11 M.T (Figure 2) (National Horticulture Board, 2013).

Table 1: Area under Different Fruits in Himachal Pradesh in Hectares (HP Dept. of Horticulture, 2013)

	Year							
Crop	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**
Apple	84,112	86,202	88,560	91,804	94,726	97,438	99,564	101,485
Plum	8,316	8,335	8,360	8,396	8,428	8,420	8,456	8,477
Peach	4,861	4,966	5,000	5,134	5,175	5,170	5,195	5,182
Apricot	2,897	2,947	3,034	3,178	3,230	3,392	3,444	3,483
Pear	7,519	7,564	7,596	7,662	7,561	7,405	7,382	7,370
Cherry	292	302	313	345	374	405	453	480

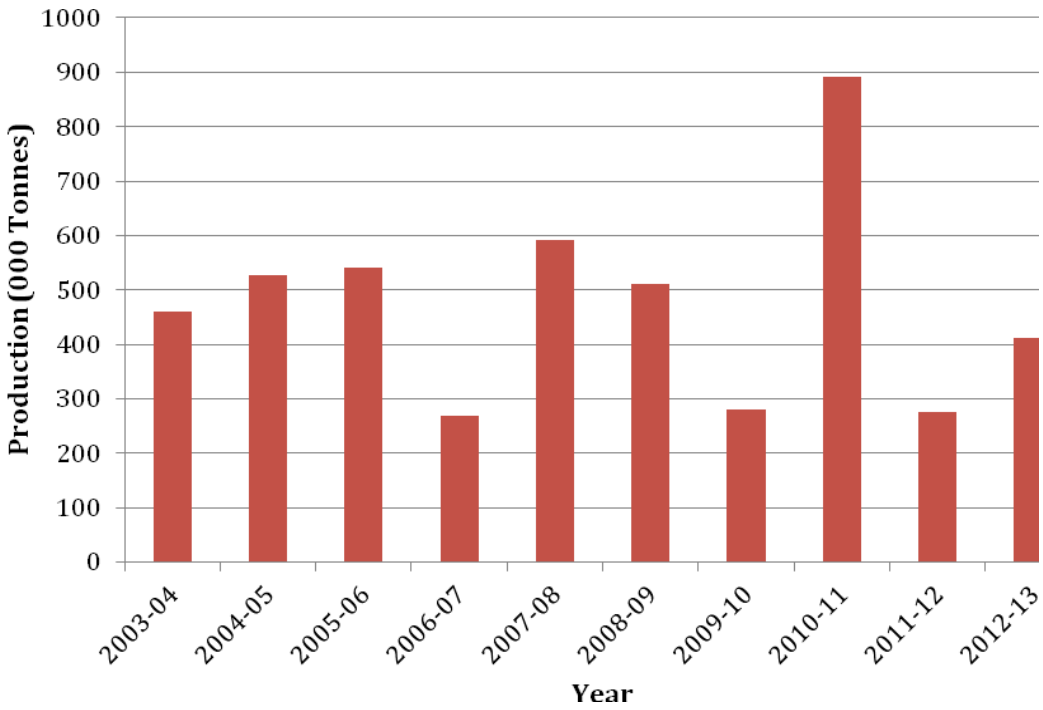

Figure 2: Apple Production in Himachal Pradesh (National Horticulture Board, 2013)

Temperature and precipitation play significant roles for the production of apples. Apples require 700-1200 hours of chilling per year, depending on the variety (Vedwan and Rhoades, 2001). Winter temperatures and precipitation, especially in the form of snow, are crucial for bud break, induction of dormancy, and ensuring flowering in apples (Jindal *et al.*, 2001). Specifically, early snow (December to early January) is preferred because of its favourable effect on bud-break and soil moisture (Singh *et al.*, 2011). Late snow (in late January to February) can influence apples by restricting bees' activities and therefore affect the pollination of apple flowers (Singh *et al.*, 2011). Vedwan and Rhoades (2001) report that given the chilling requirements for apples, the lack of early cold in December and January months has created problems in the Kullu District.

A study conducted by Vedwan and Rhoades (2001) examined the perception of Himachal farmers and the role of climate change on apple production. Most apple growers

attributed poor production to reduced snowfall and its altered timing due to climatic changes. Snowfall in the valley was also widely perceived to have decreased in amount with changes in when it fell. Overall, the timing and the amount of snowfall and frost have significant influence on the quality and quantity of apples produced (Vedwan, 2006). Based on weather data, the mean annual temperature in Kullu has shown an increase of 1.1 degrees Celsius in the last two decades and an overall decrease of precipitation of 14.5 mm annually (Rana *et al.*, 2009).

In addition to apples, exotic vegetables and floriculture have also become increasingly important. Vegetable production in Himachal Pradesh increased from 25 thousand tonnes in 1951-1952 to 1356 thousand tonnes in 2011-2012 (HP Dept. of Agriculture, 2013). In recent years, there has been a large increase in the production of off-season vegetables. Thousands of farmers are now growing peas, cabbage, cauliflower and tomatoes from May-July, when production of vegetables crops in the rest of India is low (Pandey *et al.*, 2010). Other exotic vegetables such as capsicum, broccoli and red cabbage are grown, and some farmers in the state are now producing cut flowers including orchids, rose, carnation and chrysanthemum for external markets such as Delhi (Pandey *et al.* 2010).

3.6 Data Collection Procedures

To satisfy the objectives of the study, the data collection procedures selected for this research included participant observation and semi-structured interviews.

3.6.1 Participant Observation

Participant observation occurs when the researcher joins a group of individuals to record action, interaction or events that occur (Ritchie & Lewis, 2003). As a participant, the

researcher observed agricultural activities, agricultural training camps guided by state government employees, food consumption patterns, how food was distributed and sold in markets and the types of food purchases people made. Notes of my observations were kept and recorded using field notes and in a journal throughout the field season.

During participation observation I explored the daily activities of men and women related to food production, use and buying habits in each of the three chosen case study sites. Specifically, I paid close attention to agricultural activities including the cultivation and harvest of apples, vegetables and traditional crops such as red rice. In particular, I took note of chemical applications, the use of industrial tools, the use of bullocks for ploughing, and the application of manure for fertilizing the soil. I noted the different roles of men and women on agricultural fields, at the wholesale market and in households. I observed the timing and seasonal variations of the types of crops grown, and the types of foods grown in personal gardens. I also took note of the traditional crops being grown and whether there were differences between study sites. Lastly, I observed the types of food purchases people made at the local market and whether the types of food available for purchase changed throughout the season.

3.6.2 Semi-Structured Interviews

Qualitative interviews were used to help me understand experiences and how and why things change in social and political processes (Rubin & Rubin, 2005). In order to gain an understanding of people's perspectives of food security, how policy affects their agricultural practice and learning outcomes, semi-structured interviews were used. Researchers use semi-structured interviews for data collection because it is useful for exploring perspectives and opinions on complex and social human issues (Barribal &

While, 1994). A translator was required to conduct interviews, while I collected data obtained through the interview process. I worked closely with a translator guide that has worked for NRI students in the past and has gained significant experience. Interviews were recorded through note taking and transcriptions were verified often with my translator.

The informants selected for the interview were comprised of local community members of various ages, gender, social composition and roles within organizations. This included farmers and household members, local vendors selling food in markets, academics and researchers, and government officials. The informants were selected by using a snowballing technique, whereby participants were asked to identify other people who were involved in apple production, for example. Interviews would vary in time, but would usually take between 15 minutes to 1 hour. Interviews with farmers and household members of each study site would take place at their fields or at their homes. Topics such as dietary changes, reasons for converting crop fields and if one ever felt worried about the price of their crop, were discussed. Local vendors selling food were interviewed at the market in Manali, and commission agents were interviewed at wholesale food markets in Manali, Bandrole and Patlikhul. These interviews were used to learn more about the overall process of purchasing and selling foodstuffs, such as the types of food being sold in the market, seasonal changes in food supply and determining the price for crops sold locally or to other regions.

I also spoke to academics at the Y.S. Parmar University in Palampur, GB Pant Institute of Himalayan Environment and Development, as well as state government officials. These interviews were used to learn more about research documenting sustainable agricultural

practices in the region, science and technology, and the changes that have occurred within the agricultural sector, in line with the objectives of the research. As well, government extension work promoting agricultural practices through awareness camps, government subsidies and incentives in the region was discussed. Participants were interviewed at their office, at horticulture awareness training camps or informally in their homes. In total, 86 semi-structured interviews were conducted (Table 2).

Table 2: Interview Respondent and Number of Participants

Interview Participants	Number of Participants
Study Site Villages	
Karjan Household Members	7
Karjan Farmers	23
Khaknal Household Members	8
Khaknal Farmers	12
Solang Household Members	2
Solang Farmers	8
Total	**60**
Local Food Market	
Local Vendors at Food Markets	6
Commission Agents	4
Total	**10**
Government	
HP Dept of Agriculture	2
Department of Horticulture	3
Krishi Vigyan Kendra (KVK)	1
Agricultural Technology Management Agency (ATMA)	2
Indian Council of Agricultural Research (ICAR) Institute	1
Total	**9**
Academics and Research	
Regional Horticulture Research	1
Y.S Parmar University	1
GB Pant Institute	3
Teacher/Retired Professor	2
Jagriti	1
Total	**8**

3.7 Data Analysis

The data analysis process followed Creswell's (2003) guidelines, including organizing and preparing data for analysis based on the general themes identified in the literature. These themes included food access, availability, vulnerability, and people's perspectives regarding food security, learning constructs, obtaining a general sense of information, coding, identifying main themes, representing the main themes in a qualitative narrative, and interpreting data in relation to the literature. In following these guidelines, I began my analysis as I transcribed field notes and interview data by keeping a journal of emerging grounded themes. Data was then organized and categorized into different sections according to theme using Nvivo software. Specifically, Nvivo was used to classify, sort and arrange information, analyze my materials, identify themes and help to develop conclusions. In Chapter 5, findings from the semi-structured interviews are presented and the terms 'few', 'some', 'many' and 'most' are used when referring to the number of respondents speaking that supported a particular point. The term 'few' refers to 5 percent or less, 'some' refers to 6 to 39 percent, 'many' refers to 40 to 89 percent and 'most' refers to 90 percent or more of respondents supporting a particular finding. This research is qualitative and the percentages are meant to indicate the level of support for a finding – not the potential importance of it. A finding noted by only one respondent can still be profound. Lastly, research findings were presented to the university and to the communities where I conducted fieldwork. When I complete this research I hope to share my research with the community by sending a poster that presents my results.

CHAPTER 4: AGRICULTURE IN THE KULLU DISTRICT, HIMACHAL PRADESH: THEN AND NOW

4.1 Introduction

The purpose of this chapter is to provide context surrounding the chosen study sites in relation to the existing food system. The chapter begins by providing a brief background of the history of agriculture in Kullu, including changes in the cultivation and utilization of crops and the types of foods sold to external markets. More specifically, it highlights efforts to bring about large-scale commercialization of apple cultivation. Following this, there is a brief description of the study sites chosen and the current agricultural systems that exist. This chapter further explores agricultural trade, current food supply chains for produce and the government extension efforts that are currently impacting local food production in Himachal Pradesh. State-level extension efforts and policies are explored, focusing on aspects such as the promotion of science and technology, methods of increasing agricultural production and imparting education and training to farmers. National level policies highlighted below are examined for their impacts on agriculture, including India's public distribution system (PDS) and the national food security bill.

4.2 The History of Agriculture in the Kullu District

When the British Army officer A.F.P. Harcourt first published "The Himalayan Districts of Kooloo, Spiti and Lahau" in 1871, the agricultural region and the life of people at that time were described as being "self-sufficient and wonderfully secure". In his description, Harcourt identified the main crops being rice, opium, tobacco, wheat, Indian corn, barley and amaranth. Basmati, Jatu and Sukadas varieties of rice were commonly grown; the last two varieties of a reddish colour being the ones generally sown (Harcourt, 1871). Grain was grown more for consumption than for the market, and barley flour was described as

"the favourite food of the people" (Harcourt, 1897). Most notably, Harcourt (1897) states, "it is proverbial that a famine has never been known".

The history of agriculture and the adoption of horticulture began in the 19th century. After the British took over the Kullu District from the Sikhs in 1846, the territory became a part of British India (Sharma, 2004). When the region became an independent sub-division, the area became increasingly popular with British officers (Chetwode, 1989). In 1870, when Captain R.C. Lee retired from his regiment with the British Army, he became known as the pioneer of the Kullu fruit industry (Chetwode, 1989). When he noticed that the heavy rainfall was not unlike that of the West Country in England, he sent for fruit trees from his father's estate: apples, pears, plums and cherries (Chetwode, 1989). At the time, favoured varieties included Cox, Newton, Russet and Blenheim Orange apples, and Marie Louise and William pears.

Manali and the Kullu valley were opened for vehicular traffic in 1928 when the Mandi-Larji gorge road was constructed. Before then, Manali was simply called a Dana Bazaar, which means a market place where fodder for mules and horses could be procured (Kaistha, 2008). Once buses, lorries, and private cars became frequent, the Kullu valley became a popular holiday resort area like Kashmir, and the life of residents began to change (Chetwode, 1989). When local residents took to apple cultivation in the 1950's and 1960's, Kullu became a producer of fruits on a massive scale in order to supply the country. British varieties were no longer favourites with the farmers. They instead went for red and golden delicious varieties from the United States.

In the early 1960's, the state was characterized as 'one of the poorest and backward territories in the Indian Union' because of its primarily subsistence economy (FAO, 2007). As with most mountainous areas in South Asia, Himachal Pradesh was generally characterized as being underdeveloped on account of "specificities", such as "inaccessibility" and "marginality" (Jodha & Shrestha, 1994). During this time, efforts to bring about the large-scale commercialization of agriculture were first initiated with apple cultivation, where the late harvest season associated with higher altitude provided a competitive edge in national markets (FAO, 2007).

Apple cultivation began on a massive scale during the early 1960's and the state government played a significant role in its adoption. The Kullu district was created in November 1971 upon the reorganization of the states. With the merger of hilly areas of Punjab with Himachal Pradesh, the region acquired a distinct identity that was related to apple cultivation. Shortly after its formation, Himachal Pradesh embarked on a policy of promoting horticulture in order to transform the state's economy, which until then had been based on subsistence agriculture (Vedwan, 2001).

When Kullu was a part of the undivided Punjab, the chief minister of Punjab advocated the adoption of apple cultivation among Kullu people to achieve economic salvation. Subsidized apple saplings were provided at nominal rates from government-approved nurseries and a campaign was launched by the government agencies to popularize apple cultivation (Sharma, 2010). Additionally, subsidies were provided to farmers who adopted apple cultivation for a period of five years. Farmers owning less than five bighas (5 bighas are equal to 1 acre) of land were granted nautaurs (government land for planting apple orchards), and eligible farmers were granted government land irrespective

of their political affiliation and ideology (Sharma, 2010). At this time a 24/48 rule went into effect for landless farmers to buy land. Revenue of Rs 24 went to the government, and a payment of Rs 48 was to go to the landowner in order to buy land (Sharma, pers. comm.).

Since that time the agricultural system in the region has transformed from mainly subsistence agriculture to commercial agriculture. Instead of terraced fields of red rice, amaranth, or finger millets, land holdings today are either used for apple orchards and/or to grow exotic vegetables for external markets, or the land is being converted for large-scale development projects such as hydroelectricity dams or tourist resorts.

4.3 Food in the Kullu District in Transition: Then and Now

Himachal Pradesh can be described as the land of temples, local deities, fairs, festivals, rituals and traditions. The Kullu valley, which translates to "the valley of the gods" was isolated for centuries from large urban centers and developed a distinctive culture based on the worship of local deities (Tucker 1999). Local folklore could also be tied to agriculture and the land. If there was a drought in the lower valley, the soil of the upper valley could be described in a way similar to how you would describe the people living there: soft, bountiful and friendly (Sharma, pers. comm.). The people of the study area are culturally distinct from the plains people and many are of Pahari heritage (Berreman, 1970 in Duffield *et. al.,* 1998). Members of the traditionally dominant Rajput caste and Brahmins are the main constituents of the villages in this region (Vasishth, 2001) and members of the Rajput caste of the area hold much of the private land and control rights of use in common property areas (Duffield *et al*., 1998).

Local cuisine such as pembra, giche, siddu, chilru and akslu are foods that people in this region have traditionally consumed and prepared for special occasions (photo 1 and 2). Participants noted that red rice was usually only eaten on special occasions as a favoured meal for festive occasions or for guests.

> *A2: Red rice used to be a delicacy; it took a lot of labour. Twice in one week when I was a child was a treat. Rice was cooked for guests, I used to wish a guest could come so my mom could make.*

Photo 1: Siddu, a local traditional dish made with wheat flour, ghee, poppy seeds, spices

Photo 2: Pembra, a traditional soup made with amaranth, soybeans and saag

Participants indicated, and I observed that, *kodra* (millet), *rajma* (kidney bean), *kathu* (common buckwheat), *saag* (spinach), *Siyara* (amaranth) and *Jatu* and *Matali* (red rice) are among some of the traditional foods that continue to be grown and consumed in this area, although they are becoming increasingly rare (Photo 3). Various techniques have been traditionally used to control for disease and insects, including growing stinging nettle at the edge of agricultural fields, applying cow urine and using ash from fires. Traditional tools include *Kudyal, Khoi, and Kudali* for ploughing fields, and *Khelni* for weeding. Some households continue to grow traditional crops for personal consumption and religious purposes, and some save seeds to ensure the survival of these species.

Photo 3: Finger Millet

Traditionally, farming in this region was based on diversified land use, combining irrigated and non-irrigated agriculture and animal husbandry (Vedwan, 2006). Most families owned land in different parts of the valley in order to grow a variety of crops that were suited to the microclimate. Specifically, many families owned irrigated land in lower parts of the valley that used for growing rice. Land at higher elevations, which was steeper and non-irrigated, was used for gathering fodder or grazing (Vedwan, 2006). Today, most of the irrigated terraces have been converted into apple orchards. During the winter months when road access did not exist, people living in the Kullu valley traditionally relied on staple food crops such as wheat, dried vegetables such as *saag* (sweet spinach) and dried mutton.

Migratory pastoralism has been common throughout the Himalayas, and some of the herding communities in Himachal Pradesh include buffalo herding *Gujjars,* and goat and sheep herding *Gaddis, Kanets, Kaulis* and *Kinnauras* (Sharma *et al.*, nd). Furthermore,

pastoralism in this region is based on transhumant practices and involves cyclical movements from lowlands to highlands to take advantage of seasonally available pastures at different elevation in the Himalayas (Bhasin 1988). When the snow melts in the higher alpine regions during summer months, pastoralists move up to these areas to graze their animals. After the monsoon season, they move down to occupy the low altitude pasture for the winter months (Sharma *et al.*, nd). Pastoral activity has been an important aspect of agriculture in the region and some agro-pastoralists cultivate land along with rearing animals (Sharma *et al.*, nd). Besides breeding their own livestock, pastoralists have also taken care of animals owned by other communities, provided manure for agricultural fields and forests, and have provided wool, meat and milk for communities.

Dal (lentils), rice, sabji (vegetables), and chipattis (flour tortillas) are among some of the common foods that people in this region consume today. Milk, curd and ghee are staples in the local diet and chai is consumed in large quantities daily. Although land holdings have always been traditionally very small (1-3 bighas), the division of land between family members (predominately males) divides land into ever-smaller fragments, often making it challenging to receive large economic payoffs from growing high-yielding crops or cash crops.

The traditional lives of people living in rural villages can still be seen in various ways in the Kullu valley. Traditional houses made of wood, stone, and clay are still standing in villages. Most households own at least one cow and nearly everyone has their own personal garden for growing fresh produce or traditional crops on a small scale. Women are still seen wearing shawls and *pattus* – brightly worn traditional outfits made from wool, while many men still wear the *topi* - a colourful woolen cap with Kulluvi designs

on it. However, the lives of people have changed considerably over recent years. The construction of hotels for tourism, air pollution, water pollution, and the increasing reliance on vehicles are among some of the challenges people in this region now face (e.g., Cole and Sinclair 2002; Kuniyal *et. al* 2004).

As it is in other regions in India, agriculture in Himachal Pradesh continues to be a way of life for the agrarian population with nearly 70 percent of the population being directly or indirectly dependent on this sector (HP Dept. of Agriculture, 2013). Presently, farming is passing through a transitional phase, made up of several processes. One of the most significant factors is the economic prosperity that lies in growing high yielding off-season vegetables and the production of fruits. New spur apple varieties that mature earlier in the season, such as Oregon Spur and Super Chief, are now being promoted to replace non-spur varieties such as Royal and Red Delicious. With a strong emphasis on promoting technological advancements in agriculture, farmers are now adopting mechanized tools. Power trailers, for instance, are slowly replacing the role of bullocks for plowing fields, and many farmers now use spray machines for applying chemical inputs.

Participants indicated that diseases are becoming an increasingly great concern for apple farmers in this region. Canker, root rot, collar rot, leaf fall, black spot, and scab are all seasonal and climatic diseases that can kill an apple tree. As farmers become increasingly reliant on external markets for selling off season vegetables and fruits, there is a heavy reliance on chemical usage to control disease, produce high yields and grow attractive produce for consumers. Today, seasonal migrant workers from Nepal are hired to do much of the agricultural labour, and some farmers in this region are now contracting out

their land in order to work in other sectors of the economy or move away from the laborious task of farming altogether.

In the Kullu District, a variety of fruits and vegetables are sold in local markets, including Manali, and at lower elevation villages such as Mansari, Naggar, Jagatsukh, and Katrain. These include cash crop fruits and vegetables such as pears, plums, capsicum, cucumber, cauliflower, green peas, radishes, spinach, carrots, garlic and onions (photo 4). In northerly and higher-elevated parts of the valley, coriander, peas, potatoes, and apples are currently being grown. Some of the produce sold by local vendors is also transported from Lahaul and Spiti, including zucchini, cauliflower, red cabbage, Chinese cabbage, peas, iceberg lettuce and radishes. Although it is not regular, locally wild or traditional, foods such as wild mushrooms, ferns, and spinach are sometimes sold at local markets.

Photo 4: Produce sold in a local market in Manali

From April until October, many fruits and vegetables grown in the Kullu valley are sold locally. Food is also imported from neighbouring regions such as Lahaul. The market in Bandrole, for instance, sells tomatoes, cabbage, cauliflower, and pears at the end of April. Kiwi, pomegranates, and garlic are sold from the end of May until July and apples are sold from the end of July until October. In November, a majority of produce and cereal crops are imported from other parts India, particularly from Punjab. As a result, the Kullu District now relies on much of its food supply from other parts of India at certain times of the year. At times, relying on other regions for food has been problematic due to weather conditions or political reasons. Participants indicated two major events when imported food was temporarily not reaching food stalls in Himachal Pradesh. In 1966, the state of Punjab stopped exporting food to Himachal Pradesh for a brief time period, creating a political "food zone". Then, in 1995 during a heavy flooding period, the Kullu valley did not receive food from Punjab for ten days. Normally, food that is imported from other parts of India arrives every second or third day.

In recent years, small-scale markets have emerged and grown in the Kullu District as a result of factors such as population increases in non-agricultural permanent residents, seasonal residents and transients (i.e. tourists). Instead of transporting produce to major markets such as Delhi, farmers can receive a higher rate when selling to local markets in places such as Bandrole or Patlikhul. Currently, a majority of fresh produce is sold through small roadside and neighbourhood stalls, kiosks and delivery by hand carts. As a result, local produce can meet local demand in this region during the growing season. Figure 3 shows the local availability of fruits and vegetables and when they can be

purchased. This information was obtained from speaking with local vendors and commission agents selling produce in food markets in Manali, Patlikhul and Bandrole.

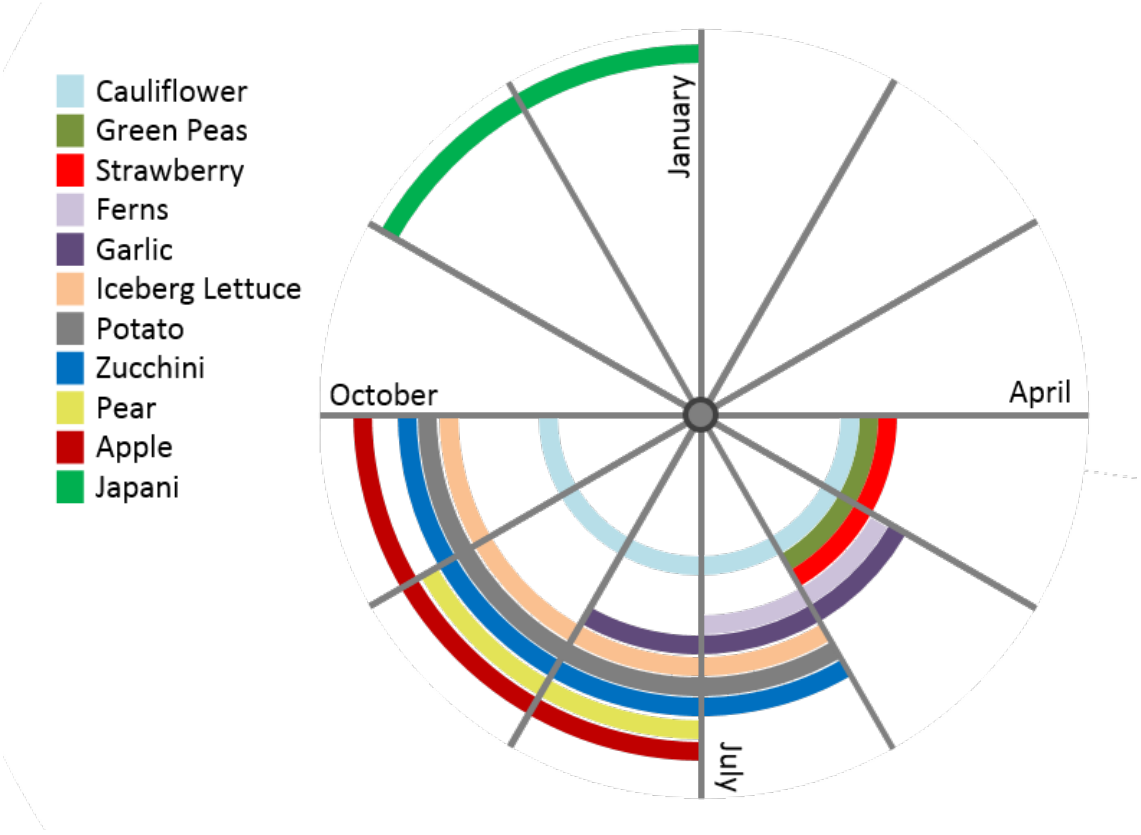

Figure 3: Fruits and vegetables locally available in the Kullu District region

4.3.1 A Focus on the Study Site

Three villages were chosen for the purpose of this study: Karjan, Khaknal and Solang (Fig. 4).

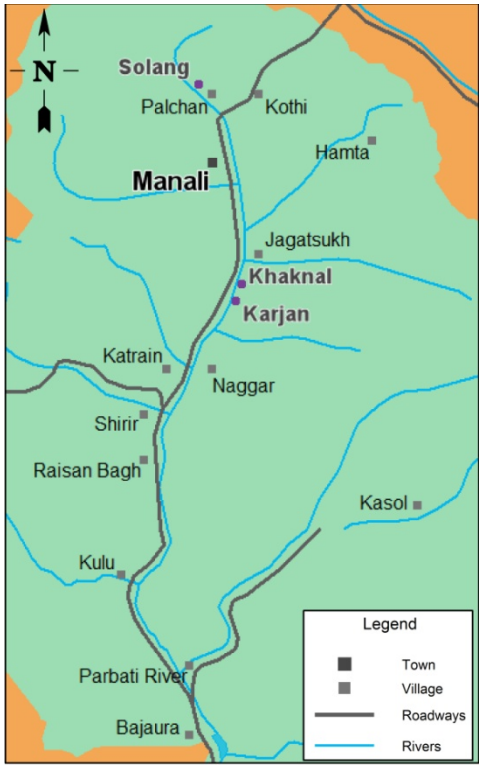

Figure 4: Solang, Khaknal and Karjan are located in the Kullu District of Himachal Pradesh

Karjan village is located in a highly productive agricultural zone in the northern part of Kullu District (Fig. 4). In terms of agriculture, a significant amount of variation exists overall. In some parts of this area, red rice paddies still exist, providing a traditional crop in the region that is becoming increasingly rare (Photo 5). Two types of red rice varieties are grown: Jatu (seedlings grown in a dry field) and Matali (seedlings grown in water). In addition to rice, farmers are also intercropping with vegetables or growing mature apple trees. Some participants are growing radishes, capsicum, broccoli, mint, peas, apples,

cauliflower and iceberg lettuce for commercial sale. The transition to move away from traditional crops such as *kodra*, *kathu*, black lentils and mustard began in the 1960's. However, the transition didn't occur immediately for all farmers living in the community. Some participants began growing fruits and vegetables on a commercial scale as recently as five years ago. Others began converting their rice fields to apples as early as 20 years ago. Nevertheless, it is important to note that most participants have not fully converted all of their rice paddy fields and continue to grow rice for themselves, their family, or for people in their community. As well, some participants continue to grow and save seeds from traditional crops such as maize, *kodra*, *kathu,* and *siyara.* The average land holding size for the study participants is 10 bighas. This study site was selected in order to examine why some farmers choose to continue growing traditional crops while adopting cash crops such as apples. In turn, this provided an opportunity to explore the question of whether they feel more food secure by using this subsistence/cash-cropping strategy.

Photo 5 (left): Farmers harvesting Matali rice, Karjan

Photo 6 (right): An aerial view of Karjan; rice fields are being harvested and young apple orchards intercropped with vegetables are present

Khaknal is a neighbouring village north of Karjan (Fig. 4). Nearly all farmers living in this village are heavily engaged in growing cash crops, particularly apples. The transition

towards commercial horticulture began in the 1950's and 1960's. Similar to Karjan, the transition didn't occur immediately for all farmers living in the community. Some participants had entirely converted their red rice and wheat fields to apples 50 years ago, while others completely transitioned to cash cropping only 10 years ago. Most participants, however, completely converted their fields to apples between 25 and 30 years ago. Therefore, the transition to move towards apples began in Khaknal earlier than Karjan. In some cases, fully matured apple trees have been cut down and replaced by new trees. Previously, farmers primarily grew wheat, black *dal*, soybeans, corn, red rice and *siyara* and *kodra*. Today, farmers are almost entirely dependent on a cropping system for buying and selling their food to an external market. Up until the 1980's, people in this village were bartering with Lahaul tribes for mutton, matches, soaps and other items in exchange for red rice.

Intercropping between vegetables and apples is common when the apple trees are young and have not fully matured. In other areas where mature apple orchards exist, no other crops are grown because there is not enough available sunlight (Photo 7). Most participants owning younger apple trees are intercropping with maize, barley and kidney beans for personal consumption. Others are growing vegetables such as garlic, peas, broccoli, cauliflower, tomatoes and radishes for sale. Some farmers are even experimenting with growing other fruit trees, such as pears and plum (Photo 8). None of the participants continue to grow red rice but are some are continuing to save traditional seeds from *siyara*, mustard, soybeans, maize and barley. The average land holding size for the study participants is 10 bighas. This study site was chosen to provide an

understanding of the change in perspective of food security when participants are more heavily dependent on external markets in order to sell and buy food.

Photo 7 (left): Mature apple orchards on terraced land that red rice traditionally been grown on

Photo 8 (right): Young plum trees intercropped with garlic

Solang is a village also located in the northern part of the District (Fig. 4). This village is not reached by vehicular road and currently is accessed by footpath and bridge across the Solang River (Photo 9). A link road is being built to connect Solang with the all-weather road servicing the nearby recreation area. In contrast to Karjan and Khaknal, this site is not considered to be within the highly productive agricultural area of the Kullu valley. Most if not all people living in this village rely heavily on tourism from Solang Nala, a nearby recreation area. Solang Nala attracts domestic and foreign tourists for skiing, paragliding, ATV riding, horseback riding, gondola rides and other activities (Photo 10).

Photo 9 (left): Solang Village

Photo 10 (right): Para gliders at Solang Nala, a popular tourist destination near the village of Solang

Traditionally, people in this community were pastoralists and heavily depended on sheep for mutton, wool and as a means to barter for other food items. In addition, people traditionally grew crops such as *kathu, siyara, kodra and saag*. The transition to move away from subsistence agriculture in this village began nearly 30 years ago. In contrast to the other study sites, the transition occurred as a result of tourism, not commercial agriculture. In the early 1980's, people began moving away from subsistence agriculture when the area became a popular tourist destination for skiing. As a result, people began relying more heavily on local vendors for purchasing their food supply. Most if not all households are now heavily reliant upon on tourism for their financial security. The average land holding size for participants is eight bighas.

Presently, crops such as wheat, mustard, peas, potatoes, cabbage, cauliflower, radishes, carrots and garlic are grown mainly for personal consumption or for sale on a small scale. Traditional crops such as *saag, rajma and kathu* are still being grown and some participants continue to save seeds from *siyara, kathu,* barley, wheat and mustard. Many

participants stated that they did not grow apple trees previously because heavy snowfall could break the tree branches. Today, as a result of decreasing amounts of snowfall during winter months over recent years, people have now begun to experiment with growing apples. Still, as a result of factors such as geographical isolation and a heavy dependency on tourism, participants are not heavily reliant on agriculture as a livelihood, growing food mainly for their own consumption or selling food on a small scale. This study site allowed me to explore whether people feel more food insecure in a less agriculturally productive region, how the agricultural system has changed with tourism growth, and how geographic isolation may influence people's sense of food security.

4.4 Agricultural Trade, Supply Chains and Government Extension Efforts

4.4.1 The Fresh Produce Supply Chain

With over half of the population of India living in rural areas, there is a general lack of infrastructure for transporting food and reaching consumers. Currently 95% of the sale of fresh produce happens through traditional supply chains (Pandey *et al.*, 2010). The majority of farms in these areas are small and farmers must deal with poor roads, little or no cold storage facilities, lack of farm credit, little market information, and poor infrastructure (Pandey *et al.*, 2013). Currently in Himachal Pradesh, a majority of fresh produce is sold through small roadside and neighbourhood stalls, kiosks and delivery by hand carts, as described above.

The marketing and sale of products in India has traditionally been controlled by the state and regulated by the Agricultural Products Marketing Committee (APMC) act. This act required that all agricultural produce must be sold in government regulated markets or

mandis (Pandey *et al.*, 2013). In 2005, Himachal Pradesh adopted the amended APMC act, allowing farmers to sell their produce to private parties, retailers and food chains (Pandey *et al.*, 2013).

For example, in Kullu, after farmers harvest their crop, they pack their apples in cardboard boxes and transport them to the *mandis*. A commission agent works with the farmers by acting as a link between the farmers and buyers. In most cases the farmer must sell at whatever price the apples are sold for at auction by the commission agent. Due to the absence of cold storage infrastructure and because of transportation costs, farmers are generally at the mercy of whatever price the commission agent offers (Pandey *et al.*, 2013). In general, there have also been issues with an oversupply of apples in domestic markets in the peak season and shortages in the off-season, resulting in off-season prices that are three to four times peak-season prices (Pandey *et al.*, 2010). When the produce is sold, all marketing costs, including transport, handling, storage costs and the agents' commission are deducted and a net price is paid to the grower. Currently the buyer must pay 6 percent (5 percent goes to the commission agent and 1 percent goes to APMC market fees). Conversely, the commission to sell in major markets such as Delhi is 9 percent. The increase of small local markets to meet local demand during the growing season has reduced the cost of rent, packaging and transport for fresh produce.

4.4.2 Agricultural Trade

Since gaining independence, India's agricultural policies, research and extension efforts are essentially aimed at increasing agricultural productivity for improving self-sufficiency and alleviating hunger through food distribution (OECD, 2007). In order to achieve self-sufficiency, the country placed limits on global agricultural trade. However,

technological developments and macroeconomic policy reforms have brought about increased liberalization, contributing to changes in trade policy in India (European Commission, 2007). More specifically, reforms in the 1990s have greatly increased overall trade flows and since 2000 import and exports have grown steadily (SPAN, 2005).

In terms of exporting apples, an agri-export zone has been established in Himachal Pradesh, including the districts of Shimla, Kullu, Mandi, Chamba and Kinnaur (NHB, 2011). Efforts have specifically been made to export to neighbouring countries as well as to West Asia and to the South-East Asian countries. In 2010-2011, India exported apples to Bangladesh, Nepal, United Arab Emirates, Liberia, Maldives and Singapore (NHB, 2011). When the government lifted quantitative import restrictions in 2000, imported apples from places like the United States began appearing in the Indian market and sold at about Rs 100-120 per kilo (SPAN, 2005). As a result, Himachal farmers realized they could sell their apples for up to Rs. 60 per kilo. Despite a 50 percent tariff against imported apples, Washington State has beaten the competition into India to become the number one export supplier (Pandey *et al.*, 2013). Until 2008, the majority of imported apples came from the United States. However, over the past few years, Chinese apples, imported mostly from Shaanxi province, have flooded fruit markets in Delhi, giving tough competition to Indian farmers (Pandey *et al.*, 2013). Overall, changes in trade reforms and tariffs have meant an increase in competition for Himachal farmers growing their apples for external markets, and these farmers are increasingly more susceptible to supply and demand from external markets.

4.4.3 Agricultural Research and Government Extension Efforts

Policy focuses in Indian agriculture have shifted throughout recent history. Between 1950-1965, heavy emphasis was placed on achieving self-sufficiency in food grains, with significant public investment in constructing irrigation reservoirs and distribution systems throughout the country (Dev, 2012). From 1967-1990, incentive policies for the adoption of new technology and public investment policies dominated government efforts in agriculture in order to achieve self-sufficiency in food grains (Dev, 2012). Otherwise known as the 'green revolution', the agricultural production potential within India significantly increased. In the 1970's and 1980's, the Indian government implemented incentive policies that focused on inputs and outputs. Inputs such as irrigation, fertilizers and mechanization were heavily subsidized to provide inputs at lower prices and encourage the diffusion of new technology (Dev, 2012). More recently, since the end of the 1990's trade liberalization in agriculture has been emphasized. Changes were made to the liberalization of export controls, quantitative controls on imports and decontrol on domestic trade (Dev, 2012).

In the 1970's, the Training and Visit system (T&V) promoted by the World Bank was a top-down agricultural extension effort to promote high-yielding technologies (Ferroni & Zhou, 2012). Since the 1990's, agricultural extension in India has focused on decentralization, outsourcing, and involvement by the private sector and non-governmental organizations (NGOs) (Ferroni & Zhou, 2012). Extension can come from public sector bodies such as Agriculture and Rural Development, the private sector (e.g. companies supplying seeds and other inputs, and buyers of produce), non-profit NGOs and farmer-based organizations (Ferroni & Zhou, 2012). Finance can come from

government, donors, private firms or farmer fees. In comparison to other forms of extension, farmer participation is an important theme. Participatory methods aim to enable farmers to become self-teaching experimenters and to train peers (Anderson, 2007). Government demonstrations, village fairs, farmers' study tours and farm science centres (known as Krishi Vigyan Kendra or KVK) are of importance to smallholders. Additionally, it has been noted that the private sector (progressive farmers and input dealers) is a more common source than the public sector for imparting information on seed, fertilizer, crop protection, harvesting and marketing (Ferroni & Zhou, 2012).

Today, agricultural research and state government efforts play a strong role in disseminating information to farmers about the latest technologies and agricultural practices within the commercial cropping system. Some of the current agricultural efforts in Himachal Pradesh, as well as national food policies centered on food security are discussed below. Figure 4 illustrates organizations or departments conducting agricultural research and government extension work at the federal level, state level or both. National food policies, such as the public distribution system, are italicized below.

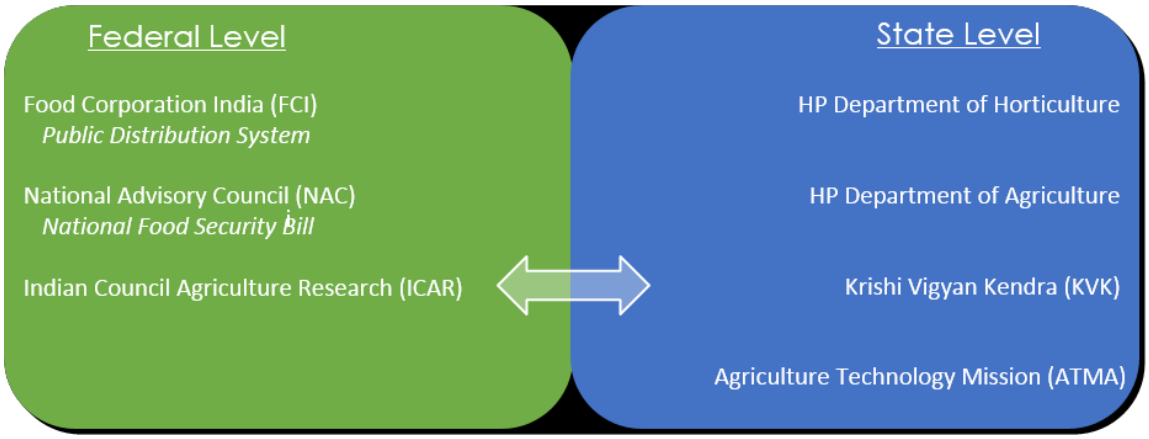

Figure 5: Agricultural organizations, departments and policies at the federal and state level

Indian Council of Agricultural Research (ICAR):

The Indian Council of Agricultural Research (ICAR) is an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. Currently there are 99 ICAR institutions and 53 agricultural universities spread across India. The research programmes under the ICAR are designed to promote "science that ensures food, nutrition and livelihood security for all". The council is the central body for guiding research and education in agriculture including horticulture, fisheries and animal sciences.

The ICAR has played a pivotal role in ushering in the Green Revolution and subsequent developments in Indian agriculture. Its research and technology development has enabled the country to increase the production of food grains by four times, horticultural crops by six times, fish by nine times (marine five times and inland 17 times), milk six times and eggs 27 times since 1950-51, thus directly impacting food production on a national scale (ICAR, 2013). This organization has played a direct role in creating a network of over 607 Krishi Vigyan Kendra (i.e., farm science centers) for agricultural extension work in rural districts in the country, and has helped to develop 721 high-yielding varieties and production technologies in horticulture crops within the country. Presently 12 KVK groups work within the state of Himachal Pradesh and have been directly involved with promoting agricultural practices in the region.

When visiting a KVK in Bajaura, I learned that one of the aims of the organization was to better understand the impacts Integrated Pest Management (IPM). For instance, the impact of chemical pest management on soil quality was observed for vegetable crops

such as cabbage, cauliflower, tomatoes, cucumbers and peas. In addition, organic pest management was being examined, including the application of bio-pesticides and traditional plant extracts to deter harmful pests. Other methods for IPM included the use of light traps as a means of controlling insects. Although it was not evident that any participants were using organic pest management techniques, the research and procedures that are successful are imparted to the farmers through training or awareness camps.

Agriculture Technology Management Agency (ATMA):

The Agriculture Technology Management Agency (ATMA) is a central scheme with the government of India. ATMA is a registered society responsible for technology dissemination at the district-level. It has linkages with all the line departments, research organization, non-governmental organizations and agencies associated with agricultural development in the district. Keeping in view geographic conditions and demand of farmers, the purpose of ATMA is to bridge the gap between research and extension to increase productivity.

The program started in 1998 in 28 villages in seven states by the Indian Institute of Natural Agriculture Management. An agriculture technology management agency was constructed in each district, and in 2005 this program had expanded to 591 districts in India, including Himachal Pradesh. The project process involves adopting bottom up planning procedures for setting the research and extension agency priorities in order to make the technology dissemination farmer driven and farmer accountable. This program receives 70 percent of its budget from private institutions and the remaining 30 percent comes from government.

In 2007 the Indian government launched the National Food Security Mission (NFSM) scheme through ATMA in order to increase production and productivity of wheat, rice and pulses to ensure food security in the country. In 2012-13 the government allocated Rs 22 crores (1 crore is equal to 10 million rupees, or approximately 217,000 US dollars) in order to increase production through area expansion, restore soil fertility and productivity, and enhance farm level economy (i.e., increase farm profits to restore confidence among the farmers).

ATMA has been present in Kullu since 2005 and is now regularly involved in educating farmers about topics such as waiting periods and residual effects of chemical inputs, the use and application of agricultural technologies and the quality of organic foods. The ATMA message is given to all farmers through department schemes and publications, and the success stories of other farmers, the timing of procedures, and the methods they have adopted are all publicized. Thus, they are directly associated with formally educating farmers about agricultural practices through regular agricultural camps, workshops and publications.

Himachal Pradesh Department of Agriculture:

The Department of Agriculture was established in 1948 when Himachal Pradesh was still part of Punjab, and promotes industrial as well as sustainable practices at the state level. Some of their efforts include educating farmers about diversified farming, providing training for integrated pest management (IPM), ensuring timely supply of all types of agriculture inputs such as improved seeds, pesticides and fertilizers, and imparting the latest technology for increasing agricultural production. State-sponsored schemes include

the distribution of fertilizers and crop protection, vermicomposting, farmer training and education, and agricultural marketing. These schemes are discussed below:

The distribution of fertilizers and crop protection is a continued scheme whereby the Department provides a 100% subsidy on the transportation of fertilizers for retail sale from major headquarters to a storage facility, thereby providing uniform fertilizer prices in the state of HP. The state government also has allowed subsidy on the cost of urea and ammonia sulfate, and on complex fertilizers containing nitrogen, phosphorous and potassium (NPK).

When visiting a Department of Agriculture station that sold insecticides and fertilizers to farmers in the Naggar area of Kullu, issues such as increasing demand for chemicals, government subsidy costs and increasing price of chemicals were highlighted. For example, if a farmer buys insecticides privately, they would cost around Rs 260 per package. When the government subsidizes it, however, the cost is around Rs 160. Due the recent significant increase in the price of fertilizers, farmers must now apply for subsidies from the government. It was also revealed that the price of chemicals has been increasing over time and farmers were required to pay Rs 1 to 3 more per package for insecticides in 2012 than in the previous year.

Conversely, the state Department of Agriculture is now focusing on the promotion of organic farming and vermicomposting. The HP state government has approved an organic policy for the state, with a focus on the promotion of organic farming during a five-year plan from 2012 until 2017. The main features of this policy include the incorporation of organic into agricultural development, awareness raising, research and

technology support, supply chain development and marketing, identifying niche areas for organic farming, and meeting organic input requirements. Vermicomposting units are being promoted as a way to produce organic fertilizer and farmers are currently being provided with a 50% subsidy for setting up vermibeds. Although some of the study participants have adopted organic agriculture in some way, it was illustrated that it was out of self-interest or because they felt they it was not necessary for crops such as red rice. No participants indicated that they had received rewards or incentives from any department for adopting natural ways to control disease or insect on their cash crops.

> *KAF17: We grow rice for ourselves because it's a necessity. We don't buy from the shop. It's more organic than the shops. If you compare it chemically, we use very little chemicals. We don't use sprays on our rice, it can be carried by water.*

Most of the participants who were adopting sustainable farming techniques were doing so in the form of vermicomposting. Currently in Kullu, the Department of Agriculture is trying to motivate farmers to use vermicomposting pits and produce organic fertilizer by providing Rs 30,000 per unit. Many of the participants living in Karjan and Khaknal now use vermicomposting for creating organic fertilizer. While some of the participants indicated that they have seen no visible impacts from the process, others have seen good results.

> *KAF11: I've used vermicomposting regularly before 2000. I have seen no visible impacts. In the 1980s the government promoted use of vermicomposting. They are providing subsidies but the method is not tested scientifically.*

> *KRF08: I think it (vermicomposting) is good for the crops, with good results. We also attended a workshop with the horticulture department and they told us about organics and vermicomposting. I've seen a few people trying it.*

Photo 11: Vermibed demonstration site at a KVK in Bajaura

Another important state-sponsored scheme is farmer training and education. The main function of the Department of Agriculture is to disseminate agricultural technology to farmers. The Department runs two training centers and farmers training camps are organized at village, block and district level.

This has impacted Kullu in terms of linking formal learning processes with the adoption of agricultural practices. At a farmer training camp in Naggar district in the fall, the Department was educating farmers about determining and testing soil quality. Men and women of all ages attended the full-day workshop, and many indicated that they regularly attend training camp sessions throughout the year. All of the participants attending were

apple growers and all of the training camps focus on the adoption of modern agricultural practices on cash crops.

The Department of Agriculture also focuses on agricultural marketing. The Agricultural Produce Market Committee (APMC) is controlled through the HP Agricultural and Horticultural Produce Marketing (development and regulation) Act (2005). Currently, 10 marketing committees are functioning and 48 markets have been made functional. The market fee is one percent for farmers choosing to sell their food to external markets. APMC plays a role in facilitating agricultural education, constructing link roads between rural villages and local markets, and supplying plastic crates for transporting produce. During 2009-10, APMC held a series of block-level awareness camps in Kullu, Lahaul and Spiti, with more than 600 farmers taking part (APMC, 2011). Specifically, the committee plays a role in educating farmers about the latest marketing trends for better marketing and post-harvest technology for fruits and vegetables.

In Kullu, APMC has played a direct role in increasing the amount of market yards available for the purchase and sale of local produce in the area. Instead of transporting and selling apples to places such as Delhi, farmers can now sell their fruit and vegetables in markets located in towns and villages such as Bhunter, Kullu, Patlikhul, Bandraol and Khegsu. For instance, the principal market yard in Bhunter was established in 1992 and remains functional throughout the year and caters to the marketing needs of the farmers of about 150 villages in the region (APMC, 2011). APMC also distributes plastic crates on subsidy for transportation and storage of produce, and constructed 90 link roads in Kullu, Lahaul and Spiti in 2010-11 (APMC, 2011).

HP Department of Horticulture:

The Department of Horticulture is carrying out various activities to promote horticulture, including the implementation of schemes that are associated with the production and post-management harvest of fruit and vegetable crops, beekeeping development, and floriculture. The Department currently provides aid in the following ways:

- Subsidy on pesticides at 50% to small farmers and 30% to big farmers
- Subsidy on various kinds of packaging for the packing of fruits
- 50% subsidy for the purchase of plastic crates
- Subsidy on horticulture production inputs at 25% to small farmers, 33% to marginal farmers and 50% to the scheduled caste and tribe farmers

The Department also has a number of missions that aim to provide assistance for the promotion of horticultural growth in the state. Horticulture Technology mission - II provides the following assistance:

- Expanding area under horticultural crops
- Establishing on-farm handling unit for grading, sorting and storing produce at the farm level itself
- Promoting organic farming and use of bio-fertilizers
- Promoting modern horticultural equipment
- Promoting integrated pest management
- Transfer of technology though training, front line demonstrations and publicity
- Creating water sources for ensuring irrigation to horticulture crops

In Kullu valley, an outcome of the department's extension efforts has been area expansion. Specifically, the department has played a large role in assisting and encouraging people to grow a diversity of foods alongside their apples, including other fruits, vegetables and flowers. Although growing vegetables has become common in all study sites, many of the participants who are growing other fruit trees in Karjan and Khaknal indicated that they were reluctant to continue because they are not as profitable as apples. Other outcomes have been to increase vermicomposting and to encourage integrated pest management by discouraging farmers from spraying chemicals that can harm "friendly" pests.

4.5 Food Policies: National to Regional Importance

The Public Distribution System:

Since India's Independence in 1947, the government established a large social assistance program to support the incomes of rural farmers while providing affordable food for the urban poor (Mallory & Baylis, 2012). This was established in two ways: The Food Corporation of India (FCI) procures staple food crops from farmers at often higher than market prices, then the Public Distribution System (PDS) sells to the poor through government-run "Fair Price Shops (FPS)" or government ration shops (photo 12) (Mallory & Baylis, 2012).

Photo 12: Fair price or government ration shop in Jagasukh

FCI was set up under the Food Corporation Act 1964 in order to fulfill the following objectives:

- Effective price support operations for safeguarding the interests of the farmers
- Distribution of food grains throughout the country for public distribution
- Maintenance of a satisfactory level of operational and buffer stocks of food grains to ensure National Food Security

Currently, FCI purchases nearly twenty percent of the total wheat crop in India, and in the state of Punjab, FCI purchases nearly 80 percent of the crop (NMCE 2009 in Mallory & Baylis, 2012). The government purchases crops at a minimum support price (MSP), but because they actually purchase the grain at a price fixed throughout the year, the government stores much of the grain (Mallory & Baylis, 2012). This purchasing currently excludes vegetables and fruit.

Items such as sugar, rice, flour, black and yellow lentils, chickpeas, salt, kerosene and refined cooking oil are available for cheaper rates at government ration shops across the country including in Kullu, Manali, Jagasukh and various villages in the study region. The Panchayat, or local government at the village level, is responsible for placing individuals or families under the following categories: above poverty line (APL), below poverty line (BPL), or as the lowest category, Antyodaya Anna Yojana (AAY). The price and amount of food available for purchase differs for each category. Implementations of the PDS with regard to targeting schemes, the diversion of food grains to the open market or the addition of subsidies differs from state to state (Mooij 1999).

A few participants, particularly those that owned less land, felt more food secure with the PDS as a result of factors such as having less income and rising food costs in the market. Other participants' spoke of inefficiencies and corruption within the system, and that the system contributed to the idea that people do not need to be self-sufficient through growing local crops.

> *KAF21: If you get food from the shops no one will work. When it's easily available, why work in our own field? It may be necessary when people are very poor, but not in Himachal Pradesh. There needs to be some criteria. It's not a good policy. We used to have rations for sugar, way back. Nowadays Kashmir and tribal areas get cheaper food. Some use the food for cattle and their own use, they misuse the facility.*

National Food Security Bill:

Following a finding by the National Family Health Survey (2005-06) that 22 percent of India's population is undernourished, the National Advisory Council (NAC) proposed the National Food Security Bill (NFSB) (India Business times, 2013). The National Food Security Bill (2013) extends to the whole of India to "provide for food and nutritional

security in human life cycle approach, by ensuring access to adequate quantity and quality of food at affordable prices to people to live a life with dignity" (The National Food Security Bill, 2013) The central government is responsible for ensuring the regular supply of food grains to persons belonging to eligible households at specified prices. The main features of the NFSB proposed by the NAC are:

- Legal entitlement to subsidized food grains to be extended to at least 75% of the country's population: 90% in rural areas and 50% in urban areas
- The priority households to have a monthly entitlement of 35 kg at a subsidized rate of Rs 1 per kg for millets, Rs 2 per kg for wheat and Rs 3 kg for rice
- The general households to have a monthly entitlement of 20 Kgs at a price not exceeding 50% of the current Minimum Support Price for millets, wheat and rice
- The minimum coverage entitlement to be extended to 72 percent of the population. In the final phase, to be completed before March 31, 2014, full coverage of food entitlement (to 75 percent of the population) to be ensured
- Legal entitlements for child and maternal nutrition, destitute and other vulnerable groups
- Reform of the Public Distribution System

In terms of food distribution, a number of issues need to be addressed. This includes dealing with current deficiencies in the PDS such as poor identification and targeting of beneficiaries, massive leakage of grain especially from APL allocations, and lack of accountability (EAC, nd). Another concern is finding ways to increase the production of food grains on limited land. The Department of Agriculture and Cooperation has suggested a number of measures to increase food grains by investing in productivity-

enhancing technologies in irrigation, fertilizers, seeds and post-harvest technology to reduce losses (EAC, nd). In terms of increasing the production apples and other fruit, the Horticulture Mission of North Eastern States (HMNEH) is a scheme under the Department of Agriculture and Cooperation that aims to improve the productivity of horticulture crops through adopting improved varieties and technologies, reduce post-harvest losses, improve marketability to consumers, and to promote exports and export-oriented growth.

India's agricultural policies are essentially aimed at increasing agricultural productivity for improving self-sufficiency and alleviating hunger through food distribution. However, government extension efforts, policy and research have impacted local food production by playing a significant role in the reduction of subsistence farming and the shift towards commercial agriculture. Specifically, modern and standardized processes of industrial practices are replacing traditional farming methods and techniques that are often cheaper and more environmentally sustainable. Examples of this include the heavy promotion of science and technology, the use of modern farming tools, chemical inputs and maximizing production. Although there is now a formal effort to promote and research certain sustainable agricultural practices, this overlaps and contradicts the promotion of unsustainable practices such as chemical usage. The NFSB is discussed further in relation to the results related to food security in Chapter 5.

4.6 Chapter Summary

Historically, the Kullu District was described as being wonderfully secure and rich in food grains (Harcourt, 1897). Farming in this region was based on diversified land use, with most families owning land in different parts of the valley to grow a variety of crops

or practice animal husbandry (Vedwan, 2006). Foods such as *saag*, *kodra*, *kathu*, maize, barley and red rice were staples in the local diet. Similar to other regions in the Himalaya, the food system has transitioned away from producing food for self-sufficiency, moving towards cash crops and other land uses (Djoghlaf, 2008; Maikhuri *et al.*, 2001; Kuniyal et al., 2004, Grassroots Institute, 2012).

This region differs from other mountain areas in that it has overcome barriers such as remoteness, isolation, and limited access to infrastructure such as roads that can limit food security and economic development (Djoghlaf, 2008). Rather, Himachal Pradesh is viewed as a 'model state' in its transition from subsistence to commercial crop system, and experience that can be replicated elsewhere (Vedwan, 2001). The research data show that cash crops grown in the region today, such as apples, are now part of an ever-increasingly globalized system as a result of agricultural trade policies. Although state government policies are now working to promote sustainable practices, the focus remains on maximizing agricultural production for selling fruits and off-season vegetables to external markets. Current extension efforts by state government departments, organizations and researchers have been a driver for the widespread use of chemical inputs, mechanized tools and high-yielding seed varieties. In addition, government schemes such as the public distribution system have made food access and availability in the region simpler. But while the shift has been to move away from accessing food through self-sufficiency, concerns over supply and demand, vulnerabilities from market prices, and food brought in from other regions present challenges to food security.

CHAPTER 5: DIMENSIONS AND DRIVERS OF FOOD SECURITY IN THE KULLU DISTRICT

5.1 Introduction

Many variables can affect food security at the household level. Fluctuations in crop production, food supply and prices, and on-farm and off-farm employment are all examples of variables that influence food security (Balatibat, 2004). This chapter describes local perspectives of food security in relation to various aspects of food security. Figure 6 illustrates drivers and dimensions within the concept of food security in high mountain environments (adapted from Dame & Nusser, 2011). Drivers and dimensions (highlighted in bold) such as political/institutional drivers, are themes grounded in the literature, whereas the subheadings underneath each category are themes found in this research. This chapter presents data from the semi-structured interviews with local farmers from each study site, government department officials and academic and NGO representatives. Their purpose is to better understand the participants' feelings and perspectives about the drivers of food security within the local food system at work in the region. Lastly, findings from the semi-structured interviews are presented and the terms 'few', 'some', 'many' and 'most' when referring to the number of respondents speaking that supported a particular point. The term 'few' refers to 5 percent or less, 'some' refers to 6 to 39 percent, 'many' refers to 40 to 89 percent and 'most' refers to 90 percent or more of respondents supporting a particular finding. As previously mentioned, this research is qualitative and the percentages are meant to indicate the level of support for a finding – not the potential importance of it. A finding noted by only one respondent can still be profound.

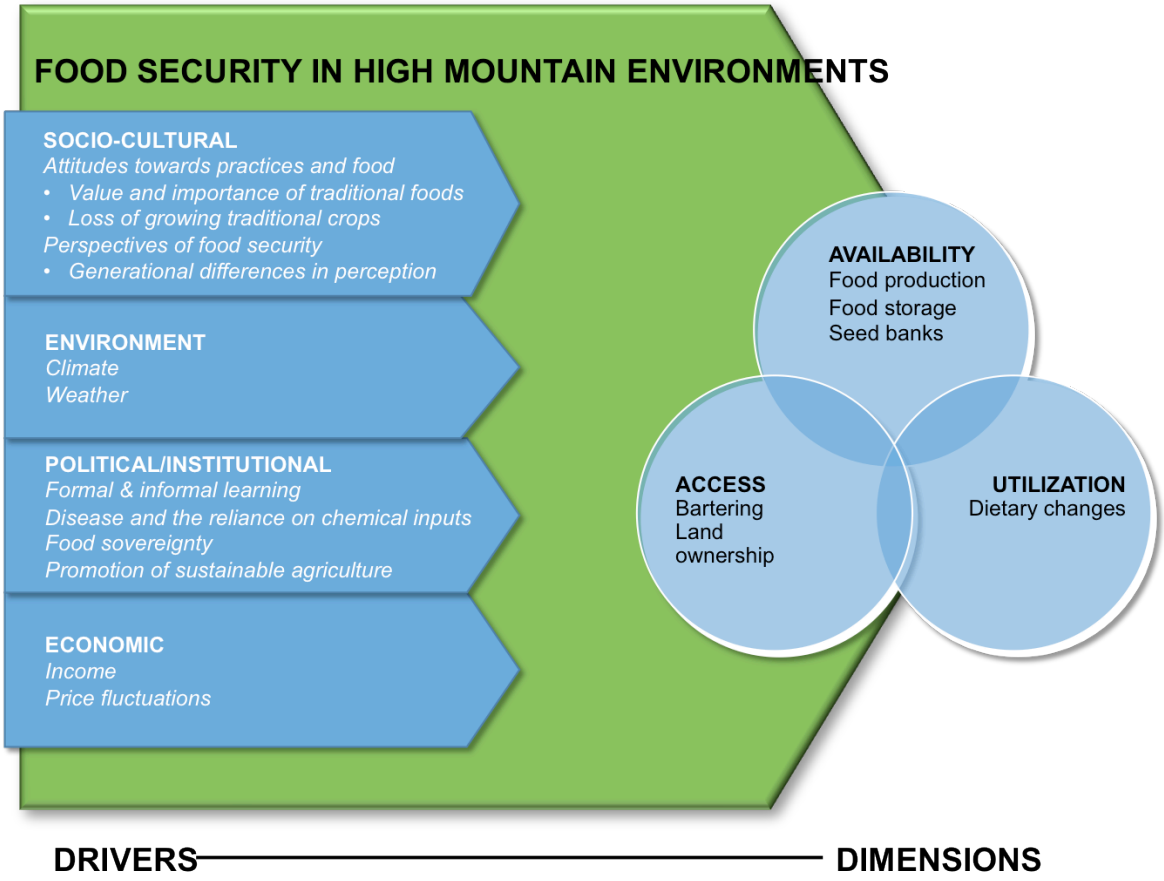

Figure 6: Drivers and Dimensions of Food Security in High Mountain Environments (adapted from Dame & Nusser, 2011)

5.2 Socio-Cultural Drivers of Food Security

Food security can be assessed by factors such as availability and access, but also by how a person feels about how secure their food supply is (e.g., anxiety, worry) and what a person thinks about it (e.g., perceptions, cultural acceptability) (Wolfe & Frongillo, 2000). This section examines cultural attitudes and perspectives of traditional practices and food, the value and importance of growing traditional crops, the transfer of knowledge to the new generation of farmers, local perspectives of food security and generational differences in perception.

5.2.1 Attitudes toward Traditional Practices and Foods

According to the literature (Kuniyal *et al*., 2004; Navdanya, 2006; Grassroots Institute, 2012) there are significant benefits to growing traditional crops, including low input requirements, nutritional increases and suitability to grow within the local environment. However, most participants living in Karjan and Khaknal who currently rely on agriculture as a livelihood indicated that they no longer grow traditional varieties because there is little to no market access for such crops, there are fewer financial pay-offs for growing such crops and people view their cultivation as labour intensive.

> *KAF10: There are very few fields left for growing these crops and apples have a better return. There is a shortage of labour also. There is less land, and more labour is required and man power.*

The perspectives of all government officials were similar. Many indicated that traditional crops were less productive than cash crops such as apples, and had less value in the external market.

> *DO03: Traditionally people were dependent on traditional crops. But people were not getting as much output or not getting a return on investment and varieties could not be improved. Traditional crops are very rich in protein but they take a longer time to grow.*

One academic researcher believed that there needed to be a better balance between traditional and commercial varieties. Specifically, he indicated that traditional crops were necessary for their nutritive qualities, while commercial varieties were necessary for their economic output.

Many government departments, such as the Department of Agriculture, have encouraged farmers in the region to continue to grow traditional varieties for special occasions such

as agricultural exhibitions. During the festival Desara, for example, agriculture exhibitions held in Kullu enable farmers in the region to enter contests and win prizes for their crops, including traditional varieties such as amaranth, black beans and finger millets (photo 13). Commercial varieties, such as Oregon Spur apples, are also highlighted at agricultural exhibitions each year.

Photo 13: One farmer enters amaranth into the exhibition

5.2.2 The Value and Importance of Traditional Crops and Foods

Although the practice and knowledge of cultivating traditional crops is slowly vanishing in the region, the perceived health benefits of consuming traditional crops are often still being recognized according to many local farmers in each study site. Traditional crops such as red rice and millet are not only associated with controlling blood sugar levels for diabetes, but the "old foods" are described as being easier to digest, having medicinal benefits, and making people strong and healthy. During the interviewing process, it was revealed that the benefits of traditional foods are often associated with knowledge from the "old culture" or way of life that people in this region have traditionally relied on.

> *KAF07: The old foods were very healthy and people would not get sick. Millet and amaranth could kill diseases in the body.*

Not only were traditional crops recognized for their health benefits, but they also provided a sense of security. Some participants living in Karjan felt food secure by continuing to have the ability to grow and store their own crops, particularly red rice. Although many others from the same study site felt food secure through gaining financial capital, some participants felt secure knowing that they could continue to eat foods such as red rice, even if the cost of food increased or the price earned from cash cropping decreased. Some participants were even renting out other people's land in order to grow rice for themselves and their families.

> *KAF08: The red rice is healthy and we don't have to buy it. We have enough for one year. If the cost rises, it doesn't matter (…) if the apple crop is bad I still have rice so I can survive.*

> *KAF07: If we have rice, we are more secure. It is not for the full year but we have for some months. We have corn and soybeans…if worst come to worse, we can survive on these things.*

Not only did some participants living in Karjan feel a sense of security knowing that they can presently grow and store traditional crops, but most participants in all study sites felt a sense of security knowing that they could go back to growing traditional crops if future issues arise within the cash-cropping system. When asked about whether one had considered a food crisis such as food being unable to reach local markets through road closures, almost all participants from each study site indicated that they would go back to growing traditional foods and their old way of life, particularly those living in Karjan and Khaknal who relied heavily on selling apples, and those participants in Solang heavily reliant on tourism.

SF05: Our lifestyle can change if the food stops coming. We will not die; we can grow old foods and go back to the old culture.

One participant even mentioned that they almost pulled out their apple trees after having issues with growing apples.

KRF05: There was problem with the apples. There was a time we almost pulled out the trees and went back to rice. Then we started making money again and have no problems.

5.2.3 The Loss of Knowledge to Grow Traditional Crops

Although growing traditional foods is perceived as a form of security for some participants presently or in future times of crisis, there is little evidence that the knowledge surrounding the cultivation of traditional crops is being transferred to the new generation of farmers in each study site. Although some farmers continue to grow traditional crops such as *siyara* and kidney beans in their personal gardens or on a small scale, in many cases the knowledge surrounding the cultivation of traditional crops can no longer be applied to the current agricultural situation. For participants that have children, most if not all indicated that their children are becoming educated or working in other sectors of the economy such as tourism, engineering, medicine and law. In Solang, most if not all youth are heavily engaged in the tourism sector. Some participants in Khaknal indicated that although they have the knowledge of growing traditional crops, their children now only have the knowledge of growing apples or have little farming knowledge altogether.

KRF04: I think the knowledge is there but there's no space. It's all apples. If we had rice, we'd teach our kids.

KRF07: It is a rare case that our children help in the field. They study. They have no interest. Maybe they'll farm.

It is important to note that most participants living in Karjan are hiring migrant labourers from Nepal to assist in growing, cultivating and harvesting their rice. Still, a few youth are acquiring and practicing the knowledge of growing red rice from their parents. One respondent indicated that the cultivation and harvest of red rice remains a family affair, even though Nepali wageworkers are often hired to assist in the process.

> *KAF13: My children know how to grow. The whole family comes to help with the rice.*

Similarly, some of the youth participants I spoke to in Solang also had the knowledge of growing traditional crops, as well as newly introduced exotic vegetables such as cauliflower and fruits such as apples. Although they were heavily engaged in the tourism industry, they continued to help their family farm during the off-season.

> *SF05: We grow wheat, vegetables like cauliflower, kathu, siyara, sweet spinach, barley, potatoes, apples.*

This is a significant aspect of food security because this type of knowledge is necessary to preserve traditional crops in the area, whether it is by choice and/or as a matter of increasing resilience in times of crisis.

5.2.4 Perspectives of Food Security

When exploring the perspectives of local farmers, most participants revealed that the risk of food scarcity on a large scale is presently not a worry or concern. In the Hindu religion it is believed that people are blessed by the god/goddesses for safekeeping their harvest while protecting their food from any type of natural calamity (i.e. hailstorms, droughts) (Nautiyal *et al.*, 2008) Some participants living in Karjan believed that a future food

crisis would be outside of their control, indicating that the gods would have to deal with it if it happens.

> *KAF18: It depends on the god what will happen, if there are no apples, there is no money. It's out of my control.*

Although few participants mentioned hearing stories of famine from their grandparents, most participants from each site indicated that they had never seen or heard of food scarcity in the valley. Rather, there was never a worry about food because the valley has traditionally been rich in food grains. It is important to note, however, that this has not been the experience throughout much of the high Himalaya, with close-by areas such as Ladakh, Spiti and Lahaul facing food shortages throughout history. In a study conducted by Dame and Nusser (2011), it was revealed that micronutrient deficiencies and seasonal shortfalls are still affecting food security in Ladakh.

> *KRF10: Kullu valley is very rich in food grains, there was never food scarcity.*

> *SF07: We've never had a worry about food. There was less production but we were never hungry. We heard about famine in other parts of the valley from our grandparents, but not in our area.*

Similarly, most department officials and academics believed that food insecurity is not presently a concern as a crisis is unlikely in the region. Some participants indicated that the access to imported food through the road system, as well as existing food policies and land would ensure that everyone has enough food.

> *DO06: Food security is not a big problem. Himachal Pradesh is promoting rice paddies and wheat in the national food security mission so that people can survive.*

> *A04: In old times the concern was okay for food security. Now we have a road network and rely on other states. We rely on all of India for food. With floods,*

food is more expensive. It comes by horses in that case. We are quite safe unless there is a big war and this is unlikely.

5.2.5 Shifting Perspectives of Food Security: Generational Differences

Gartaula *et al.* (2012) point out that socioeconomic status can influence people's perception of agriculture and food security. Variation across households and communities can be dependent on time, place and social group (Balatibat, 2004). The research data reveal that during the transition to commercial agriculture, many farmers in the region were originally reluctant to convert their fields to apple plantations because they felt that it was more important to grow foods for self-sufficiency in order to be food secure.

KRF12: The elders used to say no, if you plant (apples) here, you will die. That's why we kept the rice. The elder's decision was not right, if we kept the rice we'd have less income.

KRF07: It was my decision when my parents died. They wanted to keep it (the rice). They didn't have any idea that the apples would give that much cash. They wanted to grow food for the family.

Conversely, most farmers today believe that it is more important to grow food in order to access financial capital. Some participants even stated that their family's decision to keep fields for traditional crops was a mistake. Additionally, some participants mentioned that it used to be shameful or embarrassing to buy food from the market, that you could be viewed as a bad farmer. Today, however, everyone indicated that it has become common practice to buy food from external markets.

5.3 Environmental Drivers

The key themes of food security include socio-cultural, environmental, political and economic drivers. Concerns over climate, weather and disease were important issues in the participants' view of food security.

5.3.1 Climate and Weather

Environmental drivers such as weather, climate and disease were important aspects within the participant's perspectives on food security. There is presently fear and concern over weather variation, including hailstorms, changing seasonal patterns, and climate change among the people I worked with. Climate change may affect food systems in several ways, ranging from direct effects on crop production (e.g. changes in rainfall leading to drought or excess rainfall, or warmer or cooler temperatures leading to changes in the length of growing season) (Gregory *et al.* 2005). For apple growers, the timing and the amount of snowfall and frost within the growing season has significant influence on the quality and quantity of apples produced (Vedwan, 2006). In Solang village, farmers spoke of changes such as warmer summer months, decreasing amounts of snow during winter months and changing monsoon periods. As a result of warmer temperatures and less precipitation, some farmers have now begun experimenting with growing apples in this village.

> *ST01: When I first came to the village there was 10-12 feet of snow in 2004. Now we get 5 feet. There is more heat now in summers here. Before monsoon came until July-August. This year it has been a late monsoon, it started late July and ended at the end of September.*

Similarly, government officials and academic researchers also recognized that climatic conditions in Kullu District have been changing.

> *DO08: Climatically conditions are changing: disturbed nature, growing population, pollution, construction, power projects. It's affecting temperature. The government is taking steps to improve climate change. They encourage orchardists to grow more trees, vermicomposting, new plantations, water tanks for water conservation.*

In Karjan and Khaknal, there was a lot more fear concerning weather variations because more participants rely heavily on agriculture as their main livelihood pursuit. In contrast, participants living in Solang are relying on tourism as their livelihood. Environmental impacts including hailstorms, variable precipitation such as floods and droughts, difficulties with pollination, and changes in snowfall periods were cited as major changes in Karjan and Khaknal.

> *KRF04: Before it was good crops but now the crops are reducing. Now the weather is changing, the apples are reducing.*

> *KAHM01: During planting for 3-4 months in April we couldn't plant because of no rain. Then we got too much rain at the end of July. In 2002 we had this problem, there was a drought from June to September. After the drought we had less apples too, we weren't selling as much. We are agriculturalists so we worry about weather conditions.*

5.4 Economic Drivers

Many economic drivers can influence an individual's perception of food security, including income level, market variability and price fluctuations (Dame & Nusser, 2011). It has been argued that the concept of industrial development has been associated with the rationality of industrialization, removing food from its direct link to local ecology and culture, using food as an input for urban diets (McMichael, 2000). Participants revealed that before the monetary system was largely adopted into agriculture in this region, barter and trade between communities was important. In Solang, for instance, sheep were equivalent to the cash crop and pastoralists owning a lot of animals were seen as rich.

5.4.1 Income

Most participants indicated that over recent decades, financial gain has become the main driver in the transition towards cash cropping and the reduction of subsistence

agriculture. This is largely reflected in people's decisions to move away from growing traditional crops. In all of the study sites it was revealed that the decision to convert their fields was jointly made by family members, the father-in law, the male of the household, parents, and/or grandparents. As previously mentioned, many respondents view traditional varieties as being less economically viable. For example, although red rice is a desirable crop, there is some local demand and it can be sold for upwards of Rs 130/kg, there is currently little to no market access and the productive output is lower than cash crops such as apples.

> *KAF08: There was no income in millet and rice so we grew apples. This was five years ago. Some of the fields were giving good crops so we kept them and converted the bad ones to apples.*

The goal of financial gain and higher income levels has been an important driver towards commercial agriculture, but it is also viewed as one of the one of most important aspects of attaining household food security. When asked if they felt more or less food secure after transitioning to commercial agriculture, participants felt more food secure when they had money and could buy food from the market, versus owning land and growing food for self-sufficiency. In Solang, individuals felt more food secure when they could receive money from tourism; whereas in Karjan and Khaknal, individuals felt more food secure from earning financial capital through selling cash crops.

> *KRHM01: Now money comes out of the land. If there was no cash, maybe we would not do farming. If there was no cash crop, I would earn money from a job.*

> *KRHM04: Now I think we are more food secure because we have money and we can buy. Before we had crops with no money but now we have both.*

5.4.2 Price Fluctuations

On the other hand, financial constraints and price fluctuations were causes for concern for selling commercial crops and buying food in the market. When asked if they ever worried about the price of their crop, many participants, particularly those living in Khaknal and Karjan, admitted that they feel a sense of worry over supply and demand in the market and how it can affect the price they get for their crop. When more apples are being sold in the market, farmers can receive around Rs 30/kg. However, when less apples are being sold in the market and there is less competition, farmers can receive upwards of Rs 45/kg. The male(s) of the household are typically the ones to manage the marketing side of cash cropping. Specifically, it is the male who takes crops to local *mandis* and deals directly with the financial aspect of selling crops to commissioning agents. Not surprisingly, farmers would often receive rates that fluctuated because of market demands. The cost of buying food in the market has also been increasing and many participants from all study sites revealed concern.

> *KAF07: Yes, there's tension about the prices. The farmer gets less price and benefits but buying foods are always getting more expensive.*

In some cases, farmers are moving away from farming altogether. People living in all three study sites have largely moved away from subsistence agriculture as a livelihood, but all or most still had their own gardens that provides some fresh food for the family. In Khaknal, farmers have begun to contract out their land to others who wish to grow apples, enabling them to increase their financial capital and work in other sectors of the economy, such as tourism, education or the government. In Karjan, some farmers have been renting out land to people who want to continue to grow rice. In many cases,

farmers who are renting land for red rice cultivate and harvest the crop, giving half of it to the landowner.

> *SF02: Who is farming is becoming poor; who is into tourism is rich. Before there was no work so people relied on agriculture. In 1990 this changed.*

> *KFM06: This year we have contracted out land; my husband gets money from a tourist vehicle and we get a better rate from contracting now.*

Participants in Khaknal who were contracting out their land to others could receive rates of 3.5 Lakh Rupee (1 Lakh is equal to 100,000 rupees) per season, depending on the size of the landholding. In contrast, participants in Karjan contract out their land in order to continue to eat red rice.

5.5 Political and Institutional Drivers

In addition to socio-cultural, environmental and economic drivers, political and institutional drivers also play key roles in the concept of food security. In the 1960's, apple cultivation was heavily promoted in the Kullu region for economic salvation (Sharma, 2010). Subsidized apple saplings were provided at nominal rates from government-approved nurseries and a massive campaign was launched by government agencies to popularize apple cultivation. More importantly, farmers were granted government land for planting apple orchards. Today, government agencies continue to provide subsidies for seeds, fertilizers and machines, thereby fostering the implementation of new inputs and technologies. In addition, political drivers are influencing formal and informal learning processes surrounding the adoption of current agricultural practices.

5.5.1 The Promotion of Agriculture through Formal and Informal Learning

Mezirow (1991) points out that the major domains of adult learning are communicative, transformative and instrumental learning. While communicative learning is related to understanding what others mean when they communicate with you (e.g. feelings, values, or intentions), and transformative learning is associated with the processes of reflecting on individual and social dimensions, instrumental learning refers to learning how to successfully achieve desired ends (e.g., how to propagate a new crop) (Mezirow, 2000). It was found that government agencies, such as the state Department of Agriculture, are facilitating formal instrumental learning processes associated with agricultural practices. On a regular basis, farmers can receive free education and support training for topics such as area expansion, crop diversification, improving production, and the implementation of new varieties and crops.

> *DO08: 25 people can come to farm school for education for six weeks. Each week a scientist speaks about a list of topics. They have a schedule of problems and a discussion of questions.*

> *DO10: The ATMA message is given to all farmers'…schemes run by departments, timing of procedures, every quarter we publish to farmers. We share success stories of successful farmers. We share methods they have adopted and bring our message to the field level.*

When asked how and why an individual began adopting modern agricultural technology, it was revealed that many farmers living in Karjan and Khaknal adopted new techniques because of advice they had received from agricultural scientists and government departments through training they had taken. This specifically related to the use of modern agricultural tools such as power trailers, chemicals and vermicomposting. One

participant in Solang also mentioned that he had attended a training camp about learning how to grow apples.

> *KAF09: We've used sprays and fertilizers since apples started. The horticulture department tells us what to spray. The come to the village. We get subsidies from the departments.*

As well as formal learning, informal learning processes were observed, particularly in Karjan and Khaknal. Many farmers explained that they had converted their rice fields to apple fields as a result of seeing other farmers doing it. Similarly, agricultural practices such as a vermicomposting and chemical applications were in some cases adopted as a result of informally learning from others.

> *KRF04: We saw others and decided to grow the apples. Where we had rice fields we planted trees later, around 20 years ago.*

> *KRF01: We've used vermicomposting since 4 years. I saw someone else using it. I was trying to get organic apples. All people are using chemicals.*

5.5.2 Disease and Reliance on Chemical Inputs

Government extension programs work to promote the continued use of industrial agricultural practices, including the application of chemicals for disease and insects. Most department officials and academic researchers indicated that these practices have been widely adopted in order to maximize the productive output of apple trees. However, a few department officials and academics indicated that chemical reliance has negatively affected soil fertility, built up more pesticide resistance in bacteria and insects, and led to a decline in crop productivity.

> *DO01: Bacteria and insects are becoming resistant to chemical sprays. More research leads to more spraying which leads to more resistance.*

DC09: Factors responsible for the decline of crops have been pesticides and loss of soil fertility.

All farmers that I interviewed rely on chemicals for a number of reasons, including the control of disease. Most farmers from each community admitted that they began relying on chemicals after a disease outbreak. In Karjan and Khaknal, participants mentioned that they started relying heavily on chemicals when apple scab in the early 1980's affected the area. In Solang, a recent disease on kidney beans caused most participants to use chemical pesticides.

Many participants from Karjan and Khaknal also admitted that they now require chemical usage in greater frequencies. Canker, root rot, collar rot, leaf fall, black spot, and apple scab were mentioned as some of diseases that can affect the apples and kill the apple tree. Similar to the concerns raised by government officials and academics, a few participants mentioned that the impact of an over-dependency on chemical inputs has had negative effects on the agricultural system. Negative impacts of chemicals affecting the quality of apples, an increase of disease and poor soil quality were all mentioned as concerns.

KAF18: Diseases are coming and trees are dying. People used to spray very little. It is not improving, if people use more sprays, more diseases are coming, trees are dying. Some people sprayed too many things and their apples started rotting.

A few participants from each site noted that ingesting foods sprayed with chemicals could have negative effects on human health. One participant in Khaknal even mentioned that he chose to stop using pesticides because his labourer experienced negative side effects after spraying his apples trees.

> *KRF06: The labourer for the sprayer time was getting a reaction. Scientists are now advising to not use pesticides because of the side effects.*

As well as managing disease and insects, chemical inputs are also used to suit consumer demands. Some participants living in Karjan and Khaknal often indicated that in order to compete for buyers in the market and receive a good rate, apples had to look red and shiny.

> *KAF17: I would avoid chemicals but there is competition in the market. The people who buy never see purity but they see shine.*

Although many participants revealed that overall the use of chemical inputs has caused negative impacts, there is a continued dependency and increasing reliance on their usage to this day. This is significant for food security because many farmers have become overly reliant on external inputs for commercial crops, which will no doubt affect farmers financially, cause long-term environmental impacts and impact the health of consumers, farmers and hired labourers.

5.5.3 The Promotion of Sustainable Agriculture

Although the state government now offers support in the form of subsidies and incentives, organic agriculture has yet to be adopted on a large scale in my study sites. For example, the Department of Agriculture is currently providing incentives of Rs 10,000 to any farmer that can become organically certified, but none have done this. Although the benefits of organic farming are now being recognized, many department officials currently believe it is not possible to completely adopt it in practice. Some department officials indicated that it was not possible to completely adopt organic agriculture for reasons such as climate and the risk of fruit losses.

DO01: Organic is not 100% possible here due to fruit losses. We cannot suggest other alternatives; we cannot provide advice away from research and technology.

Vermicomposting, a process whereby organisms convert organic waste into fertilizer, is the most common practice that has been adopted by farmers in my study areas and throughout the region. Some farmers from Karjan and Khaknal believed that they could only adopt organic agriculture is if everyone in their community did.

KAF12: I think slowly we can stop chemicals because it's not good for the apple trees and other crops. When we started chemicals, so many diseases came and it's not good for our health.

Additionally, few participants in Karjan and Khaknal are engaged in organic farming through self-interest. For most participants, the adoption of organic agriculture was seen as a risk as people feared that they could lose their crop.

KRF12: We can only do organic farming if everyone else started. If we will start and others are using chemicals, maybe we'd lose our crop.

In terms about learning outcomes associated with sustainable farming techniques, it was evident that participants understood the negative impacts of using chemical inputs through formal and informal learning processes, such as the media, or from people living in their community. However, it is important to note that although farmers understood the negative impacts of chemical usage, most if not all participants were still relying on chemical inputs in some way. More importantly, it was not evident that other aspects of sustainability were being recognized within the concept of food. No participants mentioned the negative impacts of monoculture farming or the benefits of growing food locally versus buying imported food.

There are currently a few groups, researchers and NGO's aiming to promote sustainable practices within the Kullu District. At the Y.S Parmar University in Palampur, there is a small group of researchers investigating the effects of organic agriculture on crop productivity. Although the research is in its infancy, researchers have been examining the impact of chemical fertilizers on micronutrients within the soil, traditional ways of managing diseases without the use of chemicals and the impact of switching from inorganic to organic agriculture.

> *OA: Organic is in its very infancy stage. Farmers must be given alternatives. We are in the initial stage of research, but there is total organic farming in one village already.*

> *OA: When switching from organic from inorganic there is an initial decrease in productivity, poor soil quality. It takes 3 to 5 years to promote microflora, the convergent period of 3 to 4 years. Then the soil health improves, crop yields will increase, less pests and disease. The yield will be sustained. We're looking at maize, rice, pulses, all vegetables, garlic, onion, ginger.*

In addition, an organization called Jagriti, located in Badha village in the Kullu District, works predominately on sustainable livelihoods for hill women in the region. The group currently works in conserving red rice and mountain millets, sustainable agro-forestry and non-timber forest products. It also focuses on other projects including the conservation of indigenous bees, education and nutrition programs, and ecological sanitation. Presently, Jagriti runs a marketing initiative called "mountain bounties" which markets various products including amaranth, millets and flours, soaps and traditional mountain teas.

> *JA1: If there is consumer demand, there will be a market. Because once these things are gone, they're gone forever. We focus on amaranth, buckwheat, finger millet, soybeans and beans. We're not trying to improve quality; we're trying to*

find a market. More people are phoning us. This is reviving traditional foods. We are encouraging stone ground flour… not just the grain but also the practice.

More importantly, they have helped to create market demand and access for traditional crops, providing financial incentives for communities to continue harvesting these crops. The focus is not just the cash economy, but how to find value for traditional crops within the current system and how to encourage growth of crops such as finger millet, amaranth, buckwheat, proso millet and foxtail millet.

5.5.4 Food Sovereignty

It has been argued that food sovereignty differs from the food security concept in that it ignores how power relations determine favoured production, distribution and consumption patterns within the food system (Rudolph, 2012). The recent history of agriculture in the region is significant because the state government has played a significant role in favouring the production of apple cultivation, particularly in the 1960's. Shortly after Himachal Pradesh was created in 1971, the state government promoted apple production by providing saplings at nominal rates, giving subsidies for cultivation and providing farmers with government land for planting (Sharma, 2010).

Then in 2005, Himachal Pradesh adopted the amended APMC act, allowing farmers to sell their produce to private parties, retailers and food chains (Pandey *et al.*, 2013). In villages in Himachal Pradesh, the company Amar Him Agro is now procuring food for OSI foods, a worldwide supplier of meat and produce. Today, farmers in villages such as Karjan can receive a fixed rate for selling iceberg lettuce to Amar Him Agro, a company that supplies produce to major multi-national companies like McDonalds and Kentucky Fried Chicken. The company functions in two ways: 70 percent of the time land is taken

on lease, while 30 percent of the time farmers are given seedlings in order to grow produce. Currently in Karjan, farmers can receive free seedlings, technical support, chemicals, and a fixed rate of around Rs 25/kg for growing iceberg lettuce. Packing material is also supplied to the farmer, and the harvested produce is picked up in trucks that have cold storage facilities.

> *KAF05: There's a company that gives us seedlings. If we grow other things sometimes the market is low. For iceberg lettuce we get a fixed price. It takes two months to grow. We have to take salad to the road and the company takes it. It goes all over India. I heard about it because a boy from the village is a partner and he got us into it.*

Farmers working with Amar Him Agro must follow GAP (Good Agricultural Practices) guidelines, which are codes, standards and regulations that have been developed by the food industry, government and NGOs (FAO, 2007). The objective of GAP is to

- Ensure safely and quality of produce in the food chain
- Capture new market advantages by modifying supply chain systems
- Improve natural resource use, workers' heath and working conditions
- Create new market opportunities for farmers and exporters in developing countries

When speaking to two employees representing the company, they indicated that farmers can receive education about irrigation techniques, how to use chemicals, and receive advice from scientists working in close proximity. The main criteria for choosing suitable sites all relate to the land: the quality of the soil; irrigation procedures; and whether it is near a main road for the supply chain. One important aspect to note is that many of these

practices are going against traditional practices, such as the use of farmyard manure (FYM) as a fertilizer.

> *AA1: The land holdings are very small and the culture is not there. It's not taken seriously here. Documentation is a big part of this. Food safety is not taken seriously here. E. Coli is one example. E.Coli is mainly from livestock. Our fields have to be a certain distance away. People put manure on their fields.*
>
> *AA2: We currently use Bayer for fungicides and insecticides. We currently only have 74% compliance because chemical usage is not there.*
>
> *AA2: McDonalds follows GAP for safe and healthy food, environmental issues, labour hygiene, workers' welfare. Everything must be traceable for recalls, the papers must be there.*

Therefore, in order to sell produce to large companies like McDonalds, farmers in Karjan must comply with guidelines that favour modern agricultural practices, which can go against traditional sustainable farming techniques. As a result of recent policies, farmers are now able to sell directly to private companies instead of government-regulated markets. Although farmers can receive a fixed rate for their crop and are therefore less vulnerable to market fluctuations, participants who have chosen to grow crops for multi-national chains are immersed in a system that heavily favours the production and distribution of one crop and requires the use of industrialized techniques and products. This relates to the concept of food sovereignty because it reveals an increasing dominance of private institutions, thereby removing individuals from the center of decision making within the food system. This in turn relates to food security because although there are advantages in directly selling produce to a private company (for instance, receiving a fixed rate for iceberg lettuce), farmers also have less choice in what they produce and the types of agricultural practices they use. Although no participants mentioned putting their land on lease to the company, farmers who have done so in other

villages ultimately have less control about what is produced on their land, and have no control on how to take care of their land.

5.6 Food Utilization

Another driver of food security is food utilization, referring to safe and nutritious foods that meet the dietary needs of a household or individual (WFP, 2009). This area can be more broadly related to clean water, sanitation, and the use, conservation and processing of food commodities (Simon, 2012). More importantly, the ability of the human body to ingest and metabolize food, nutritious and safe diets, an adequate biological and social environment and access to proper health care can influence the food security of an individual or household (Gross *et al.*, 2000).

5.6.1 Dietary Changes

Dietary transitions refer to changes in the types of foods that households and communities are able to access and consume (Finnis, 2006). Rising incomes and the influence of globalization have contributed to changes in the Indian diet with a slight decrease in cereal consumption and an increase in pulses, fruits and vegetables, milk, meat and edible oils (European Commission, 2007; Pandey *et al.*, 2013). Participants revealed that dietary preferences have shifted away from staple foods including millet, maize, barley, mutton and red rice and moved towards the consumption of cereal crops, beans, fruits and vegetables bought from local vendors. Most participants from all study sites indicated that they now eat traditional cuisine rarely or for special occasions, such as weddings or festivals.

> *KAF10: 50 years back we used to have corn rotis, wheat, pembra with rice, beans and spinach. Now everyone has rice, wheat, pulses, and vegetables. We've almost stopped eating traditional foods. Our diet used to be very heavy.*

Interestingly, a few participants living in Solang mentioned that they currently continue to eat traditional foods, and eat them more frequently during winter months. However, it is important to note that participants also indicated that they consume traditional foods for pleasure, not because it's a necessity.

> *SHM01: I feel that we eat traditional foods in winter, like pembra, siddu. We're busy in summer so we don't have time.*

> *SF07: In the winter we eat a lot of dried mutton, corn and millet rotis, kathu, kodra and honey.*

It is also evident that there can be generational differences in food preferences; some older household members stated that they no longer cook traditional dishes because their children do not like the taste of traditional foods. Finnis (2006) observed that dietary transitions as a result of adopting a cash-cropping system might be accompanied by local dissatisfaction with local food taste and variety. More importantly, greater food choices exist today for households than they did in the past.

> *SF02: Before we were less secure because we didn't have a choice. Now the young kids don't eat the old food. My father and my generation we had to eat old food. My kids don't like it. They have choice and money now.*

The increase of vegetarianism, for example, is one of the most notable changes in dietary preferences. As previously mentioned, people living in this region have traditionally relied on dried goat or sheep mutton during winter months. Today, many people have the choice to be vegetarian as a result of taste preferences and religious and spirituality

teachings, the year-round availability of vegetables in the market and the money to buy them.

> *A05: Vegetarianism gives you peaceful thoughts and happiness, what you eat gives you peace of mind.*
>
> *KAF20: When I was young we ate meat, but not now. Now we have teachings, religious and spiritually. On T.V. they give us holy teachings, they come to the villages.*

Households now have greater choice in their food habits, the taste of traditional crops is often not favoured by the younger generation of participants and traditional local cuisine is now being eaten more rarely or on special occasions. Overall, dietary diversity, or the number of foods consumed over a given period, has a role in food security in that people are considered to be food secure if they have access to a variety of socially acceptable foods, not simply an adequate amount of food to feel full (Anderson 1990; FAO, 1996).

5.7 Food Access

5.7.1 Bartering as a Means of Accessing Food

Food access is a dimension within the concept of food security that can be referred to as a household's ability to acquire adequate amounts of food regularly though a combination of purchases, barter, food assistance or gifts (WFP, 2009). For mountain communities, access to markets is critical for household consumption and trading activities (Dame & Nusser, 2011). However, when buying food from markets was rare, participants mentioned that items such as sugar and salt were rarely purchased and used sparingly. As mentioned, the barter system previously existed in all study site communities, and some continued bartering for items up until the 1990's.

SF01: Some years ago we used to sell dried spinach to other people. It was a bartering system with corn.

KRF02: I had rice until 1993-94. We didn't sell the rice but sellers came from Spiti. They used to bring soap, cookies, matchboxes, etc. We used to give corn to them. This finished between 1985-90s.

KAF10: Rice was mostly sold locally to Lahaul Tribals. This was an exchange for wool and sheep or goats meat up until the 1970s.

Although all study participants now rely heavily on market systems to provide food, some farmers growing red rice in Karjan are not only keeping the rice for themselves, but are continuing to exchange or sell their rice to people living in the surrounding community.

5.7.2 Land as a Link to Food Access

Land is not only a natural resource, but also a social, economic and cultural resource. It is a means of production as well as a status symbol, determining a great extent a person's standard of living in rural communities (Gartuala *et al.*, 2012). Agriculture in Himachal Pradesh is dominated by a large number of small-scale holdings that are predominately owner occupied. Land holding sizes in each village ranged from 2 bighas to 40 bighas (5 bighas are equivalent to 1 acre). Many participants in each study site recognized the importance of owning or acquiring land to feel food secure.

SF05: With cash we can get a good education. With money we have modern facilities, but if we have our own land we are food secure.

KAF23: We feel more secure if we have land. Not for us but for others also. We sell and satisfy other people with growing their food. Financially we are more secure.

Another important consideration is a gender dimension associated with acquiring land. The land is in most cases inherited by males because it is assumed that the women of the family will get married and acquire land from their husband's family. Therefore, women who are unmarried may not receive any land holdings from their family members. It was also revealed that widows could face similar challenges when losing their husband. One participant living in Khaknal lost her husband and inherited 2 bighas of land when the land was divided. This is significant because, although she acquired land from her husband, her family did not have money to afford more land and therefore have more money to access food from markets.

> *KRHM05: I don't have a husband and if there is no money and we can't buy, what will we do? I can't say the names of things we can't afford, there are so many things we want but can't have. 2 bighas is not enough.*

Similarly, when interviewing participants living in Kraknal who owned less than 3 bighas of land, including those with no land, all felt more food insecure. One household felt more food secure through accessing food from government ration shops, while another household indicated that it was not enough. This is an important consideration for food security because participants who have less land and are continuing to rely on agriculture for their livelihood sell less food and therefore acquire less money to buy food from external markets. Some of the participants living in Khaknal who have little to no land as a result have less money to access food from markets.

> *KRHM07: We are a BPL family for government ration shops and it's not enough. It is difficult because we won't make much money. It goes for our living expenses and paying for things in society. We can't afford land but I haven't missed a day's meal.*

Overall, most participants from each study site recognized that owning and acquiring land was an important function of their personal food security, and some worried about their food security as a result of owning less land.

5.8 Food Availability

Food availability is closely tied to access, defined as the amount of food that is present in an area through all forms of domestic production, imports, food stock and food aid. With the presence of government ration shops as well as local and external markets, there has been a considerable change in local food production and availability. Many participants indicated that throughout recent history it has become much easier and simpler for households in the region to acquire food. However, some participants found that the overall production of their cash crops was decreasing.

5.8.1 Food Production

As a result of changes in the food system, participants noted that their household food production has gone down. Although some participants were continuing to grow traditional crops, particularly in Solang and Karjan, many admitted that they were no longer growing enough to sustain their household food needs and instead relied on purchased food items for their food security. In the case of those growing cash crops, some participants in Karjan and Khaknal admitted that the overall production of apples was also decreasing. While some participants did not know why, others attributed decreasing production to smaller areas of land for growing crops, hailstorms, climate change and disease.

> *KAF11: The yield is very poor now. The expected yield was 2 crole, 65 lak boxes. This year the department estimated 2.5 crole. Now it is less than 2 crole.*

> *KRF06: Due to production we have good prices so in coming time we don't worry, but areas in Himachal Pradesh are day by day squeezing, making roads, houses. The area is squeezing. Area under production is squeezing.*

Overall, participants that were affected by decreasing yields for their apples worried about their financial security, talked about diversifying their fields to grow other fruits, or mentioned that they would go back to growing traditional crops such as rice.

5.8.2 Food Storage

Most participants indicated that in previous years, foods such as millet, wheat, rice and kidney beans could be stored in homes for up to a year or more to provide a sense of food security during winter months or in case of a famine or crisis. Although large storage containers can still be seen in traditional homes to this day, many are no longer being utilized. Instead, people are generally storing grass for cattle feed and firewood during winter months. Most participants that I spoke to in Karjan and Khaknal indicated that they no longer store foods, largely because foods sold at government ration shops or local vendors are easily accessible year round.

> *KAF16: We have millet. We have a little bit but it's useless because we used to use it but it's just lying there because no one eats. In the olden days we stored it in case there wasn't enough to eat but now we don't store it, it lays there.*

Conversely, households in Solang continue to store food for three months or longer. Most if not all participants were storing foodstuff such as *saag* and leaves of *kathu*, potatoes, lentils, cooking oil, wheat and dried mutton. Due to its isolation and proximity to a river, the village can be closed off to major road access in the case of heavy snowfall or rainfall events.

> *SF07: We have food storage for at least three months because of heavy snowfall in the winters. We also store from July to August because of monsoon. Before we stored for one year. Now we store for three to six months. We store rice, dal, cooking oil, wheat, both from the market and from our own garden.*

Thus, participants living in Solang are continuing to store food grains because of their geographic location and isolation. In contrast, participants living in Karjan and Khaknal are no longer choosing to store food grains because they have better roads and therefore easier access to external food markets. In terms of food security, the storage of the previous year's harvests can provide a buffer for households in case of a crisis caused by natural calamities, food not reaching local markets or economic changes.

5.8.3 Seed Banks and Saving Traditional Seeds

Some households continue to save traditional seeds for various reasons, including religious ceremonies or puja, astrology, or to ensure a crops' future survival. Red rice, amaranth, barley, millet, mustard, soybeans, kidney beans, black beans, corn, barley and spinach are among some of the traditional seeds that farmers indicated that they are currently saving for personal use or exchange. Currently, no agency or organization is formally saving traditional seeds for sale or distribution to farmers in this region. Instead, farmers are primarily sharing seeds and traditional crops amongst themselves and people living in their community. Although it is more common to see traditional crops being grown in the villages of Solang and Karjan, a few participants living in Khaknal are saving traditional seeds for similar reasons. In all three sites, the traditional seeds were kept and distributed by the older generation of farmers.

> *KAF12: I'm saving amaranth and millet because it's traditional. I want to plant them in the future because the new generation is forgetting so we want to keep it.*

KAF23: We still have millet, mustard and corn traditional seeds. We get this from villagers, it's not expensive.

KRHM08: Mustard, soybeans, corn, barley. Little we can grow. Sometimes we are switching seeds. We exchange corn and barley if we have poor seeds and we get from others.

5.9 Chapter Summary

Overall participants identified with feeling more food secure when they received financial capital from selling crops commercially then from growing crops they themselves could eat. However, generational differences in perception exist, as the older generation of farmers felt more food secure by growing food for self-sufficiency whereas the new generation feels more secure with having money to buy food from the market. Closely tied to financial gain was the ownership of land, an important dimension of people's personal sense of food security. The few participants that owned little to no land worried about their household food security more than people who owned larger amounts of land. As well, there was an important gender dimension associated with inheriting land, and women who are unmarried or widowed may be more vulnerable to owning little to no land.

Overall, geographical location has significant importance for political and institutional drivers, as well as food availability and the access to food. When examining transitioning agrobiodiversity in the Great Himalayan National Park, it was observed that villages that had better road access were more exposed to penetration of market culture, market-dependent food chains, and the promotion of HYVs by extension workers (Grassroots, 2012). Similarly, it was found that Karjan and Khaknal were more influenced by political and institutional drivers. In Karjan, land that was located near road access was a key

criteria used by companies for selecting farmers to privately grow iceberg lettuce, for example. As well, farmers living in these sites were more heavily engaged in adopting a modern agricultural system and received more formal training for learning about agricultural practices from local departments and organizations. In terms of food access and availability, participants living in less geographically isolated areas were heavily dependent on purchasing foodstuffs. Participants in Solang had less accessibility to markets at certain times of the year, and therefore stored food longer and grew food more for personal consumption.

Lastly, when exploring drivers and dimensions within the framework of food security, it was found that there is worry and fear over the production of food. Interestingly, many people feel more food secure knowing that they can go back to the "old way of life" by growing traditional foods in the case of a famine. However, as a result of changing dietary preferences, lack of market access, knowledge loss, and the labour-intensive task of growing traditional crops, it is becoming rare for people to cultivate the old foods. The transfer of knowledge for growing traditional crops is also becoming much less uncommon. Still, cultural attitudes towards traditional crops reveal that many participants continue to place value in these foods. Traditional crops and foods are no longer necessities for household food security but people continue to grow and consume them for special occasions or for pleasure.

Table 3: Summary of Major Findings

	Karjan	Solang	Khaknal
Socio-Cultural			
Recognizing health benefits of traditional crops	☑	☑	☑
Traditional crops as a form of security for the present	☐	☐	☑
Traditional crops as a form of security for future	☑	☑	☑
Youth growing traditional crops	☑	☑	☐
Environment			
Fear over weather variations on agriculture	☑	☐	☑
Economic			
Financial capital as a form of security	☑	☑	☑
Concern over rising food prices	☑	☑	☑
Political			
Reliance on chemicals for disease	☑	☑	☑
Reliance on chemicals for selling to markets	☑	☐	☑
Formal learning (Agriculture training)	☑	☑	☑
Food Utilization			
Dietary changes away from traditional crops	☑	☑	☑
Food Access			
Owning land as a form of security	☑	☑	☑
Decreasing production of commercial crop yields	☑	☐	☑
Food storage	☐	☑	☐
Traditional seed saving	☑	☑	☑

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

Food security can be viewed as a complex and multi-dimensional phenomenon comprising not only adequate nutrition but also social purposes and cultural meanings (Gartaula *et al.* 2012). Furthermore, it has been argued that food security is too complex to ever be truly captured by a single indicator. Nonetheless, by examining local perspectives of food security, how people value and perceive food security can be better understood (Gartaula *et al.*, 2012). This contention was explored to reveal how a transitioning food system has changed people's knowledge and practices surrounding food, positive and negative perspectives of commercial agriculture, and perceived vulnerability and risk associated with the transformed food system. The overall purpose was to explore the key determinants causing the transition of food production in a mountainous region of India and how this transition has impacted local perspectives of food security. The research objectives were:

1) To explore local perspectives on food security;

2) To determine how government extension efforts, policy and research has impacted local food production;

3) To examine learning outcomes related to agricultural knowledge and practice; and,

4) To make policy recommendations related to food security.

The research was conducted in the Kullu District of Himachal Pradesh, India. A qualitative approach, consisting of participant observation and semi-structured

interviews, as well as literature and document review, was used to obtain data for the research. The following draws together the findings of this research in order to offer conclusions and recommendations in relation to each of the objectives.

6.2 Local Perspectives on Food Security

The first objective was to explore how local perspectives on food security are impacted by an agricultural system that has transitioned from a subsistence land-use system to a largely commercial cropping system. As outlined in the results, the data revealed how perceptions of food security can change when local farmers depend on external markets for the sale and purchasing of food crops.

6.2.1 Perceptions of security

As a result of the transition towards growing commercial crops and having a strong dependency on external markets for food, the perception of food security has ultimately changed. Economic considerations were key drivers of food security and most if not all participants believed that financial security was necessary for attaining food security. Most participants in each study site indicated that they felt food secure at the individual and household level when they had financial security. However, economic variables revealed perspectives of risk. Most farmers that I spoke with also often worried about their income, market fluctuations, the rising cost of chemical inputs and the rising cost of food in the market. The data also revealed generational differences in perspectives, with many participants indicating that their parents or grandparents were originally reluctant to convert their fields because they felt food secure by growing their own food.

Additionally, a strong correlation exists between income and access to food. When participants owned little to no land, they ultimately had less access to food sold in external markets and therefore felt less food secure. This is an important consideration for food security, especially since there is often a gender dimension associated with land ownership, as widowed or unmarried women are in some cases less likely to own or inherit land. It was found that the distribution of cheaper food grains through the public distribution system helped to make a few participants feel more food secure, while others said it was not enough.

When exploring environmental dimensions within the framework of food security, it was found that many local farmers worried about the production of food, particularly apples. Similarly, some of the research participants admitted that the overall production of apple crops has been in decline due to weather. Weather and climate were identified as risks within people's perspectives on food security, as farmers worry about the production of crops in response to temperature variation, hailstorms and changes in precipitation. Other perspectives on risk arose from an increasing reliance on chemical inputs, disease and shrinkage of land size available for agriculture.

Closely tied to the production of food is food availability. As a result of recent changes in the food system, the availability of food has also changed. Although it is much simpler and easier to access food, participants indicated that the overall production of their crops had decreased, and all participants indicated that they now store less food. In terms of food utilization, the data show that dietary preferences and food choices have changed. Vegetarianism has become more attainable as a result of changes in food access and traditional local cuisine is now eaten rarely or only on special occasions. A few

participants indicated they felt more food secure having greater choice in the types of foods they can eat. This is primarily a result of imported foods being available year round, which has affected people's choice in what they can eat.

Local perspectives revealed socio-cultural and religious values of traditional crops. Interestingly, participants from all study sites felt more food secure knowing that they could go back to the "old way" of life by growing traditional foods in case of a food crisis. Some participants in Karjan indicated that having the ability to grow and store traditional foods, particularly red rice, helps them to feel food secure today. A few participants from each site are also still saving traditional seeds like amaranth, finger millet and black lentils for religious reasons or special occasions such as festivals and weddings. Although cultural attitudes towards traditional crops reveal that people still place value in these foods, most people have stopped growing local foods as a result of changing dietary preferences, lack of market access and because it is viewed as a labour-intensive task. Ultimately, the data revealed that these crops have cultural importance and value, but are becoming less common because they do not provide financial security - underscoring a changing attitude towards growing traditional crops. This is significant for food security because traditional crops provide people with a sense of security in times of crisis, even though these crops are slowly disappearing from the region. In reality, traditional crops can also play an important role in food security in that they require fewer inputs, can be richer in energy and are adapted to growing in the local region (Kuniyal *et al*., 2004).

Overall, this research reveals the heterogeneous impact of adopting a commercial cropping system. In many ways, participants feel food secure. For instance, people feel

food secure from having financial success from commercial cropping or tourism, and by having greater choice in what they can eat. However, climate change, decreasing production, income, and market fluctuations revealed feelings of risk and worry. This was particularly true for those who had less land for growing cash crops, as they felt food insecure.

6.2.2 Links to other research

In other communities that have transitioned from subsistence to cash cropping, similar heterogeneous impacts were evident. In the Ilam district in eastern Nepal, for example, the government has tried to focus its efforts on the diversification of agriculture through the promotion of cash crops so that farmers can earn money to meet their food needs. Despite pressures on the land, the growth of cash crops has allowed farmers to earn money in order to buy food and thus increase their ability to achieve food security (Takahatake, 2001). However, problems with plant disease, losses in production and highly volatile market prices have become uncertain risks for farmers in the region (Takahatake, 2001). Therefore, although farmers had gained financial capital through the promotion of cash crops, they became exposed to the same risks within the food system as I found in my research.

In the context of environmental drivers of food security, Vedwan (2006) found similar findings to mine when examining local perspectives on climate change in the Kullu District. When asked about the role of climate in apple production, local farmers attributed poor production to reduced snowfall and its changed timing. Similarly, others considered hailstorms as extremely destructive weather events because of their impact on crops, including apples (Vedwan, 2006). Overall, it was apparent that climate change had

given rise to cultural notions of risk and vulnerability within local communities.

Market integration has been cited in the literature and in this research as one of the main reasons why food preferences have changed. In the Kolli Hills of India, Bohle (1992) found that market integration through crop commercialization has led to a dependence on purchased foodstuffs and a movement away from traditional foods. Farmers in this area have been growing cassava as a cash crop, subsequently moving away from growing millet varieties and instead favouring rice purchased at ration shops or local markets (Bohle 1992).

In the Central Himalaya, similar trends have occurred in agriculture. Population growth, land fragmentation and insufficient yields of traditional crops compelled farmers to adopt HYVs. Seed and labour exchange systems are disappearing and community participation in natural resource management has led to a decrease in socio-cultural integration (Nautiyal *et al.*, 2008). There also has been no systematic documentation of ethno-medication uses of traditional crops, and there have been signs that the younger generation is unaware of the distinctive properties of the traditional land-use system (Nautiyal *et al.*, 2008). Still, people place religious value in traditional crops. The festival *Harela* encourages farmers to grow and conserve five to seven traditional crops/landraces, such as Maize, Sarson, Wheat and Gahat (Nautiyal *et al*., 2008). At the day of *Harela*, all plants harvested are offered to the deities and therefore taken as a blessing by all the family. Although it has been noted that festivals are now becoming a social symbol rather than the exact religious cause, people continue to value traditional crops. Clearly, socio-economic and cultural changes have led to a decline in diversity-

based traditional knowledge in the region, as some traditional varieties of crops have gone extinct (Nautiyal *et al*., 2008).

6.3 Government Policy and Extension Efforts

The second objective was to determine how government extension efforts, policies and research have impacted local food production in the region.

6.3.1 Government schemes and policies

This research considered how household strategies regarding food production are influenced by government schemes such as farmer training and education, vermicomposting and the distribution of pesticides and crop protection. Through the promotion of a commercial system of agriculture, the government has played a role in increasing farm income and rural employment, which has helped in some ways to improve individual and household food security. The results of my study show that the main role of state-governed schemes is to provide education, training and dissemination of agricultural science and technology to farmers within the context of a commercial cropping system. Through incentives and subsidies, farmers are encouraged to grow commercial crop varieties, adopt modern technology and manage disease with external inputs. With a strong focus on improving knowledge of commercial fruit and vegetable cultivation, there has been little to no recognition of conserving traditional varieties, traditional agroecosystems or agrodiversity within the education provided.

Overall, it was revealed that government schemes and policies at the state level lack cohesiveness and can be contradicting. For instance, the department of agriculture currently offers subsidies on pesticides, but recently implemented an organic policy in

their five-year plan that focuses on promoting the use of organic fertilizers and vermicomposting. This contradiction is also reflected in the perspectives of department officials. Although one department official recognized that insects and diseases are becoming resistant to chemical sprays, another participant indicated that they could not suggest organic alternatives due to the risk of fruit losses. Furthermore, the findings reflect the differences in perspectives pertaining to disease management on commercial varieties.

When Himachal Pradesh adopted the amended APMC act in 2005, it allowed farmers to directly sell their produce to private parties, retailers and food chains. As a result, farmers living in Karjan began growing iceberg lettuce to supply the demand for multinational fast food chains like Kentucky Fried Chicken and McDonalds. This brings up many concerns related to food sovereignty as well as security. Although selling to a company such as Amar Him Agro reduces the vulnerability of factors such as price fluctuations in the market, it also removes choice in regards to production from the farmer. Under this approach, farmers are required to comply with Good Agricultural Practices (GAP) that promote standardized techniques which move away from traditional practices, such as the use of farmyard manure as a fertilizer. As well, supplying produce to multinational fast-food chains does little to promote health to people living in India or elsewhere, a key component of food security.

Regarding national agricultural policies, particularly the public food distribution system, the perspectives of participants varied. One participant indicated that government ration shops helped them to feel food secure, while another felt it was not enough to help them feel food secure. Additionally, a few participants were critical of the inefficiency and use

of the public distribution system. One significant point raised was the wrongful categorization of beneficiaries within the system (for example, a family who can afford to buy food from the market can be categorized as a BPL family). This is among the many concerns that the new National Food Security Bill aims to address. Although perspectives varied, it was found that the public distribution system can impact perceptions on food security by increasing food accessibility to vulnerable households, making people feel more food secure.

6.3.2 Links to other research

Numerous researchers have examined the impact of government policy interventions in traditional mountainous environments. A study conducted by Nautiyal *et al.* (2000) in Uttarakand revealed that prominent scented paddy land rice "Mukhmar" became extinct as a result of the introduction of HYVs by government policy interventions. During the 1980's, a program launched by the government through a watershed management project resulted in seeds of HYVs, along with fertilizers at subsidized rates. being provided to local farmers. Initially, the HYV showed high output in terms of grain yield under agronomic management, but over time its production declined when the government agencies decided to remove fertilizer subsidies (Nautiyal *et al.*, 2000).

Geographical location has been found to be a significant aspect of political and institutional influence in other regions. In the Great Himalayan National Park, it was found that villages that were accessed by road were more exposed to a market culture (Grassroots, 2012). The villages of Tung gram panchayat in the Great Himalayan National Park in Himachal Pradesh have similarly been exposed to a market-dependent food chain, an increasingly monoculture system of agriculture, and the promotion of

HYVs through the extension work of Himachal Pradesh Agriculture University and HP Department of Agriculture (Grassroots Institute, 2012).

6.4 Learning Outcomes Related to Agricultural Knowledge and Practice

The third objective is to examine learning outcomes related to agricultural knowledge and practice.

6.4.1 Participant learning

As a result of political and institutional initiatives, farmers are receiving information and education about modern agricultural techniques, what types of crops the government is supporting, and the use of technology. For example, farmers can receive education, training and advice from crop scientists on growing apple orchards at horticulture camps. This can include topics such as testing soil quality, pruning, spraying, integrated pest management and vermicomposting. These learning outcomes fall within the instrumental learning domain since they involve acquiring skills and information and task-oriented problem solving. Similarly, it was revealed that farmers have informally looked to the practices of other farmers in order to adopt new agricultural techniques or convert their fields altogether. Overall, instrumental learning was primarily experiential, whereby farmers adopted an agricultural practice by learning through experience.

Therefore, political and institutional and socio-cultural factors have influenced formal and informal instrumental learning processes, whereby people have adopted new agricultural practices, selected different crop types, and adopted a new idea of what it means to be food secure as the conclusions above show. Although the participants recognized the negative impacts of chemical inputs, there was no data to indicate that any

had learned about other aspects of sustainable agriculture such as diversified farming or the role of traditional knowledge.

Another important realm of learning pertains to the loss of traditional knowledge or the lack of sharing of traditional practices. As a result of a loss of traditional land-use systems and the increasing reliance on migrant labour to aid in growing crops, the knowledge surrounding growing traditional crops is becoming less applicable and available. Although some people continue to grow traditional crops and save traditional seeds, many study participants, particularly those living in Khaknal, admitted that their children are not learning how to grow traditional crops. Rather, the younger generation is studying in school, working in other sectors of the economy such as tourism, or learning how to grow cash crops. Furthermore, although some participants continue to value traditional crops, this research reflects a loss of traditional knowledge within the younger generation of farmers.

6.4.2 Links to other research

Instrumental learning was the main learning outcome identified among participants in the study. Instrumental learning involves obtaining new skills and information, determining cause-effect relationships, or task-oriented problem solving (Sims and Sinclair, 2008). These results are similar to other studies in which the main learning outcomes identified were in the instrumental domain (Sims and Sinclair 2008, Kerton and Sinclair, 2010).

It was revealed from my participants that farmer education and training through state-sponsored schemes helped them to gain technical skills, such as pruning apple orchards, how and when to apply chemical inputs, and setting up vermicomposting pits for organic

fertilizer. Furthermore, the effectiveness of formal education and training could be measurable through the adoption of practices such as setting up vermicomposting beds. Similarly, many studies have examined formal education in the form of farmer field schools and farmer training programs. In exploring the impact of Integrated Pest Management farmer field schools in Southeast Asia, knowledge and skills could be observed in the technical and socio-political domain (Berg & Jiggins, 2007). For example, farmers gained technical skills of pesticide reduction, yield increase and knowledge about ecology through attending a farm field school (Berg & Jiggins, 2007). In addition, the effects of extension services can be measureable through considering the level of adoption of specific practices, information or technologies (Berg & Jiggins, 2007). It could also be argued that farmers themselves determined (in a broad sense) which was the best practice, based on their values and the local conditions (Berg & Jiggins, 2007).

Aspects of sustainability were also included in farmer education and training. Soil fertility, vermicomposting, and IPM were among some of the topics mentioned, however vermicomposting was the most noticeable practice that farmers had adopted. Similarly, in an examination of sustainability and gender through farmer field schools in Kenya, Najjar *et al*. (2012) discovered that farmers learned about a variety of topics, such as soil fertility, water management, pest management and health issues. Furthermore, most of the instrumental learning that occurred on the farm field school was experiential in nature, and a major contributor to adopting productive technologies of soil and water conservation (Najjar *et al*., 2012). Therefore, it has been shown that farmer-training programs can serve an important role in the adoption of sustainable farming practices.

6.5 Policy Recommendations

The fourth and final objective was to identify policy recommendations related to food security in the region.

6.5.1 Recommendations

In terms of policy, there ultimately needs to be a focus on state agricultural policies that lead to decisions that promote local-level food production. A recommendation to conserve and promote traditional crops, and to promote education that fosters sustainable agriculture, is discussed below.

- **Conserving and promoting traditional crops at the local level**

Increasing the use of underutilized crops suited to the local environment for food security involves overcoming many constraints and obstacles. The data indicate that there needs to be more recognition and incorporation of traditional practices and food in the agricultural system in order to deal with the challenges people face in producing such crops within a commercial cropping system. For example, a wider range of food crop species, such as traditional varieties that are adapted to the local environment, can help to mitigate issues of climate change and create greater system resilience. It was also revealed that some participants are still valuing traditional crops for their socio-cultural, religious and health benefits. Thus, there is a need to formally recognize the value of these crops before they have completely disappeared from the region.

Overall, there needs to be a greater focus in government and academic research and policy pertaining to ways of conserving traditional crops. Mayes *et al*. (2012) suggests that policy and research should include a focus on genetic preservation, marketing and

the cultural acceptability of local crops. In addition, placing a focus on conserving, breeding, producing and increasing post-harvest value are some of the ways that traditional crops can be better included when considering future development and quality of life.

This research reveals that economic considerations are important for food access and thus for making people feel more food secure. However, many traditional crops suffer from poorly developed markets and a lack of value-added production, which may limit their value for providing the poor with buying power to obtain their staple crops (Mayes *et al.*, 2012). Ultimately, there must be financial incentives to grow traditional crops in order to conserve them locally. State-level political organizations, such as the HP Department of Agriculture, need to focus on creating local market access for traditional crops in the area as a way to create financial incentive for growing these crops.

Although economic considerations are important and necessary for conservation, it is important that it not be the only driver focused for promoting traditional crops. For example, the production of amaranth locally for a niche global market can have economic benefits, but may be difficult to obtain locally and farmers remain heavily dependent on a volatile global market. Other concerns surrounding monoculture cropping and relying on external inputs still remain. Preserving and/or reincorporating traditional varieties in the local food system can play an important role in food security. It not only provides some form of economic security, but also increases self-sufficiency at the local-level, preserves local knowledge and cultural values and increases crop diversity, if it is done well and not just for external demand.

- **Education that promotes traditional practice and sustainable agriculture**

It is evident that education surrounding traditional knowledge and practice is important for not only food security but also for preserving the cultural importance of foods in this area. Farmers can informally teach traditional knowledge to the new generation of farmers and department officials can also help to formally facilitate this knowledge. The Grassroots Institute (2012) has recommended on-farm training and counseling to farmers on organic production of traditional crops, as well as on-farm training on quality control and post-harvest storage as ways to conserve traditional varieties.

It was revealed that state-level organizations such as ATMA and the Department of Agriculture are strongly focused on facilitating agricultural education and training. This training can help to disseminate knowledge of sustainable and diversified farming. The continued promotion of sustainable agricultural techniques through farmer training programs, such as IPM and vermicomposting, are important skills that can foster sustainable farming development. An inclusion of local farmers' experiences using natural approaches to treat disease, such as the use of urine and ash, can provide others with knowledge and information regarding their effectiveness. In addition, education that focuses on the importance of crop genetic diversity is important for mitigating disease and increasing resilience within the agricultural system. Education can serve as an important tool for preserving traditional knowledge and fostering an agriculture system that produces a diverse variety of healthy foods within communities.

6.6 Future Research

How individuals value and perceive food security can be better understood by examining local perspectives. The consideration of values and perceptions related to food security can be used in combination with other forms of assessment to better understand local conditions in this region. For example, a quantitative assessment of nutritional adequacy can help with understanding the impact of dietary changes within individuals. As well, a closer examination of the situation in regards to people who own little to no land would help in better understanding food insecurities that may exist, particularly among females or landless migrant workers. Lastly, a closer examination of the benefits and disadvantages of engaging in organic or traditional farming could help in better understanding the barriers that small farmers may encounter through adopting alternative agricultural practices.

6.7 Limitations

Future research might also consider the limitations that I experienced during this fieldwork. Two key limitations related to language and the participation of women in the research. Although I had the opportunity to work with a well-experienced translator, I could not obtain the informal data (conversation) between the translator and the participant as easily as someone who speaks the same language as the participants. For example, my translator would often have informal conversations with participants after the semi-structured interviews were conducted. These conversations would often revolve around the topic of local food issues and agriculture – conversation stimulated by the questions I asked. No doubt there was a lot that could have been learned through accessing these informal conversations.

I also found it challenging to engage women in the research. People would often regard women, particularly those living in the villages, as "simple minded" or less knowledgeable about agriculture, and so not suitable as interview respondents. Similarly, there were instances where women refused to participate in the study because they felt that their husband or son knew more about farming than they did. As a result, it was sometimes challenging to address the gender dimensions that exist within the case, as has been shown in other research. The women at my study sites, and generally in the region, were heavily involved in farming activities and many were apart of decisions surrounding what crops to grow and what foods to consume. The women I did speak with had a strong understanding of the local food systems and played an important role in food security at the individual, household and community level. It was evident that males play a larger role in the marketing of food, as well as working at the state political level, and in researching other aspects within the food system. These factors lead me to interview more men than women, leaving room for a more gendered study.

6.8 Concluding Remarks

With global population growth and an increasingly globalized system of agricultural trade, the questions around food security and the increasing demand for food are becoming more pronounced. Agricultural policies adopted through various green revolutions have undoubtedly reduced famine and widespread hunger across the country. State policies and government schemes in Himachal Pradesh have effectively promoted and helped educate farmers about commercial agriculture, which has in turn increased the financial security of many local people.

However, agricultural intensification with the use of HYVs and purchased inputs has also resulted in many negative implications locally. Long-term consequences such as nutrient imbalances, soil infertility and reduced production, as established in the research findings and literature, can have major repercussions for the mountainous environment and the people who live and farm there. More importantly, this transition to HYVs has reduced self-sufficiency at the local level through the adoption of an external system of trade, which presented concerns for food security for some of my participants. This will be especially true in times of change or crisis in the future.

It has been stated that by examining local perspectives of food security, how people value and perceive food can be better understood (Gartuala *et al.*, 2012). Through examining local perspectives in the Kullu District, my research has supported this notion. It was revealed in many ways that there has been a change in how people value food. Today, agriculture is primarily perceived as a means of attaining financial security in order to feel food secure. However, some participants are also continuing to recognize traditional crops for their socio-cultural, religious and health benefits, and feel a sense of security knowing that they can go back to their "old way" of life if necessary.

Through this research I observed local conditions around food security. Overall, I observed that people are still engaging in agriculture because it has become a business. Remnants of a traditional system of agriculture, including pastoralism and a mixed-use system of growing traditional crop varieties, are still present. However, these remnants were rarely seen. People have begun contracting out their land to work in other sectors of the economy and migrant workers from Nepal now do much of the agricultural labour. The "old way" of life has been preserved through a few local farmers in different

communities, local festivals and special occasions, but it no longer governs how people grow food or view their personal food security. As a result of socio-cultural and economic changes, the way in which people view agriculture and food security has changed tremendously. People are still considered to be food secure because they have the economic means of accessing food from external markets. Although I believe that many people in this region are food secure, I think people are at risk of facing many challenges associated with insecurity in the future. Reflected in people's perspectives on economic and environmental drivers, it is evident that there are feelings of insecurity about aspects of the commercial cash-cropping system. It is important that food and agricultural systems are recognized and valued for ways that include their environmental, socio-cultural and economic benefits.

I believe that informal and formal dialogue with participants has been one of the most important aspects of this study. Having discussions about the potential concerns surrounding food access, such as road closures, was important because many participants later indicated that they had never considered such issues in relation to their personal food security. I also believe that by having an open dialogue about both the benefits and challenges within the food system, we can start to re-imagine it. Ultimately, the way in which people perceive and value their food system will dictate what they grow and consume, and what knowledge they will use and transfer onto others. In order to change aspects of the food system, people will have to want that change for themselves and their community.

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APPENDIX A: Interview Schedule

A.1 Local people associated with food production (apple farmers, etc.)

1. How many members are in your family?
2. Can you describe to me your primary source of income/sustenance (could be agriculture, labouring for others, government, tourism, processing food)
3. What is the size of your land holding?

4. Have you changed your crops over the years?

    a) If yes, can you describe these changes and why you made them?
    b) If no, what makes you continue to grow the same crops?

5. Do you grow for your self/family?

    a) If yes, what types of crops and how much do you grow?
    b) If no, why do you choose not to?

6. Do you grow for the market/export?

    a) If yes, what crops do you grow and how much?
    b) Has the amount of food you've grown for the market changed?
    c) Has the price of your crops changed over the years?
    d) How far do you have to travel to sell your crop(s)?
    e) If no, why do you choose not to?

8. Do you use any modern technology to assist you with farming? (Tractors, fertilizer, pesticides, insecticides, sprinklers for irrigation, GMO seeds?)

    a) If yes, how did you start using this/these technologies?
    b) If no, what are the reasons for not using this technology?

9. Do you know what the traditional crops grown in this area were?

10. Have you ever grown traditional food crops?

    a) If yes, do you save traditional seeds (seed bank)?
    b) If no, have you ever considered growing traditional foods in the future?

11. Have you noticed changes to your land over time (degradation, poorer soil quality, less pollinators, etc.)?

12. Do you ever worry that you will not be able to grow enough food for your family/the market?

a) If yes, what factors make you fearful of how much food you will be able to grow?

13. Do you ever worry about the price of your crop?

14. Have you heard of India's new Food Security Bill?

a) If yes, has it affected your life in any way?

A.2 Local household members (non-farmer)

1. How many members live in your household?

2. Can you describe to me your primary source of income/sustenance (could be agriculture, labouring for others, government, tourism, processing food)

3. How many times a day do you eat? (one major meal, two major meals, three?)

4. Is there always enough to eat for all family members?

5. What constitutes your primary diet? (Rice, vegetables, fruit, lentils, wheat, *dal*?)

6. What is the most secure way of accessing food for your family? (Buying food in the market, exchanging food between people in the community, growing food for your self/family)?

7. What are the main products that you buy from the market (cooking oil, lentils, rice, vegetables, wheat, meat, eggs, etc.)?

8. How much of your income is spent on food?

9. Do you notice the price of items from the market fluctuate often?

a) If yes, how often do prices change? (Seasonally, randomly)

10. Do you ever find things sold at the market too expensive to buy?

a) If yes, do you supplement your diet in other ways if you cannot afford to buy food at the market?

11. Do you ever worry about how much food you have for your self/household?

a) If yes, how often do you worry that there will not be enough food to eat? (everyday, every few weeks, every month, during different seasons?)

12. What is your perception of agriculture as a livelihood?

13. (If have children) Do your children go to school?

    a) If yes, what level of education do they have?

14. Do you think your children will choose to grow food/farm one day?

15. Have you heard of India's new Food Security Bill?

    a) If yes, has it affected your life in any way?

A.3. Local food vendors and commission agents at local food markets

1. How often do you sell food at the market? (every day, once a month, seasonally)

2. Where does the food that you sell come from?

3. How often does the food you sell come in?

4. Is it common for imported foods (out of state/ out of country) to not reach your market? What are the reasons for this?

5. Have you ever considered threats (climatic, economic) to the agricultural regions outside of Kullu that you rely on for the food that you sell here in the market?

6. What do people buy most regularly?

7. Do you usually sell the same food (s)? What food(s) do you typically sell?

8. How often do the types of foods you sell change? (monthly, seasonally, yearly – with examples)

9. What locally grown foods (from region/ HP) do you sell? What percent of the total food you sell is this?

10. Do you ever see local people selling their own locally grown food?

11. Have you ever seen traditional crops being sold? If so, what crops and how often does this occur?

12. Does the price of food fluctuate often?

13. Has the amount of food being sold changed during your experience here?

14. Has government policy affected selling food at the market?

15. Are you ever worried that you will not have enough to feed yourself/your family?

    a) If yes, what factors contribute to that fear? (price fluctuation, food shortages, food not reaching your market)

16. Do you know anything about India's new Food Security Bill?

    a) If yes, how do you think it will affect you/the market in any way?

A.4. Academics of GB Pant Institute, Y.S Parmar University, Government Officials

1. How long have you been working on agriculture or food issues/policy?

2. What do you think are the most important food security issues in the Kullu region?

3. How have the crops grown in the region changed? What has been the impact of moving from subsistence agriculture to commercial horticulture?

4. How has government policy influenced the transition from subsistence to commercial horticulture?

5. Have you ever considered threats (climatic, economic) to the agricultural regions outside of Kullu that people rely on for the import of their food to this area?

6. Have you documented changes in indigenous knowledge surrounding local food? (dietary changes, growing different crops, adopting modern technologies)

7. Have you seen communities or people embracing their indigenous knowledge about food and growing traditional crops for local consumption?

8. Have you worked with youth in the area about sustainable food systems/traditional knowledge of food?

9. Have you documented/been associated with sustainable agricultural practices in the area? Have these practices increased or decreased? (water conservation, crop diversity, etc.).

10. Have you noted/or been involved in keeping any seed banks of traditional crops?

11. Have you documented food insecurity in the region (people not having enough to eat, season insecurity, people getting money loans to eat).

a) If yes, has this changed over time?

12. What role has the extension work of regional agricultural/horticultural units played in influencing the types of crops grown?

13. Do you know anything about India's new Food Security Bill?

a) If yes, how do you think this will change agriculture in the area?
b) Are there aspects that you would change?

14. What would you recommend for resource management in this area, specific to agricultural practices and food?

15. Do you have any other comments about food security in the Kullu region?