

1 CHAPTER ONE: INTRODUCTION

1.1 1.1 Background

Farmers in hill area have evolved in peculiar ways of dealing with the difficulties created by changing condition of climate. Climate change is one of the many changes that have undertaken since the origin of earth. Existence of life and vegetation on earth is the result of favorable climate and the availability of freshwater. Climate Change is a multi-disciplinary subject. Climate change is "a change of climate which is attributed directly or indirectly to human activities that alter the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (*UN Article 1 n.d.*). Climate change, weather fluctuation, seasonal changes are used as interchangeable words. But in anthropology climate change is long term change in climatic events like rising sea level, drought, drying out water resources, relocation of plant and animal, cultural disappearance etc (Crate, and Nuttall 2009). It adversely affects the way of life, culture and livelihoods of the rural people everywhere. Therefore different actors/farmers have been affecting and experiencing the climate change. Among the most affected groups, the poor women of hill village have distinct experiences about climate change. They have very close attachment with the natural surroundings, changing situations; from early morning to late night local farmers especially women are connecting with agricultural activities as well as day to day domestic affair.

Impact of climate varies from one geographical area to another, one society to another, one cultural group to another, one house to another, even one person to another .Anthropologists argue that local people are the key eyewitness of ongoing climate change (Slacik and Byg 2007). Anthropologists argue that climate change is ultimately about culture (Crate Nuttall, 2009). Similarly, women may have different experiences about weather and climatic fluctuations in their surroundings. Local

farmers (especially women) might see clouds in the sky and based on their color and shape know whether it will rain or not, they may feel the wind and based on direction or strength recognize whether it will bring rain or chase it away; they may hear thunder and see lightning flashes on the horizon and, based on their orientation, predict whether the storm will head their way or not, and based on its intensity and the time of year way; they may feel heat at night, and , based on its intensity and the time of year, discern whether planting time is approaching or not (Orlove et al. 2008).

Climate change affects both men and women, but may do so differently. Due to climatic and geographical conditions, men and women in Nepal's Himalayan mountain belt work long hours, but women work longer hours than their male counterparts (Sherpa n.d.). Very little research has been carried out on how mountain women adapt to change and how gender specific conditions affect their ability to adapt (ICIMOD 2010). Since being female is strongly linked to being poor, unless poverty is reduced, the increase in disasters and extreme climate events linked with climate change is likely to affect women more than men. In addition, there are some specific gender attributes which increase women's vulnerability in some respects (Cannon, 2002). Women have close interrelation with natural resources which is affected by climate change. In most of the Nepali community, women engage in domestic labor but they have no power to mobilize the income. Income of the production is taken by head of the family. In local community, there is still the trend of giving birth to more children to fulfill their labor power.

Local communities play a vital role in the adaptation process as the characterization of climate change impacts at the level could present solutions and measures that can possibly be adopted at meeting the challenges in the future (LLED 2007). Nepal's economy is basically agriculture-based and people are highly dependent on agriculture for their everyday needs. Local farmers of the research area are primarily dependent on a climate-sensitive rain-fed agriculture system. So, Government of

Nepal has expressed commitment through international conventions and treaties to develop strategies to minimize the impacts of climate change on environment. GoN has set priority to study and information dissemination on climate change and its impact adaptation measures. However, the field actions of climate change impact adaptation measures have not been adequately address including their academic research in this regards (MoPE 2004).

Anyway, Women bear disproportionate burden of climate change, leading to consequences of: decreased food security, Women lose harvest, their sole sources of food and income. It impacts on livelihoods: women's livelihoods based on natural resources are threatened. For example, water resource shortage & access: drying up water resources, increases burden to them. Increased burden of care giving: responsibilities increase when family members suffer from disease and due to the exposure, women themselves become sick (Parikh 2003). In each of these situations, women have to take additional responsibilities and burdens in family. Culturally, they are bound to do their household work and subsistence farming. So in order to understand the challenge that is faced by hill women and men, it is necessary to look what kind of challenges and opportunities they are facing is very necessary to search. Hill farmer's life based on natural resources is being affected in number of ways. Rain is not falling on usual basis, agricultural activities are affected more. Diseases are spread on cultivation all this new surroundings are problem for them. In one word hill farmers are affected in number of ways. In this research researcher tried to collect hill women and men farmer's experiences, perception and effect from their own view point.

1.2 1.2 STATEMENT OF THE PROBLEM

Climate change could have negative and positive impact on human beings. It has been already experiencing throughout the country with varying degree of impacts. It is experiencing increase in dry periods, intense rainfall, floods, landslides, forest fires, glacial retreats and Glacier Lake Outburst Flood (GLOF) threats (Shrestha 2007). But,

its effects may be more adverse for the poor, powerless and the vulnerable women whose livelihoods are based on subsistence farming. Therefore, it is essential to examine the impacts of climate change on hill women and also men's life.

Women in Nepal, particularly in the rural hill households, are primarily engaged in agricultural activities. Rural women have to do farming, looking after livestock, taking care of children and sick family members. Sometimes, even an entire family or village is displaced, such as in the case of the entire village of Dhe, located in Surkhang VDC of Upper Mustang which has been resettled in Thangchung in lower Mustang due to acute shortage of water for irrigation over the last 6-7 years. Burden may fall on women (Baral 2010). However, anthropological research does focus on impact of climate change on women and men farmer's life. In this context, it is essential to document experience of hill women and men who are very close to nature and available resources. So, what experiences are facing by the hill farmers about climate change? What is its impact in their life? These are relevant research problems. There is heterogeneity in the composition of women members in a family as well as in the society. Since the most affected is not the power holder in the family or society, this causes the voice of the most victimized to remain unheard because of their social thought. The contradiction lies here. Merely setting up physical infrastructures and offices will not solve the problem of climate change unless the most affected are included in the debate. Several anthropological studies related to climate change focus on different aspects of human dimension. In this context, researcher has tried to answer some questions of unpredictable change of climatic events like the frequency of occurrence of hails, level of rainfall, flood, temperature fluctuation, drought linking with women/men and their interaction with the agriculture and water in their surroundings. From women and men informant's viewpoint, using emic perspective, hill women and men farmer's perception and their knowledge is explored during the research and this study has attempted to answer the following research questions:

1. What perceptions and experiences do hill women/men have about climate fluctuation in their surroundings?
2. What was/is the condition of resources like water, plants in their surroundings?
3. What is the relationship between climatic fluctuations and agriculture?

1.3 1.3 OBJECTIVES OF THE STUDY

The general objective of the study is to understand the issues of the climate change from hill women/men view in two communities, Logwa and Hattisar.

The specific objectives of the research will be as follows:

1. To understand hill women/men's perception and experience about climate change in their life.
2. To identify impact of climate change on agriculture and water resources linking with hill farmers.

1.4 1.4 SIGNIFICANCE OF THE STUDY

Local farmers especially women, are facing the challenges of climate change. This study shows the effect of climate change to the hill farmers. By assimilating remote people's understanding and local cultural knowledge and responses about climate change, this study helps to show the new cultural relationship within the changing climatic context among different farmers, especially women.

This is the study of hill farmers with anthropological perspective to climate change, gathering basic knowledge about the situation of local environment which is day to day closely interlinked with farmers. It is also helpful for interested people working in the area of climate change. This document can give the knowledge about hill farmers who are struggling in changing context of climate without leaving their profession but adjusting with the situation by adopting different mechanisms. Anthropology talks about human beings who are leading life towards challenging future. It shows the real situation to the readers. Therefore, it is easy to forward plan and policies towards the affected groups. Farmers who are facing problems of ongoing climatic

conditions regularly and living with challenging future, hiding their burden faced in daily life is somehow made visible in this document. They have many eye witnesses account which is essential to understand the situation. Being a student of anthropology, this study is essential and meaningful to enter in the field of climate and cultural ground of hill area.

Rural elderly people have knowledge on climate fluctuation, and scientists are merely repeating the same (Shrivastava, 2007). So without using scientific data rural people are capable to identify climate change through their cultural interactions. This study shows real interaction of local women/men with changing environment, resource, culture and society. It shows the ground reality of rural society and understanding of climate change through mind and day to day witness with their eyes. Scientific data focus only numerical values, but does not focus on human dimension. So, this study is relevant to focus on human dimension and to open hidden reality faced by local farmers in changeable climatic context.

1.5 1.5 THEORETICAL FRAMEWORK

To study climate change in hill farmer's perspective through anthropological lens, cognitive cultural model is relevant. This model helps to know how people cognized climatic situation and how they put their thoughts into actions. This model is used to understand women understanding of their environment which shapes their interaction with their community. This model conceptualized in cultural frames the way local women/men perceived, understand, experience, and respond to their environment. Women are closely interlinked with natural surroundings, so climate change is an important phenomenon in their life. From early morning to evening they get connected with dews, fog, water, droughts, hailstone, cold and hot. They have many experiences and heart touching events by the effect of climate change that they could not forget throughout their life and is essential to dig out.

Agriculture is affected most when drought adversely impacts rain-fed agriculture, largely in developing countries where the majority of farmers practice subsistence

agriculture (Presiser 2005). Besides, this model helps to analyze the differences of women and men's perception, experiences and their knowledge based on the expression of local climate change, especially focusing on the changes in agriculture and water availability based on the expression of hill area. In anthropology, two perspectives are mainly important:

1. Global/descriptive/etic perspective, this model helps to analyze the differences of women's perception, experiences and their knowledge
2. Emic/ local/ interpretative perspective, (source)

There are wider differences in epistemological understandings between the descriptive/ positivistic approach and the interpretive approach in weather and climate research. The positivistic perspective emphasizes meteorological data and visible objects/facts, whereas an interpretive perspective focuses on insider's perspectives, which are cognized and culturally framed in the given context (West and Vasquez-leon 2003:233). Among them, I have emphasized to emic/local/interpretative, cognized perspective because it digs out the reality of local surroundings about climate fluctuation and its effects on hill farmers (women and men). Moreover, it helps to analyze the differences of women's perception, experiences than men and their knowledge based on the expression of local climate change, especially focusing on the change in agriculture and water behaviors. Local farmers, women/men are very closely interlinked with nature and natural surroundings. They are keenly observing rain, flood, dews, snow, drought, water scarcity in their surroundings. To grasp the reality, different informants are taken such as elder male farmers, elder female farmers, youth, educated, uneducated, business man.

Ethnographic field work, based on extended periods of residence and research at a community level, has been anthropology's dominant approach to capture the elusive domains of cultural meaning and practice. Anthropology's emphasis on fieldwork and participant observation stems from the recognition that engaging in daily life and

social relationships provides a contextual understanding of cultural realities that cannot be captured by structured survey methods alone (De Walt and De Walt 2002; Jorgesen 1989; Schensul et al. 1999, cited in Ben Orlove et al. *Fielding Climate Change In Cultural Anthropology*). Field work allows for a slower accumulation of evidence and understanding for key insights to arise unexpectedly, during experiences that allow glimpses of how the world is perceived and experienced by local people-e.g. while participating in ancestral rituals in Tanzania (Sanders 2003), witnessing impacts of EL Nino drought on daily life in Papua New Guinea (Ellis 2003), or drinking early morning coffee with Maryland crab fishermen (Paolisso 2003). At the same time, given the ideological and politicized nature of climate science and its influential role in policy decisions that affect the lives of indigenous communities, marginalized groups, and the poor, anthropologists should stand firm in their tradition of committed localism and ethnographic reflexivity (Marcus 1995).

From the early evolutionist through Steward, Rappaport, Vayda, Wolf, McCay, and others, environmental anthropology, cultural and political ecology have provided the conceptual tools to examine the complex interplay of culture, society, power, and environment (Lahsen 2007, as cited in Poudel thesis). Among these studies, some of them are study about climate change through local people's experience observation about the ongoing change in their surrounding environment-local perception (Crate2008, Nuttall 2009). Anthropology from its very inception, built an analytical and theoretical tradition. The study of interaction of human population and their surroundings is the fundamental subject matter of human ecology, which mainly focused on the environment, culture and human population (Milton 1997).

Understanding the decision process by which households select and enact adaptive responses, and the institutional context that shapes those decisions, is important because even successful adaptations entail alternative risks and costs that may be borne by less powerful groups and sectors within households, women, children, and the elderly may see their needs curtailed, their work burden increased, and their

assets diminished or appropriated by other (Denton 2002). According to Nepal's Initial Communication to the Conference Parties of the UNFCCC, almost 20% of the glaciated area above 5000m is likely to be snow and Glacier freeze at 1 degree Celsius in air temperature"(MOPE 2004). The changes in rain fall can cause devastating effect on crops leading to crops failure and ultimately food scarcity in the region (Regmi and Adhikari 2007 cited in Poudel thesis). The hazards induced by change in climate such as land slide, drought, flood and forest fire have threatened the existence of various plants and animals. For example hotter, drier summers are expected to increase evaporation and generally worsen the severity of fire seasons and increase the risk of the forest fire cross the Himalayan belt (Dahal *et al.* 2009). If climate change adversely affects the crop production, it will have direct impact on livelihood of several millions people residing here. The temperature increase is expected to reduce maize and wheat production while climatic variability will pose serious threat leading to famine and death of the poorest at first (PAN 2009).

After reviewing above literature and being a student of Anthropology, researcher found this discipline is sensitive and it goes in depth of hidden reality of local communities, especially hill farmers, women/men's daily lives. Real experience and perception is drawn from hill farmers who are facing challenges brought about by climate change. Most of the above literatures are concerned on the negative effect of climate change. These literatures reflect devastating effect on crops, crops failure and ultimate income of farmers especially women farmers are being poor. Women are not in the condition to make their decision strong because of scarcity of resource in hands. It is because of climate change according to the mentioned literature. The research gap researcher found in previous studies is that all review gives the conclusion that climate change brings only negative effects for the hill farmers. But there can also be optimistic situations; farmers can change their crop patterns if there is no timely rainfall. Instead of paddy farming, they can start to cultivate other types of crops which need little water. They can change the seeds which can tolerate at the time of drought. Fighting with new climatic situation, they can develop

peculiar way of adoptive mechanism. Women farmers have higher access to agricultural production than other assets. They are primary producer and consumers of food grain. Male farmers primarily sell paddy and maize but they do not concern about the millet, curry, wheat, hen, and pigeon. Women can sell and get money in their hand. Adverse effect of climate change primarily victimized the women but they can change their challenges into opportunities with their own ideas and changing crop pattern.

2 CHAPTER TWO: LITERATURE REVIEW

In this chapter, there are two major sections. First, there is general review; the global and national scenario of climate change, its impact and effects which help to know the issue of climate change for research purpose. The next section is theoretical review on the perception and situation of water, agriculture, plant; it is crucial to know to formulate the particular way of conceptual idea for the need of this study.

2.1 2.1 GLOBAL CLIMATE CHANGE SCENARIO

In this 21st century, the issue of global environmental change is the most attention seeking grave ever seen at any other times in recorded history. The complex interplay of social and economic factors in this backdrop of environmental change increases the vulnerability of both people and environment, intensifying the impacts of such changes when they occur. Great numbers of people are more vulnerable to the impacts of such changes. Climate change can result in the loss of sufficient resources and other ecosystem services, uprooting people and communities and forcing them to migrate and obligating in population to relocate (Smith 2009).

Climate change is likely to accentuate the gaps between the worlds of rich and poor. It is widely accepted that women in developing countries constitute one of the poorest and most disadvantageous groups in society (Denton, 2002). Yet, women in particular, play a key role in environmental and natural resources management. Hence, women and their livelihood activities are particularly vulnerable to the risks posed by environmental depletion. Women and men can complement their efforts and build sustainable future through using their comparative advantages (ibid).

Global warming was not an issue prior to 1976. The first authoritative statement on the accumulation of CO₂ and the potential impacts on the earth's climate were announced in 1976. Climatic concerns led to the first World Climatic Conference in 1979. Inter Governmental Panel on Climate Change (IPCC 2007) which was formally established in 1988 was one of the major outcomes of the Climate Conference. The

Second World Climate Conference was held in 1990 and the third one was organized in Geneva from 31 August to 4 September, 2009.

IPCC produced the first assessment report in 1990. The report was instrumental in the establishment of the United Nations Framework Convention on Climate Change (UNFCCC). Some of the relevant IPCC findings from around the world are:

-) CO₂ has increased 36% since the industrial revolution.
-) Global average temperature has increased by 0.74 degree Celsius since the start of the 20th Century.
-) Global average sea level rose by 1.8 mm/yr during 1961- 2003 and 3.1 mm/yr since 1993.
-) 12 of the 13 warmest year since 1850 fall in 1995-2007
-) Arctic ocean has lost 17% of ice over the last 25 years

These kinds of meteorological data do not focus human dimension. Anthropology gives the clue to grasp the reality of climatic change and its effect in depth.

Anthropologists get the in-depth knowledge of the different realities of local people of their day to day real experience.

2.2 2.2 ANTHROPOLOGICAL PERSPECTIVES ON CLIMATE CHANGE

Climate change is not only cause of natural phenomena but also with cultural context it is changed and shaped. People communicate with nature through their culture. Local people especially women give value to natural resources; culturally they manage natural resource, store knowledge about it. Climate change is also about the relocations of human, animal and plant populations to adjust to change and to cope with its implications (Crate and Nuttall 2009). Losing animal and plants are central to their daily subsistence practices, cycles of annual events. Remote people, especially women themselves are at risk from climate change consequences due to their dependence on and close relationship with the environment and its resources including plants, animal or other resources like water. Their livelihood systems are

often vulnerable to environmental degradation and worse effect of climate change (ibid). With the climate fluctuation people's culture shape and reshape in new ways. It affects every human but the local farmers, especially women, are more affected by it because of their close interaction with natural resource.

Through their culture, people communicate with nature. Culture is way of life of people. People who are involved in agriculture managed natural resources in terms of their social use. Local people's knowledge system and interaction with nature is embedded and knowledge system considered as contextual and symbolic. Climate change is totally related with culture (Crate and Nuttall 2009). People, especially women, are keen witness of local climate. They have to play with their livelihood such as farming, livestock etc., according to seasonal events through their culture. Every cyclic changing process in environment is recorded in community they behave through their way of life and traditional practices.

Local people offer local observations and techniques for adapting to and mitigating climate change. Their knowledge and perceptions must be incorporated into the climate change forum. They, especially, women must exercise self determination and be empowered to deal with climate change which threatens their traditional livelihoods. Women and local people are vital and active parts of many ecosystems and may help to enhance the resilience of these ecosystems. They are not only keen observers of climate change but are also actively trying to adapt to the changing conditions. Especially, women need climatic knowledge for their livelihood. Women are culturally bound to stay at home and work in subsistence farming. So, they know the process of environment change which brings lots of negative effects but they have the capacity to cope with it.

2.3 2.3 ANTHROPOLOGICAL ENGAGEMENT IN CLIMATE CHANGE

To understand climate change from anthropological lens, we should understand how cultural behavior has changed among local people; especially poor women and old people, what coping mechanism they have adopted to tackle the change in climate,

what alterations have taken place in their livelihood strategies and how they have perceived the issue of climate (Orlove2008). Anthropological studies often aim to identify an appropriate solutions to the problems of the local people by studying their real ground situations. Although, climate change affects everyone, the intensity of its effect differs according to the caste, class, gender. To know climate change in-depth, anthropologist should take into consideration the perception of local people, their knowledge, behavior, validation and responses (ibid). The human interaction in particular area of weather guides them to their livelihood strategy. So, the framework for making decision and climate change cannot thus be isolated from culturally consisted ways of seeing, knowing and valuing (Vedwan and Rhoades 2001). People's meaning of culture is centered in season of climate prediction where local choices as shaped by livelihood meet goals and cultural values (Orlove 2004).

The subject matter of climate change and its effect on men and women, while interring in the anthropology, somehow is sensitive in relation to women's daily life. Again, it tries to open the women's social dimension with cultural perceptions, feelings and experiences which is guided by social values, norms, which helps to cope with that particular environment. Most of the anthropologists are working with indigenous and other place-based people have a critical role in the issue of climate change. But yet, they do not give that much importance for hill farmers especially women who are in critical condition with the effect of climate change.

2.4 2.4 CLIMATE CHANGE IN NEPAL AND WOMEN

Nepal had accessed the Kyoto Protocol on 16 September 2005 and was put into force from 14 December 2005 (Sharma, 2009). Likewise, for the first time, in December 2009, Cabinet meeting of the Government of Nepal was held in Kalapathhar¹ at the height of 5,242 meters in the Khumbu region that is located in the lap of the Mount Everest with a view to drag the attention of the whole world

¹ **'Kalapathhar'** is the Base Camp of Mt. Everest in Khumbu Mountain range

towards the issue of climate change. Nepal is a land of extreme topographical variations and the strong seasonality of the monsoon are typical features of Nepal. Because of high sensitivity of the mountain environment, even a small change in climate can have huge impact on the environment affecting the livelihood of population and development activities.

Observations show that high rainfall regions and seasons are recording increase in precipitation and becoming wetter, whereas low rainfall regions and seasons are recording decrease in precipitation and becoming drier (HMGN 2004). Though Nepal is responsible for only about 0.025% of the total annual CFC emissions of the world (Karki, 2007), the country is one of the ten most vulnerable developing countries. The evidences reveal that marginal group (poor, women, including single women, indigenous people, landless households and elderly people) in the country are more vulnerable to food security (Adhikari, 2008). At a time, they abide massive cost to secure their livelihood and food goal in amidst of vulnerability from climate change incidences (Regmi, 2009; WFP 2009). The evidences show that both formal and informal economic, social and political institutional barriers, existed in the Nepali societies are primary sources of the additional vulnerability to the groups. It shows that Nepal is warming at significantly higher rate compared to the global average 0.74 Celsius, recorded in the twentieth century (IPCC 2007). Precipitation is also becoming unpredictable and more erratic than ever, with more droughts and shorter periods of heavy rainfall (Shrestha et al. 2000).

In order to understand how people respond to climate change, it is essential to study people's perception of climatic variability in general. Therefore, farmer's knowledge should be incorporated in decision making processes while making strategies to mitigate the impacts of climate change. Moreover, any decision must be based on the concept of inclusion than exclusion as well as locally grounded knowing, seeing and valuing the world (Chhetri 2008, Roncoli et al. 2009). Climate Change usually impact on sectors that are traditionally associated with women, such as, paddy

cultivation, cotton and tea plantations and fishing etc. This means increased hardship for women (Parikh, 2003). Poor local women can be especially vulnerable because they are concentrated in high risk areas. They tend to have more limited adoptive capacities and are more dependent on climate-sensitive resources such as local water and food supplies (IPCC 2007, 9). Women make up 70 percent of the world's inhabitants living below the poverty line (Rohr, 2006). Women in their roles as the primary managers of family, food, water and health are hit the hardest and must deal very directly when the impacts of climate change are brought home (Wisner et al, 2007). The impacts of climate change vary across regions and community. Vulnerable poor, hill farmer, powerless people; women are influenced greatly (ibid). "The reason for the disparity is that women, due to the culturally specific evaluation of their gender, face different vulnerabilities and many live in conditions of social exclusion. Examples include exclusion from survival skill learning, such as tree climbing and swimming, which help during floods, restriction on women's movement in times of crisis, including dress codes requiring lengthy garments and prohibiting women from leaving the home without a male's permission; and unequal allocation of food resources to girls and women, rendering them physically weaker in time of evacuation crisis" (Aguilar 2008).

Analyzing all these evidences, collecting water, fuel and food become more time consuming and involved with increase burden due to greater resource scarcity. This burden disproportionately shouldered by women in the local regions. The situation becomes worse when large numbers of men migrate for work. Women are bound to look after their family. Climate change also caused loss in the agricultural production, causes food shortage and decline or loss in monetary income. In the face of reduced resources, such as water and food, social conflicts and unrest may rise or be exacerbated among nations, communities and tribes. Water related disasters such as floods droughts, landslides, and extreme weather events may increase or become more frequent due to climate change. This poses a huge threat to livelihoods and well being of the farmers especially women farmers of the hilly region. Therefore,

with human dimension, researcher's interest is to take out the hidden reality of women/men farmers who are living in challenging situation of climate fluctuation.

2.5 2.5 LOCAL PEOPLE'S PERCEPTION REGARDING CLIMATE CHANGE

People's perspective over natural hazards by their feelings, seeing and experiencing even smelling the events they should view upon those natural phenomena. Within certain environmental phenomena, the process of perception is also a process of action (Ingold 1992). With the help of their indigenous knowledge, local people change their perception to local context. Climatic phenomena are understood through the knowledge and response with cultural values. So perception of climate change is structured by the knowledge of crop climate interactions which is associated with changing nature of climate (Vedwan and Rhoades 2001). With the help of local weather people view to climatic differences upon certain period of the season. People having their own culture can understand the event of climate by seeing and knowing it. Anthropologists have begun to explore the empirical relation between local knowledge and climatic phenomena (Roncoli et al 2009). Perception can be decided into two types- visible perception, physical objects, visible thing, created by ongoing climate change, e.g. drying out water resources and the other is invisible perception which is closed in peoples mind e.g. shifting away the day to day useful plants with climate fluctuation, the intimate cultural relationship with local people may end.

On the contrary, social scientists like anthropologists consider local people including farmers as primary witnesses of climate variability in the local surroundings. As primary eyewitness of climate variability, "people talk about the recent weather and the weather that is to come. They remember the conditions of months ago and anticipate future seasons, and they discuss the weather of the past as well" (Strauss and Orlove 2003:3).

Local people respond to the unfavorable environmental condition by modifying the available strategies for them. Migration as one of the important adaptive strategies followed in response to environmental difficulties throughout the human history (Smith 2009). People's perception regarding climatic changes has been frequently reported in different studies and media during the past few years. Most of these findings and observations are similar. Sher Bahadur Tamang of Chitwan (Vidal, 2006) "The floods are coming more severely, more frequently, not only is the rainfall heavier these days than any one has ever experienced, it is also coming at different times of the year."

Poudel (2009), based on his interactions with local communities and students in the mountainous village of Khudi in Western Nepal, that the people in and around the Khudi watershed are experiencing: different rainfall pattern, flooding, landslides, decreasing water level, bare mountain because of excessive snow melt, increase in mosquitoes and insects, increase in disasters such as heat waves, droughts, dust storms and thunderstorms. Some crops increase while others decrease. Different rainfall patterns, flood and landslide gives trouble to the farmers. So, when local people observed the interaction between crop weather pattern, they easily can read whether the climate is changing or not. Daily interaction of farmers with nature, natural resources, crops and day to day experiences explain the nature of climate change.

3 CHAPTER THREE: RESEARCH METHODOLOGY

This research mainly focuses on the hill farmer's experiences and perception about climate change, situation of water, plant, animal and agricultural cultivation in both communities of Oyakjung village of Terhathum District. This chapter is related to the relevance of research site selection, unit of the study and way of informant selection, data and data collection techniques, data analysis and limitations of the study.

3.1 3.1 RESEARCH SITE SELECTION

Sociological/Anthropological lens views everything as being created and re-created socially and culturally. Even climate change is product of centuries and millennia of human social actions. (Mishra C. 2009). Gradual increase in temperature makes different places situation sensitive. In this context, the impact of climate change on hill farmers is very relevant. Researcher has chosen local hill village's two communities as research site because there are no much physical changes seen. These hills are totally full of natural scenarios, local farmers, women/men engaged in subsistence agriculture every time, whole life they witness nature very closely. The geographical structures remain unchanged as against the case in towns. Therefore, Oyakjung village in the Terhathum district of eastern development region is selected as the research site. Researcher thought that from these kinds of place and people it is easy to get the data about concerned topic. Farmers, women and men family background, status, situation are different so their experience and perception about climate change is also different. Different kinds of information can collect from both localities, situated in different altitude. One of the communities lies in the upper part of the village where as next community lies lower part of village. From low and high altitude sites are selected respectively. It is easy to gather data in comparative manner. It is native village; researcher could easily build rapport with the villagers. Study sites people have primarily depended on the agriculture and livestock for subsistence. Since the area is sloppy, the fertile soil is swept away during heavy

rainfall leaving behind stony and unfertile land. So, researcher felt easy to analyze the differences in the perception, experiences and situation and get the real experiences from hill location, village women and elders. Both of the communities have different ecological and social setting and also different temperature. It was possible to explore the situation of changes in climate in these two communities.

3.1.1 3.1.1 Unit of the Study and Process of Informant Selection

Two communities are broader for qualitative study because qualitative study takes few samples but it goes deeper. Due to the nature of my study, I have chosen some local women and men who are real witnesses of environmental aspects including weather fluctuation, climate change in their life time. They have deep experiences and sentiments attached to the resources and farm cultivation. They store knowledge about climate change in their own ways. For instance, they can easily forecast the time for regular rainfall; they know how to adjust in long term drought, heavy rainfall, past and present cold/hot experiences, hailstone, dew and fog, precipitation. The availability of grass and fodder for animals, kinds of insects and frequency of snake bites indicates the increase in temperature at present days. Being a researcher, I asked different questions to the informants. However, researcher has emphasized to the old age women who have much knowledge on climatic variation and women who are active within their households and agriculture. Both young and elder women informants, who can describe about their experiences and elder male informants of the community were included in the interview. This research focuses on how local women feel and see the change in climate through different parameters of climate change and climate related risk. I gave attention in selecting the informants from both study sites with balance. Elder have long experiences of ongoing change of climate and important information and perception can give about changing pattern of the climatic situation of their surrounding during their life time. The unit of analysis is knowledge of elders and women farmer's about changing situations of climate views from both study sites.

3.2 3.2 DATA AND DATA COLLECTION

I have collected data with wide use of qualitative and some quantitative methods. Most of the information was collected through interview, observation, group discussion, FDG and eye witness account.

3.2.1 3.2.1 PRIMARY DATA

I have collected useful data for my objective; hill farmer's perceptions and experiences, change situation of plant- animal- water, change in cultivation pattern with the help of in-depth interview, eye witness account, observation and group discussion, FGD. Elders are vested with authoritative knowledge, because those who have lived many years have seen things, including, climate events, changes and impacts, like the Sahelian droughts and famines of the 1970s and 1980s (Rancoli et al. 2002). Thus open ended interviews with local elders are often used in anthropological research to elicit local knowledge and cultural memory (Crate 2002). Researcher has used open-ended interviews and fieldwork interactions to elicit farmers' views of climate variability. Drawing on their results, researchers constructed culturally specific indices of climatic variability that they then compared to meteorological data from local weather stations. Analysis shows concordance between the two cases, suggesting that people are indeed able to discern climatic changes, beyond the limited timeframe of weather fluctuations (West and Vasquez-Leon2003). All human beings have developed cognized capacities to recall the past, discuss the present and anticipate the future weather (Strauss and Orlove 2003).

The research field work was carried out in January, 2012 in both sites, Logwa and Hattisar. After the completion of field-work also I was in regular contact with some informants from Logwa (Devi Maya Nepali, Kendra Prasad Subedi) and from Hattisar (Chahdra Lal Dhakal). In the field area, researcher conducted the ethnography with the local informants at both research sites. Most of the informants were from agriculture and livestock management background. Women informants gave their good experiences which they were facing in their lives. Young women, mainly

daughter-in-laws, were more sufferers from the climatic risk situation. These women, teachers and shopkeepers are included in interview. Informants were asked about change in their natural environment and surroundings like past and present, increase or decrease, explain the new difficulties- changing situation in their view Local women and elder people are not familiar with the term climate change. At the time of interview, researcher gave reference of climatic indicators like rainfall, mist and dews, temperature, disappearance of plants and animals, outcomes of new species, situation of risk like drought, hailstone, landslide, windstorm etc. Informants were asked about change in their natural surroundings and environment during the last 20-30 years. Simply, unstructured interviews were conducted with relevant and simple-to-understand questions according to check list. The informants were asked about climate change in their areas, its pattern, effects, their way of dealing with changed situations, their cultural understanding, patterns of climate change and the overall consequences using terminologies they are well acquainted with and linking questions to activities and events that are a part of their day to day life. Group discussions, focus group discussions were organized. Dalit women, Limbu women, daughter-in-laws, mother-in-laws, and different categories of women were selected as focus group discussion in different place and time. It is because multi-vocal, multi-caste, multi-class, multi-age group information can be gathered. I talked with them in a very polite and respectful manner. When women were at work, researcher helped them and afterwards they were asked about the problems and experience. Researcher had never used the term in complex form. They expressed their feelings and experience in free mood. Elder women gave lifelong experiences whereas daughter-in-law were expressing that they were overloaded by the effect of day to day changing situation. I also observed field activities, women feet, hand, clothing pattern, their sleeping hours and working hours, water tap, springs and ponds situation. Through field observation, researcher asked to the informants about the situation of physical aspects like crop patterns, water access and scarcity, drought impact on local people, increment or decrement in the burden of women and so on.

Researcher tallied the information gathered from observation with the informants' version on climate change in the area which provided authentic primary information on the subject.

3.2.2 3.2.2 SECONDARY DATA

Besides primary data, I also consulted books written on climate change from anthropological perspective available in the library before, during and after the research period. Secondary data is also collected from different books, CBS preliminary data, magazine, articles, website, internet, thesis reports, government school register of Siddha Kali Higher Secondary School.

The climatic data (Rain and Temperature) of Terhathum station over last 15 years was obtained from Department of Hydrology and Meteorology (DHM). It helps to know the changing pattern of temperature, rainfall which is very essential to know the climatic condition in comparative manner. The socio-demographic information regarding study sites were collected from Central Bureau of Statistics (CBS) record. Moreover, I have visited the district official webpage of Terhathum for social and geographic data.

3.2.3 3.2.3 DATA ANALYSIS

Since the data collection method is qualitative, data analysis is done by descriptive method. Data was obtained in the form of field note or photography; the feelings, expression of the informant during interaction with the researcher were put into words. Cognitive knowledge of women, particularly those who have keenly observed unexpected climatic variations during their lifetime is included. Also, the root causes responsible for inequality, which makes women far more vulnerable to the negative effects of climate change in the same circumstances is analyzed

Since the perception on climate change vary according to the gender, age, occupation, family status, social status and many other factors. Data obtained from each of these factors is considered in a way appropriate to that factor. Even the same

informants may have varied perceptions on climate change and its effects on her/his way of life from time to time; because for her varied opinions is analyzed. In short, emic perspective of data analysis is preferred for the research study. The data obtain from the field was analyzed and interpreted with simple descriptive manner. The researcher has adopted cognized approach to get and analyze the raw data. The experiences and opinions of women as well as men are quoted in informant's own words.

To make sure that the responses by the informants are based on facts and ground reality and not fiction, I used the triangulation method to verify the facts. The cause for climate change affecting women more is analyzed. Knowledge of women, particularly those who have keenly observed unexpected climatic variations during their lifetime is included. Also, the root of the causes responsible for inequality, which makes women far more vulnerable to the negative effects of climate change in the same circumstances, is analyzed. At last, the real name of the informant was listed after their permission.

3.3 3.3 LIMITATIONS OF THE STUDY

Climate change is a broad topic in itself. It has got scientific, economic, social, cultural implications for the people. The study is conducted in a small geographical area in view of the limitation of time and available resources. The findings may not represent the country as a whole. All the events and experiences of informants may not recall, they can forget because of long time interval. Study is held in Oyakjung; same data may not find in other areas. Since it is qualitative research some numerical data are also found. It may not cover other issues, however important, in the area of study. The research is intended as a partial fulfillment of Master's Degree in Anthropology; researcher's knowledge may be limited for experts in the field of climate change.

4 CHAPTER FOUR: THE SETTING PEOPLE AND CULTURE

This research was conducted in two communities located in different altitude of Oyakjung. This chapter describes the social cultural condition of the study area. Similarly, it also describes the social setting, physical setting, division of work, livestock management, gender and farming practice of study area. It also describes location of whole district.

4.1 4.1 TERHATHUM DISTRICT IN GENERAL

Terhathum District, 26⁰ 13' to 26⁰ 58' North Latitude and 87⁰ 27' to 87⁰ 45' East Longitude, is located in the northern region of eastern Nepal. The district covers an area of 679 square kilometers. The district has altitude variation having lowest point at 354 meters and highest point at about 2963 meters from the sea level. So, climatic variation is available here. The average maximum temperature ranges between 19.3°C and 26.9°C and the minimum temperature between 6.2°C and 18.0°C. The annual rainfall is 711.9 mm that is lower than the national average of 1800mm.

According to the preliminary report of 2011 (2068 BS) CBS, out of the total population of Nepal (26,620,809), Terhathum has the population of 101,709 of which 47,357 are male and rest are female (54,352). The annual growth rate is -1.06 and sex ratio is 87. The total number of houses are 21015 and number of households are 22409. Similarly, the average household size is 4.54. Population density person per square kilometer is 150. (CBS, 2011)

Not all the parts of the district are connected with motor roads. However, recently, this scenario is changing and the places are gradually being infrastructure with motor roads, no matters just graveled up to district headquarter. The district produces a lot of paddy, maize, millet, pulses, mustard etc.

Almost 37% of the district's land is covered by forest. It is not only agriculturally independent in itself but accumulates tremendous foreign employment. In most of the villages, young energetic male members have gone for foreign employment.

Those residents who have left the country for foreign employment numbered 9656 of which 9113 were males and 543 were females.

The women are increasingly overburdened. Terhathum is not only dependent on agriculture, the economy of the district is also highly dependent on livestock, poultry farming, bee farming, fruits trading as well as ginger, broom stick and cardamom farming.

4.2 4.2 OYAKJUNG VILLAGE DEVELOPMENT COMMITTEE

Oyakjung village is situated around 12-64 km east-west of headquarter Myanglung of Terhathum district, Koshi zone. Towards the east of the village are places like Sikre, Giddae Bhir, Manenalengini and water drain of Pathivara Temple, Ishibu village. Similarly, river Khorunga flows in the west along with Aambung and Sabla village in the north is the Pauthak village and along the west of Oyakjung is the Jaljalae village. Oyakjung VDC is about 600 meters to 2905 meters from the sea level. It has the latitude of 26 ° 30' to 26 ° 26' North and longitude of 87 ° 25' to 87 ° 45' East. The temperature here ranges from 15°C to 25 °C in general.

This village faces west where the topmost part has black sandy soil with dense forest and grassy grounds. The lower and middle parts are the residential areas of the local people. The major sources of water are the various rivers like Ashuwa, Sabema, Mamring, Puthunga, Sisnae, Gharti and Okharbotae. The geographical pattern of the village is composed of some flat lands, sloppy hills, forests etc.

River Tamor, Koya khola, Khorunga Khola are clearly seen from the village. Also the famous Hyatrung Jharana is located near to this village. The situations of all these water resources are not in the same situation as they were in the past. The dominating villages are Hattisar, Ashuwa, Phaduwa, Mehele, Majuwa etc.

The survey of 1976/77(2033/2034) states that the total area occupied by this village is 40508-8-3 ropanies with agricultural land of 204974-3 ropani², sloppy land of 9699-71 ropani and the remaining of forest, roads, stiff land etc.

The forest of this villages like Pathivara, Sikrae contain colorful rhododendrons along with the creeping of the birds like danphe, munal, kalij and the jumping of the animals like deer, rabbit, dumsi, etc

This village has the popular Panchakanya temple alongside huge rocks and sloppy land. Water flows from these huge rocks. Anciently, in Limbu language, 'Oya' means water and 'lung' means stones which associated to form 'Oyalung'. With the passage of time the word repeated and changed its pronunciation from Oyalung to Oyakjung.

Until 1843 AD (1900 BS), the Limbu community was the original and dominating community in Oyakjung. So, in this VDC, young Limbu women and men dance and sing by holding their hands each other in group with loveable wording song in happy ceremony, in weekly and monthly local market (Mela Bazaar) which binds them in affection, it is called "DhanNach³" in local language. Major portion of the land was covered by dense forest. With the passage of time, it is believed that other communities also migrated and settled here. As population increased the forest became thinner due to deforestation and residential area increased resulting to the extinction of different wild lives found there.

River Khorunga flows from the lower belt of the village. This river which flows 600m above the sea level is at a distance of almost 2905m from the upper Pathivara and Sikre hills of this village. As both Lek and Bensi falls in this village, the lower parts have warmer climate while the upper areas are much colder. Dews and fogs are seen

² **Ropani** is a unit of land area in the mountains of Nepal = 5476 square feet or approximately 608.44 square yards, approximately 508.74 square meters. A square 74 feet on a side is 1 ropani, 1 hectare is about 19.65 ropani, and there are 8 ropani in an acre.

³ **DhanNach** is a traditional cultural dance of Limbu ethnic community in Eastern Nepal. The Young Limbu women and men dance with holding each other's hands in mela, Bazaar, feasts and festivals.

from Kartik to Falgun from the upper belt villages to Pathivara and Sikre hills. Sometimes, even snowfall can be experienced in Poush and Magh here.

There are a lot of small rivers flowing which are used for drinking purpose and irrigation. But, nowadays droughts reduce the production. Through the village have pipe water facilities now. For irrigation, the water is drained to the fields from different rivers like Sabewa, Ashuwa, Mamring, Sisnae etc. Before 20 years, every month small rainfall could be seen. However from Jestha to Bhadra, rainfall occurred regularly. The average temperature ranges from 15°C to 25°C.

The people residing in these villages have their own religion, custom, tradition and languages. Though they have their own religion, tradition and language, the residents of these villages live cordially with mutual help, respect and religious faith. Majority of the people in the village are engaged in agriculture. In the lower region of the village, people cultivate paddy, maize, millet, wheat while in the upper area of the village farmers grow maize, wheat, potato, mustard etc. Cash crops like cardamoms, gingers and fruits are popular among the villagers. Radish, spinach, tomato, cauliflower, carrot, bitter guard, lady's finger, pulses, gourd and broccoli are the common vegetables grown in this village. Similarly, people teamed cow, buffalo, ox, goat, pig, duck, hen, rabbit, bees, fish etc. in their home for income or consumption. These are the major source of income of the village people.

There is no facility of motor way in this village. The roads are constructed and connected only form Dharan to Myanglung, headquarter of Terhathum. Myanglung Athrai Sankranti motor way is under construction now in assistance of RAP. This road is extended to Hali-mela to Logwa, sherma, Ashuwa till Jajalae. As the road runs from near the village, majority of the villages are away from this facility. Had the roads been touched to the Pouthak, Poklabang, Sherma, Samdhu and east west central hilly public way of Oyakjung, the village would be more urbanized. The small narrow paths for walking are rebuilt by the local people every year at the time of Dashain.

Logwa is located in the lower belt of Oyakjung. It is on the upper most part of Khorunga River. It is located in ward no. 3 of the VDC. The residencies code of the community is 01. There are 24 households according to district development office record. Total population of community is 159 among them 82 male and 77 female. In 20 families male are house hold head and in 4 families female are head. Average family member are 6.63. There are 100 Brahmin, among them 55 male and 45 female. Dalit (Kami) population is 27. There are 52 Damai (25 males and 27 female). Here, two families are landless. Five each family have up to 3 ropani of land, 4 each families have up to 7 ropani of land, 4 each families have up to 7 ropani of land, 7 each families have up to 13 ropani of land and 5 each families have 39 ropani of land. According to interviewed informant, female illiterate rate is so high than men.

Hattisar is located in upper most part of Oyakjung. It is in higher altitude area than Logwa. The residencies code is 02. The total household number is 53, total population is 276 and among them 140 male and 136 are female. In 39 families there are male households head, in 14 families only female are household head. There are 36 Chhettri (20 male and 16 female), 158 Brahmin (male 81 and female 77), 23 Kami (10 male and 13 female), 28 Damai (10 male and 18 female), 31 Limbu (19 male and 12 female).

In Hattisar, one family is landless. 10 each families have up to 3 ropani of land. 13 each families have up to 7 ropani of land. 19 each families have up to 39 ropani of land. Only one family has above 65 ropani land. In Hattisar, female illiteracy rate is also high. Women were looking so busy in their work in both communities.

Hydro electricity is irregular in both of the communities because of the shortage of water in the river. Therefore, both the communities are powered by the solar energy. Piped drinking water is available near the rich people's houses. It is not sure that all the time water is available in the tap. There is dense natural forest near the eastern part of the communities. In Hattisar, the forest is covered by Chilaune, rhododendron, kattus, kaphal, uttis and bamboo. In Logwa, forest is covered by

Chilaune, pine, bamboo, sakhuwa etc. Local people collect fire woods, fodder, timber (for construction of house and shed of cattle), and grass from the forest. Blacksmith and goldsmith who are largely depend upon the forest for making farming and household tools such as Khukuri, sickle, axe, knife, and gold ornaments for their income sources. It is important for the local people's survival. In both communities, all the families were engaged in subsistence agriculture and livestock management. Among the total informant 25% (n=22) percent were solely engaged in agriculture in Logwa and 50% (n=14) percent in Hattisar. Only 3 informants in Logwa and 2 informants in Hattisar have irrigated field. So, half of the informant of both study sites were poor, they have only food for less than six months. Wage labor, working outside the village and remittances from family members are other alternatives for livelihood. Young people in village like to go abroad for income source. So, older household heads and women have to fulfill the situation of climatic disasters. Half of the informants of both study sites were illiterate. Most of the illiterate were women aged 40 plus. Simple malnutrition is common in poor family; mainly children, old people and women were victim. Most of them are from poor Dalit families.

4.2.1 4.2.1 THE PHYSICAL SETTING

The study was conducted in Oyakjung VDC of Terhathum district at the South-Western region Logwa, as well as North-Eastern region Hattisar. The local people classified the area into three ethno-climatic zones. Southern part is wet and fertilized due to its location at the bottom of the hill and is called Sim⁴ with wet land most of the time. There is sufficient water in any kind of drought. Paddy can be cultivated during the drought period too. Simkhet is also called Arubotte in local language. Black-wet mud is very fertile in this area and most of the time there is good production in this land.

⁴ **'Sim'** is a land with springs and enough water. This area is wet land in most of the times and cultivable for rice production.

The middle part of the area is called Pakho⁵ Khet. It is drier than Sim. In the summer season, farmers grow paddy, maize and in winter farmers grow mustard, wheat, potato and many other vegetables. In this area, agricultural production depends on rainfall. Paddy plantation begins after rainfall.

The Northern part of the study area is called Danda Khet meaning upland. In summer season paddy can be planted after heavy rainfall when water comes out from Mool. Wheat is planted in winter. In summer, when there is no rain, now a day's farmers have started to plant ginger, chilly etc. Agricultural production also relies on seasonal rainfall. This part is drier than Pakho Khet. Farmers plant paddy from the last week of June till the second week of July. Harvesting is done 15-20 days earlier in both Pakho and Danda Khet than in Sim because of the variation in climatic ecological landscapes.

4.2.2 4.2.2 SOCIAL SETTING

The study site is seen full of heterogenic caste and ethnic composition. At the lower part of Logwa and upper site of Khorunga River, there are 12 houses of tailors called Damai Gaon in local language. They have no sufficient and fertilized land. I found that three families share 2 Ropani of land to cultivate. These poor families use other rich people's land to cultivate. The change in climate, no rain, drought, late rainfall, decrease in dews, hailstones etc. on time directly affect these poor people and women are the most sufferer ones in their own experience. In short, Damai are in marginalized condition. Climate Change, early or late rainfall directly affects these people and the ultimate victims are the women. In upper north western part of Logwa, there is Kami Gaon who are also in pathetic and marginalized condition with unfertile land. There are five houses of Kami people. They are exploited by the people of upper caste. Most of the Kami people work in rich people's home and they are compelled to work whole day because they have no sufficient and fertilized land. Climate change directly affects these poor people. They cultivate other people's land

⁵ 'Pakho' is dry up land which is not cultivable for rice production

with hard labor but couldn't get enough returns if there is no timely rainfall. The ultimate victims are the women members of this group of people. With direct contact to the informants, their outlook expressed their conditions, lean and thin. Young women looked like aged women. Thirty years old women seemed like that she was in her fifty. They are suppressed by the social settings and family members like their husband, mother-in-law, sister-in-law, and others male members and also by the unseasonal rain and drought directly affect the day to day bread of those marginalized people. Their labor goes useless if there is no timely rainfall. The people residing in this village have their own religion, custom, tradition and language. Though they have their own religion, tradition and language, the people of this village live cordially with mutual help, respect and religious faith.

Most of the people here are Hindus but they have equal faith in Hinduism, Buddhism and Kiratism. However, majority of them follow customs and traditions of Hinduism. People worship Lord Brahma, Krishna, Vishnu, Shiva, Sharaswati, Laxmi, Parwati, Ram, Sita, Durga and other Gods and Goddesses. They have faith in Ved, Puran, Rudri, Chandi, Satyanarayan. Likewise, they worship Budibaju, Maharani, Kanchi Bahini, Panchtharane, Yasukeni, Banka Dewata, Dewa, Dungdungae, Udhauli, Ubhauli and Nwagi.

They believe and worship stones, rocks, rivers, lakes, jalkanya, Singhadevi Bhagawati, big banyan and Peepal trees as Devithaan. These all resources are culturally constructed. People define these things as deities. There is no particular photograph of any God but it is worshipped for the protection of the community. The researcher believes that the reason behind these cultural beliefs may be for the conservation of scarce resources. They also worship, Sun, Naag, water, mool and their own 'Kul-Dewata'⁶. Some caste of Brahmin and chhetri also worship Diwali.

⁶ **'Kul-Dewata'** is the God of a clan or family God worshipped for a long time from the ancestors to present.

Most of the Limbus in this village, speak Limbu language. However, now a days, the new generations of the Limbu family are found speaking the actual Nepali language. So, there is more probability is that this language might be forgotten in a period of time. But, for the development of Limbu language, different books are being published now. Now a days, in the schools, Limbu language is also included as an optional subject to promote this language. Newar and Sunwar languages are not much in use. Majority of the people speak, write and learn Nepali language.

The males in this village, used to wear bhoto, lagauti, daura, surwal, coat, jwarikcoat, ascoat, estacoat, topi, patuka and the females wear gunyeu choli, patuki, pachheuri. Besides these, now a days, males wear shirt, pant, coat, kamij, trouser, sweater, jacket, cap and females wear kurtha, surwal, skirt, frock, gown and shawl. Both males and females are wearing pant and shirt.

At the time of death, Brahmins and Chhetris play sankha and take the dead body to the funeral site at the bank of rivers. The body is burnt after which the ash is washed away with the help of river water. But now, there is no enough water in the rivers as before to do these activities. Different communities have different ways of conducting the funeral ceremony; some burn and some other burry the body.

Among the Brahmins, Chhetris, Jogi, Bhujel, Sanyasi, Newar, Kami, Damai, and Sarki, there is a system to do some religious activities of 'Kiriya'⁷ on the 13th day after death and the whole year is meant to be a year of shock or mourning.

Among the Chhetris, Brahmins and some others, nomenclature ceremony is conducted within 7-11 days whereas in case of Limbus, the girl baby is named in the 3rd day and the boy baby is named in the 4th day.

⁷ **'Kiriya'** is a culture of Hindu religion, when family member dies and after his death the nearest family members mourn for 9-13 days for the holiness of deceased person.

The Brahmins and Chhetris do Bratabandha⁸ of their son at the age of 8-20. Marriage ceremony is done in their own caste but with different cultural systems.

Despite of being from different caste and class, everyone here shows equal participation at the time of marriage, festivals, birth and death ceremony, parties and they have respect for ones and others religion and cultural systems.

In the past, only the Kirats used to drink local whisky and alcohol but now this system is prevalent also in other communities like Brahmin and Chhetri which causes sometimes inter and intra family disputes in the village.

Limbu are settled in the middle part of this village. Culturally, they make alcohol and local whisky in their home. Women have to spend most of the time to make alcohol and local whisky. But most of the Limbu males take alcohol and play cards in local teashops. Women do the household works as well as in the farmland. Limbu women suffer not only economic condition but also climate variability, alcoholic habit of their husbands and overload of work cause by the effect of climate change according to local Limbu women farmers.

Most of the Chhetris and Brahmins have huge plot of fertile land. They cannot cultivate their all land by themselves. So, their land is given to their local poor neighbors in the community like Damai, Kami, Limbu and also poor families of Brahmin and Chhetri. The economic condition of the Brahmins and Chhetris women who own huge plot of land was good enough by selling the grains produced but their hands and feet were dried to wound while those of male members were not in the same condition. It showed that women are really engaged in long time work.

The settlements are located in cluster. However, each caste and ethnic groups have their own settlement separated by their respective farmland, barren field and wall. In these communities, different varieties of soil are available like red soil, brown soil,

⁸ **‘Bratabandha’** is a culture of Hindu religion. When young sons of a family get more than 8 years, they are purified by priests teaching Mantra and should follow the religious rules and are also able to do karma.

black soil, white soil and stony soil. People use these varieties of soils for decoration of their house with different colors. They decorate their walls with red and white soil while the brown and black soil is used on the floor. Black brown soil is fertile for cultivation. Most of the people follow the farming and livestock management while there are rarely few people following business and service for their livelihood.

4.2.3 4.2.3 DIVISION OF WORK

In village, women involve in household and many other works like fetching water from far off taps, collecting fodder, cutting grass, day to day household works as well as day time labor in other's field. Most of the poor women go outside carrying their pots to fetch water because there is no tap, spring or well near the house, but are only near to the richer one's house. Day by day, rainfall has become uncertain and because of draught, water scarcity is also increasing. In this situation gender division of labor is also increasing. In most of families there are only females, children and elder people engaged in farming and livestock. During the field observation, the researcher found that the men are respected by the women in home and men do not offer helping hands to women in household works. Women collect firewood, fetch water, and cook food and clean utensils whereas most male go to public places to fulfill their works in market, neighbor, tea-shop, office. Women have to get up early in the morning to accomplish their household works so as to manage time for field work. Blood was seen coming out from women informants' hands, which shows the overload of work for women.

4.2.4 4.2.4 LIVESTOCK MANAGEMENT

Women have to cut grass. Before, grass was available everywhere. Long and bushy grass was there but now there is no enough grass as before because of the scarcity of water. Women have to search it which takes time to cut and collect. Women have to look after cattle. The quality and quantity of straw is decreasing now than before. It is difficult to rear cattle. Livestock management is becoming difficult for women. So, women informant said

"We women have started to dig the field, plan to plough and looking after oxen."
One informant Kausila Nepali said, *"My husband has gone for foreign employment. So, I have to look after cattle, cut grass, fetch water and many more. I then finished my household work and start to dig the field. Sometimes when there is no rainfall, it is so difficult to dig. All work fall on my head."*

These experiences show that they are burdened by the situation. Women are ready to accomplish hard work even in the absence of male members. Rich women hire the laborer but now it is difficult to get laborers in time because hardly any energetic youths are left in the village; most of them have gone for alternative jobs, education, in the local cities and overseas. Poor women are compelled to do all kinds of works created by the day to day changing situation of climate.

4.2.5 4.2.5 GENDER AND FARMING

Over the last 10 years, people have seen inconsistent, less and late rainfall which causes regular shift in time of paddy plantation. Most of the women told that because of the increasing forward shift in farming, seasonal migration of local youths is seen in the village and the overload of work fall in women who are engaged in farming. If the seeds are not suitable for seedling, women have to go in search of others seeds. If late rainfall occurs, all the works have to be done in short period. So, women do not get rest whole day. After field work, women have to return home and start doing household works. *One informant Punya Mata Subedi said,*

"Look at my palms and feet. It shows the overload of my work. My hands are cracked out of dryness and excess work." She said further, "If rainfall is not in time, grain production also decreases, which also results our source of income to decrease. After this our decision making power is also decreased. If we have money in our hand, we can buy things that we need in the kitchen and for other activities. The low rainfall requires the farmers to invest more labor for plantation, weeding and protection of crops from harmful diseases which increase the cost. By low precipitation, we farmers start to plant ginger, chilly

and maize if paddy is late to plant. It creates additional burden for women to search rice for household consumption."

These statements prove that local people are compelled to change their cropping pattern because of untimely rainfall. Again, women of that family who change their cereal crop plantation to cash crops, have to exchange their cash crops with cereal crops for daily consumption. It is time consuming and creates additional burden for women. In rainy season also there is shortage of rainfall because of changing of Monsoon and drought causes additional cost in cultivation. Increase in insects destroys the farm products which is also a problem for women who are in day to day interaction with farm cultivation. Women have to serve meal for the whole family. So, it is difficult for them when cultivation is not good. Above sayings which are said by mother-in-law of the particular house represents women of that community. Likewise, daughter-in-laws are also suffering of less food because they should eat at last after other members in the family, when the food remains less they cannot get enough food.

5 CHAPTER FIVE: PERCEPTION OF HILL FARMERS ELDERLY WOMEN AND MEN

The main objective of this research is to examine the perception of the local people, especially women, on climate change. Therefore, this chapter mainly concerns with the women perception from their own experience and the male informants viewpoints. At the time of research, it was winter season; most of the women had gone to Terai after completing the harvesting. So, both male and female are included as informants.

In this research, perception and experience of climate change from women and men informants are collected and divided into sub-headings according to thought. At first, the perception of the young and older women member of the respective communities on climate change are taken and these climatic parameters are kept with the available meteorological data of the Terhathum station.

In the next section, the effect of climate change to rural women, risk and disaster on the basis of risk factor is kept which is important to understand how they frame their perception about changing climate on the basis of their lifelong experiences.

5.1 5.1 PERCEPTION ON CLIMATIC SITUATION

People remember that climate change has indispensable role in the entire livelihood system of the community. When asked about the change in climate, male informants began their response by describing the changed pattern in the local climatic condition particularly, with respect to the change in temperature, dews and mist pattern, precipitation pattern during their life time as well as the impact due to climate related risk and disaster. But, when the same questions were asked to the women informants, the answer was different. They remembered about the water that was more accessible, frequent rainfall that occurred in summer as well as in winter (three times rainfall). Some insects have disappeared, some still exist and some are newly emerging. Marigold flower, orange and some other fruits ripe earlier than it

used to in the past. Grass was available in every field but nowadays scarcity is increasing.

Perceptions of climate change in the regions are shaped both by the local knowledge of crop climate linkages as well as the broader historical relationship with the environment (Veddwan 2006). However, perception of women about climate is shaped not by the term climate change but whatever they experienced, observed and felt at the local surroundings. Women are very closely observing natural surroundings in their day to day life. Therefore, perception of women is shaped by local flora and fauna, emergence of new species and disappearance of old ones, situation of local taps, number of taps that dried up, spring, stream, trend of rain fall, agricultural practices, animal husbandry, number of quilts they used before and now, types of clothes (thick and thin) they wore, easy or difficult to cultivate farm land, harvesting technique, availability of grass, fodder, water in their daily lives, in the past and present. These changing situations of local area observed by local women and elder persons throughout their lives of the particular area gives the symbolic meaning of climate change to us, who wants to get information about the climatic situation.

5.1.1 5.1.1 PRECIPITATION

Most of the informants' interview can be generalized that the rainfall has decreased in quantity. In present situation, rainfall does not give satisfaction to the local farmers whether they are male or female. This type of rainfall comes either earlier or later than usual. Local farmers have keenly watched the frequencies and the amount of rainfall during their lifetime. Local women and men who are involved in agriculture have long term experiences such as, later rainfall, earlier rainfall, drought, excess of hailstone, chilly cold, increased warmness in summer. These words they mostly used to explain climate change and all of them show the changing situation of climate. They predict the occurrence of rain, hailstone through the behavioral pattern of plants excess quantity of flouring and fruiting pattern of plants and lot of grains in

plant, frequent sound produced by frog at evening, observing lunar calendar etc. *In this context, Mr. Chandra Lal Dhakal of 78 years, a local resident of Hattisar gives his experience as follows:*

"I was born here and I'm continuously living here. Before 20/25 years there was enough rainfall from April to May (Baisakh and Jestha). But for last 10/15 years, there is less rainfall and sometimes long draught has seen. Winter rainfall is rare and summer rainfall is uncertain and decreasing. Before 1963 (2020 B.S.), Bhadaure-Jhari ⁹(August/September) prevailed for 15 days or more which is very essential to the winter crops, also uncertain now a days. Because of uncertainty of rainfall, it is difficult to cultivate in time. Late farming causes overload of work for us, especially women are overloaded by late rainfall not only affects agricultural cultivation but also affects green grass and fodder to grow in balanced manner for livestock management. It is a big problem for us. In past, on "Ashar Pandra" we experienced big rainfall and, with parma system all villagers planted paddy near those days and ate curd and bitten rice. After than when 'Teej' was near at Bhadra, Teejae Jhari began to start and with the celebration of that ladies festival we planted millet inside the maize field. Then, Dashain started with Shorasraddhae Jhari which was very essential for the winter crops like mustard, pea, wheat, hieudae makai and vegetables. Chilly cold started from Aswin and that rain added more snow in the mountains. Situation of those times was very favorable; Productivity and production was good. But now everything as that time is not found.

Drought was a climatic feature of those environments and people developed adaptive strategies to cope with it, largely by temporarily migrating and then returning once the drought broke. Anthropologists have long been among the leading researchers of these adaptive patterns, particularly those related to issues of

⁹ **'Bhadaure Jhari'** is a continuous rainfall in the last of summer season in Bhadra, which is good for young paddy plants. It is generally in August to September.

famine and famine relief (Shipton 1990). Previously, seasonal migration took place only after the agricultural cultivation but now there is no certainty that crops could be cultivated. So, the village youths do not have patience to wait for favorable situation to cultivate. They are in a fair that even other opportunities would slip out of their hand if they continue to wait back in the village to cultivate their fields. Therefore, women have to suffer from overload of work. With the scarcity of farm labor the culture of '*Parma System*¹⁰' in the village has almost been rarely found. It is difficult for the women in labor management at the time of cultivation. This is the change researcher found in the village. Local women argued that because of less rainfall, original springs, taps, well are drying. It is difficult for women to fetch water. Both summer and winter crops fail. Due to the lack of labor and rain water scarcity the only source of income i.e. selling of grains by women has been lost for 7/8 years. Late rainfall consequently affected rice production. The quantity of production is decreased because of increasing uncertain rainfall and spreading disease in paddy. Change in cultivating time swept away all the local production of grains. Local seeds are nearly vanishing because of uncertainty of rain, because crops do not get proper quantity of water. So, village people select the hybrid and cash crops cultivation which need less water and produced more. But villagers found that new kind of seeds have no tolerance power to face with the changing situation of draught, hailstone, wind etc. Local farmers remember and link the rainfall with the ritual cycle. Each ritual brought essential rain anyhow in the past. It balanced the agriculture, livestock management as well as whole villagers' life. Farmers have technique of adaptation; they have changed the crop patterns nowadays.

Dhakar again said "Because of less rainfall and drought, there is low productivity in our locality. Unseasonal rainfall, hailstone, and less snow fall affect women who are limited in household work and have no other alternative

¹⁰ '*Parma System*' is a mutual help among neighbors in the farmland at the time of pick workload on cultivation and harvesting.

sources of income. If guests come at home, we male sit and talk with them while all duties of the kitchen and other household works is carried out by women no matter whether women is young or old."



Picture: An old grandmother engaged in kitchen

If there is no seasonal rainfall the cultivation time shifts and women's workload also increased. In the past, male used to go outside for job after the plantation of crops. However, now crops plantation is uncertain. Sometimes, when the plantation was late, crops did not ripe. Productions decrease resulting to decrease in income. Poverty increases in rural women and decision making power of women also declines when agricultural production goes down. Women are bound to do male works in villages. Women start to dig the field because in most of the houses, there are no males to plough it. *In the same context, Mrs. Indra Maya Limbu of 80 years old, local resident of Logwa gives her experience as follows:*

"Water is drying out. Less rainfall and increasing drought makes women's present life more difficult than past. I am old; my daughter-in-law gave birth to a baby 18 days ago but she has to start the household work now because there are no other women in my house to do the work. It is so difficult for her to fetch water since the tap water has almost dried up. Past time was better

than present. There used to be good productivity in the past. We earned money by making and selling alcohol (raksi). But, now a day, due to absence of timely rainfall there is no enough grain for alcohol and local whisky. Before, we made such cultural things with the rice, maize and millet. But now it is difficult to fulfill daily food (lunch and dinner). Only millet is there but not in proper quantity. Grass is not as good as before and straw quantity is also decreasing which makes difficult to feed cattle. I used to make money by selling milk, ghee and wine. By the effect of less rainfall now everything has gone. If we fetch water late from tap, family head starts scolding with rubbish words at home and if we react and speak back, they hit with whatever in their hand. Moreover, it rains when we do not want and it does not rain when we need. Productivity decreases, income decreases and we women bear the negative consequences with tired and victimized condition."

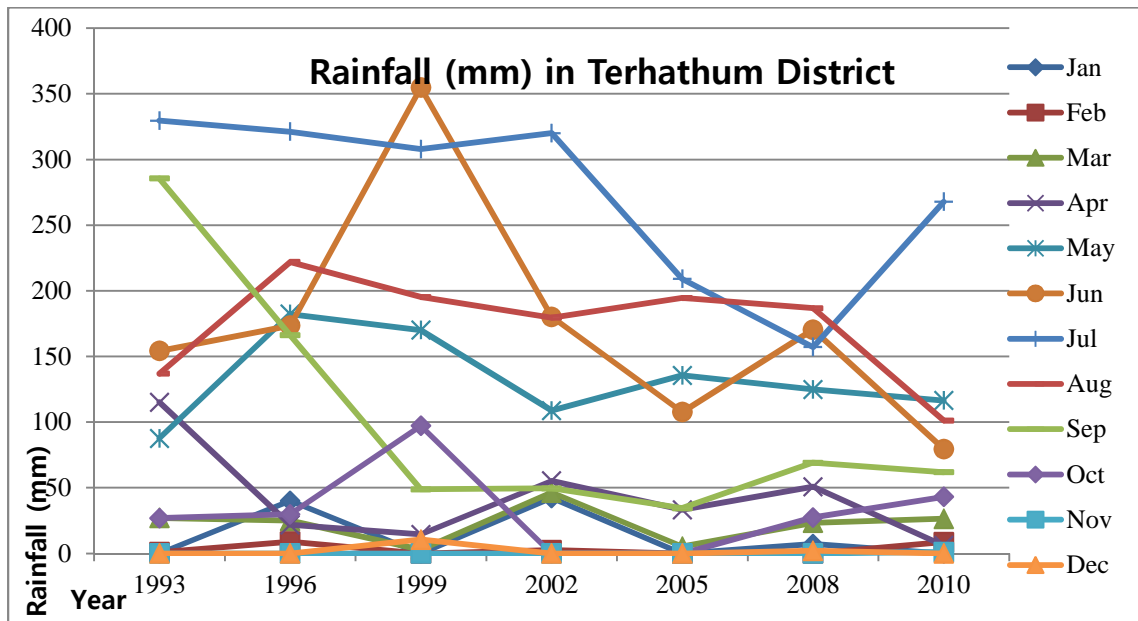
These both informants' reasoning shows the vulnerability of the situations caused by the climate change. Poor farmers, especially women, are marginalized by the effect. Most of the informants thought that the amount of rainfall per month had decreased and felt that amount and time of rainfall has changed. Most of the informants react that women are overloaded with work and their income is also decreasing. For three years at the time of harvesting hailstones swept away the ripping crops because of less productivity giving rise to family conflict. Without food it is difficult to work and essential to go to the Terhathum Bazaar for the search of grain. Daughter-in-laws and daughters are sent for that purpose and if they come late it is issue of conflict.

Dhana Maya Dhakal of 76 years expressed "Before 1963 AD (2020 B.S.) Bhadaure Jhari lasted for 7-15 days but now here is not much rainfall and it is uncertain as well. Even in Dashain Shorasraddhae Jhari (both Bhadaure and Shorasaraddhe Jhari are essential for the nutrients of winter crops) occurred but now it doesn't for 10-15 years. In summer, there used to be heavy rainfall (it is essential for paddy plantation) but now the quantity has decreased. People

used to celebrate and pray God Indra as Sansari Pooja to call the rain in time. But now the culture is almost lost. It is not certain it would rain". Growers' perceptions of climate correspond closely with the meteorological record in the valley (Vedwan and Rhoades 2001, cited in Vedwan, 2006)

The average monthly precipitation of Terhathum station (rainfall records)

Figure 1 Monthly Average Rainfall Distribution of Terhathum Station from 1993 to 2010.



Source: Source: DHM, 2012.

This chart (figure no. 1) proves that metrological data and people's experiences on rainfall have compatibility to a large extent. Informants are true in their analysis. Before 10-12 years there was somehow timely rainfall at the period of cultivation but since 5-7 years rainfall is decreasing at the period of cultivation. Rain should be timely at the time of plantation, weeding, flowering and fruiting for the good productivity. But the figure shows that after 2002 balanced rainfall was totally decreased. In 2010, big rainfall occurred only in July. According to the informants, there was unseasonal rainfall. Cultivated plants did not get proper quantity and quality of rain water when it was needed. So, farmers, especially women were struggling without unfruitful return, because they do not get much as their

hardworking they passed for agricultural activities. The trend of rain fall was fluctuating within these 15 years. Only on July rainfall was constant but in the other months rainfall was not fixed. There was also decrease in the amount of rainfall during July in comparison to past years; this is the main period of paddy plantation in local areas. If rain is uncertain, it is a huge problem for women who are solely involved in subsistence agriculture. The figure shows that in the beginning of 1993-1999, there was little imbalance, but the trend changed drastically later bringing numerous problems to all the local people who are involved in livestock management, agriculture based subsistence, fruit production etc. So, this kind of fluctuation in rainfall affects each and every activities of local people, among them women suffer more. In this context Punya Mata Subedi of 62 expresses, *"We cannot cultivate our field in time because of drought. We have no chance to work in farm land regularly at the time of scarcity of water. So, it takes long time even to do small work"*. Farmers have to stay long without work, but they are in rush to finish their work after it rains. All farmers' work starts after rain in more or less same point of time because of which scarcity of labor is a big problem for them.

5.1.2 5.1.2 TEMPERATURE

The climate is definitely different than before. When I was young, the winters were very cold, minus 50-60 degrees. When we spit, it frozen before it hit the ground and flying birds sometimes would freeze and die. The summer was a wonderful hot temperature and the hay you just cut would dry very quickly. In the last few years, the climate has changed. We have rain, rain; rain all the time and winter comes late and so does spring. For people, who live with a short summer when there needs to be the right weather to accomplish all for the winter and there is cool rainy times so that the hay does not dry and has to sit and sit and there is cool rainy times so that the hay does not dry and has to sit and the quality is bad because of that. It is the right time for haying but the conditions are all wrong (Crate, S. A. 2008, 140). As the change in the rainfall pattern, people of the study area including the women and the

elder mentioned that they have experienced a lot of change in the temperature of their particular areas. Among the two field sides, Logwa and Hattisar lie at the altitude of 600 m and 2200 m respectively from the sea level. So, there is a wide difference in the temperature of these two areas. Both sites, informants claim that the place is getting warmer in comparison to the past days. They said that in a past, days and nights of winter used to be very cold. But, since last 8 to 10 years they have been experienced less chilly winter days and nights. In both Logwa and Hattisar, there used to be no mosquitoes but now in these places, people cannot sleep without mosquito nets or fire smoke. This symbolizes that the days and night are getting warmer year by year.

Kendra Prasad Subedi of 72 says, "*Days are being hotter in summer. Because of winter warmness and summer hot days, snow is not seen in the peak of the mountains for the last few years*". His wife Punya Mata Subedi of 62 expresses:

"Winter was so cold before. We used to sit beside fire 3 times a day but nowadays winter is not cold as before. Likewise, in summer days we feel hot even inside the house. Before few years, people did not have the experience of mosquitoes but now the reverse has become true. To get rid of them, we lit fire to produce smoke. Papaya was never seen grown in our area before 5/6 years but now it's available in plenty. We used 2 or 3 quilts at night before 10 years but now even one is more. Mornings and evenings used to be chilly cold in the past but we do not feel the same now. Our hands used to hit by cold while washing the dishes and cloths but now we do not feel as before. Marigold flower used to bloom during the Tihar but now it dries up before Tihar (October). Orange is ready to eat now in Dashain (September) but 12-15 years before it was too sour at this time. The fruits' size is becoming small in comparison to the past. The test of oranges from even new young trees is also neither good nor juicy as before."

From this kind of local understanding and perception we can understand that during the entire course of the time, the environment and its temperature is changing. In both low and high altitude the temperature is rising. It affects the whole life of living beings. Cultivation does not get water in time and increasing warmness is difficult for the proper nutrients in plants' life cycle. So, local cultivation is not good as before. Women have to struggle for the situation. If there is problem, small children and grand parents support them.

It is pointed out that the traditional crops are now growing at much higher altitude and, concomitantly, lower parts of the valley like Bajaura are no longer producing apples. Farmers commonly recall that, earlier, Makai (corn) could not grow in Manali in the upper reaches of Kulu Valley, but was now spreading into the heights (Vedwam 2006). In Hattisar, Tulsi Maya Baraily of 58 from Hattisar has expressed similar kind of experience about the changing climate. She says:

"At the time of my marriage, papaya farming was not done in this place. Cold winter chilled us. But nowadays, winter is not cold as before. Mosquitoes are increasing for last 6/7 years. In the past, winter season lasted till second week of Falgun but now it lasts until mid Magh. In short, the duration of winter days are decreasing i.e. cold days are decreasing in number. At the time of harvesting, we feel so hot and difficult to work during the day. We changed our working time in the morning and evening. Most of harvesting of paddy in village starts 3am in morning. We have stopped to work in mid day when it is sunny day. Coldness is converting into warmness but it is not a good sign. We women are very busy to do household and field works in the morning and evening. We have to look after children, old and sick ones in the family etc wound of child not cure in short time. Before, if there was work load we prepared curry and Tiffin previous day, but now we cannot do so if we prepare it, recently smell bad. Nowadays, new type of insects are seen which were never seen before. The place where Cardamom was cultivated before and was nice

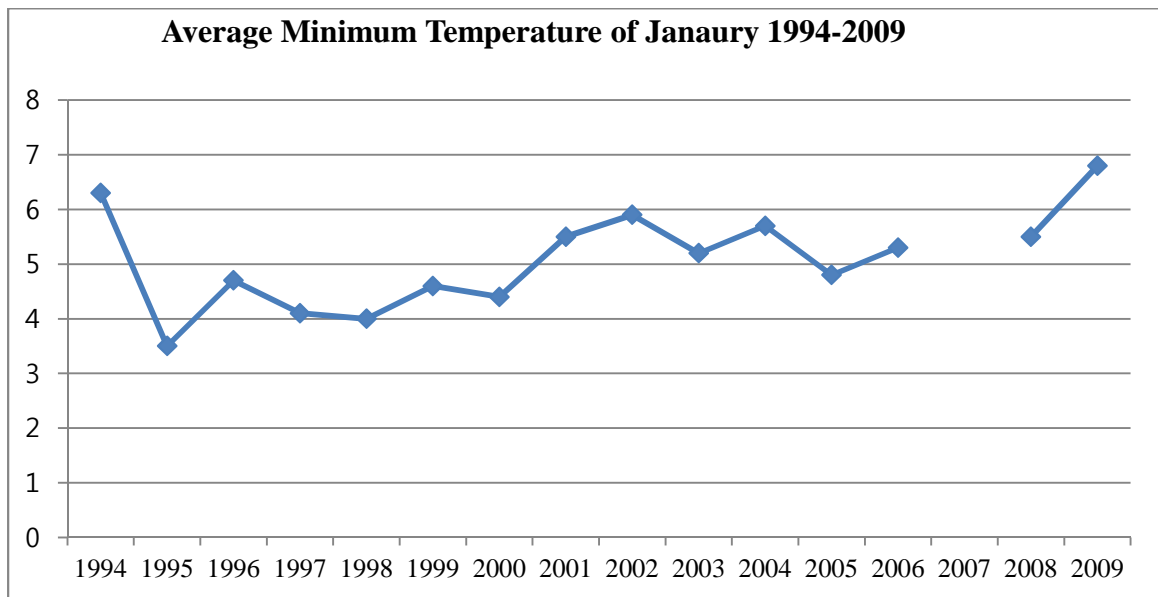
production was held is not the same as present. Its farming is shifting up hills. Before 8/9 years, there was only maize farming, but now paddy farming is starting since ten years in our locality."

From the above explanation, we can conclude that it is not good that the winter days to become shorter. Winter should be as cold as before and summer should be as hot as before. The explanation signifies that different people of same locality have their own ways of understanding about the phenomena in their locality. They have structured their feelings in relation to the activities they have done during their life time. According to their view, the temperature is really fluctuating.

The temperature in winter is rising rapidly now along with its late start. Before 10 years, winter coldness started from last of October (mid of Aswin) but now winter comes late, from the beginning of November (Kartik) only.

The local view with regards to the temperature is supported by the average minimum temperature recorded by the department of hydrology and meteorology of Terhathum station. The data of 15 years shows the increase in minimum temperature.

Figure 2: Average Minimum Temperature of January, 1994-2009



Source: DHM, 2012

Above figure (figure no. 2) shows that year by year the minimum temperature is increasing. Before there was so cold, things and materials last for long. Farmers feel tired because of increase in temperature. When it is hot they could not do more work regularly. Before could do a lot of works without any rest but now it is not so. Fruit, vegetables, grains' lasting duration is decreasing so people are compelled to sell things at the time of harvesting days. Farmers do not get proper price for their goods. Nowadays, farmers are not benefited as before. In 1995, the temperature was low nearly 3⁰C after 2009 it was 7⁰C. It is so highly increasing. It affects society a lot. Less rainfall and increasing temperature makes local life complex. Before 10 years, farmers used to do work whole day, but now people get rest at the midday for one and half hour at summer days. The period of work is decreasing now. They wanted to safe themselves from the heat of midday sun. The change in habit of community is that with the increase in temperature year by year people have stopped to eat steal foods. We can take it positive change in society. With the increase in temperature all living beings need a lot of water for survival but it is decreasing, one of the many causes for decrease is increasing in temperature.

5.2 5.2 MIST AND DEWS

Mist and dews play important role in the climate of specific area. People of the study area expressed their views that both mist and dews trend has changed in comparison to the past. Without the mist and dews there is no proper level of moisture and humidity in cold season. So, it is inevitable for the better yielding of winter crops. Most of the informant's experiences show that there was a lot of mist and dews prevailed in farm land as well as on the roof of houses and trees. It was somehow fertilizers for the crops because good production was held in the past than in the present. At present, both dews and mist are decreasing during the winter, crops do not get water as well mist and dews so production is not good. Most informants shared that the patterns of mist and dews is decreasing as well as fluctuating (71%)

while some do not see any decrease in the pattern of dews and mist (20%). Chandra Lal Dhakal of 78, resident of Hattisar expresses his experience about dews and mist pattern of his locality like this:

"If winter is so cold, it is good for both summer and winter. If mist and dew fall nicely, winter crops get water from it. If winter rains, mist and dews fall nicely and summer crops become good. Because of increased productivity, women can sell grains and earn money. Women with money in hand can do most of the household decisions themselves. When I was small, we could not see far away in a winter foggy days. We were not able to sit outside of home in the morning and evening without thick woolen clothes because of freezing cold. All the fields used to be covered by mist and it looked as if there was heavy snowfall. Dew fall made the summer and winter crops better in production. River and streams looked fresh and nice. But present situation is not like before. Before 1964 (2021 B.S.) there used to be lot of snowfall and fog covered our area, but now there is no fog, mist, dews and winter rain."

Dhakal again pointed to the front hill of his area and told that the peak of that mountain was covered by snow all year round when he was young but it has been a long time now since he has not seen any snowfall there.

Mrs. Devi Maya Sundash (64) of Logwa argues:

"Winters days are decreasing in number. When I was young, winter started before Dashain (last of September) and lasted until Falgun (March) but now winter starts only after Tihar (last of October). The days and nights used to be full of mist, fog and dews but now they are not. Now, mustard farming is affected by the decreasing winter days, low mist and dews. So, there are no good and flourished honey hives either. In cold, winter dews and mist used to fall, it was good nutrients for the mustard when it was flourished. At that time bees' hives were full of juicy yellow honey. But after there was no mist and dews; fuggy winter was turned into bright morning, the mustard and winter

crops which flourished rate is decreasing, may be the water and nutrients is not sufficient for the bees so that we do not get sufficient honey. Before I sold ten litters of honey yearly but I do not do so now."

The responses of the people show that both places (low and up land) are becoming warmer than before. In both places, mist and dews are becoming rarer which affect the grain productivity. Production has direct relationship with dews and mist, i.e. when there is enough dews and mist, it adds needed quantity of humidity for the crops and production increases and vice versa. Around 60% of the informants found that the pattern of mist and dews was positive but now the quantity as well as quality is decreasing in the occurrence of mist, fog and dews. The quantity of fog is increasing in Logwa during winter. Continuously 4/5 days dense foggy days spread fungal diseases in potato, spinach, radish, tomato and other vegetables in Logwa. But fogs do not affect vegetables in Hattisar. This difference in people's perception in these two research sites may be because of the geographical location of the place or due to the less impact of the phenomenon to the entire socio-cultural and environmental system.

5.3 5.3 PERCEPTION ON CLIMATIC RISK AND DISASTER

Local people classify and understand the climate related disaster according to the hazards that affect the existing human environmental relationship as well as to the socio-cultural environment. Since risk is a culturally defined notion (Crate 2008 and 2009), so the perception about the disaster and risk is determined by how it affects the existing system. Globally, there is an increase in the frequency of natural disaster in the 21st Century. Nepal is experiencing increased frequency and the severity of climate related disasters like heavy rain, flood, landslide, soil erosion, drought etc. It affects the existing life of living beings as well as nonliving things.

The informants of both study sites classified the risk according to the impact affecting them. Most of the informants categorized the events of risk and disaster as they are facing in real life situation. This gives the clue that both study site

communities face significant trouble of hailstone, drought, unseasonal rainfall, flood, landslide etc.

Most of the informants who have fruits orchards are greatly affected by hailstone. Heavy hailstone destroys all the flowers of fruits like orange, pears, lemon and peach in the garden itself. 11 and 13 informants of both Logwa and Hattisar experience this out of 22 and 14 informants respectively. All the people, especially farmers who have fruit farming, are mostly affected by the climatic risk and women are more sufferers according to the informants of both study sites. So, both sites people are affected by the situation of climatic risk.

People of the study area reported that the natural calamities are increasing in both the communities according to the informants' experience. Most of them experienced the increasing frequency of hardships because of disasters. Elder people remembered the golden and fruitful time of their young age which has vanished now. Loss in the productivity and difficulties are increasing year by year. Elder women remembered that the past days were very suppressing (we suffer from the mother-in-law, sister-in-law's order) but yet that time was good. There used to be timely rainfall. There were no harmful insects and diseases to hamper the crops in field. The food used to be fresh, organic and hygienic. But now, everything has gone and there is no seasonal rainfall and fresh organic food.

In Hattisar, most of the informants experienced that the increase in natural disaster damages the social, economic and environmental condition of the community. Loss of agricultural production, the productive capacity of land, loss of socio cultural environment and animal livelihood are prevailing in these days. Rural people are living with subsistence agriculture by the negative effect of climate change like unseasonal rainfall, drought, landslide, hailstone, windstorm, etc. People cannot cultivate crops in time because of unbalanced natural environmental condition.

In Logwa also, people are experiencing the increasing trend of change in climate and rise in frequency of natural disaster. Many informants think that day by day natural

calamities are increasing and life is being more complex than before. The natural resources were available in plenty, few years back but now their scarcity is increasing. Long before, there was dense forest everywhere. Water resources were available in plenty and timely rainfall used to be experienced but nothing is as before now. Long dry drought is seen now making life of people difficult to sustain. Livestock income is also decreasing due to shortage of grass and shortage of family members. In the past, most of the houses had at least one or two pair of oxen but now rarely any house has oxen. In most of the houses people tame one cow or buffalo. So, the opportunity of selling milk products is going down than before. For these reasons, people are migrating to new places in search of better opportunities. Male as well as female members want to go to abroad for employment, no matter in low quality job. According to the villagers, the village is in crisis. Most of the people in the village expressed that the villagers who had gone abroad for employment return with some kind of problems in the body.

Kausila Nepali and other women said,

"My husband is suffering from backache; others suffer from headache, minor heart attack after they returned from abroad job. So, we have to serve them food in bed. We female eat maize and millet rice but we serve white rice to our husband."

Above information gives the clue that people migrate from village in search of better employment to adjust with the changing situation of climate (people's migration for job may not be only to solve the problem of climate change but it is the social and cultural phenomena, most of youth of the community are copying the trend of society) and natural disasters like hailstone, landslide, soil erosion and late or early rainfall. However, it is not helpful for women because most of the villagers who leave the village are the males and when they do so, their part of responsibility also fall in women's shoulder over burdening them. Women, each and every works are affected by the situation. Yet, women are not quitting the difficult situations rather facing with

courage and maintaining them. Challenges created by the climatic condition, 5 informants out of 36, move to the other professions like hotel, teashop, opening mill etc. We can say that challenges make people innovative and strong in rural locality this is the strength created by the situation, but there are many problems moving around the locality near future because local life is depended with climatic condition. When people face climatic problems there is decreased in productivity as well as production, poor family started to buy the Terai or Indian grain to sustain with the situation. So, it is great problem for the women who are from the poor family or who do not have sufficient fertile and irrigated land. The change that the researcher got in community is that at the time of climatic risk, if there is not sufficient grains in community, people buy the market grains for daily consumption in high price. In the eye of local community it is not good, it is great misfortune created by the present climatic variations. As an anthropologist we can say that in each and every goods in rural society is expressed in terms of monetary value. It becomes the unavoidable part of rural life. Women farmers who cooked rice in the kitchen culturally they cooked two kinds of rice, maize/millet and rice simultaneously. Head of family and male members were given white rice and daughter-in-law and cook were culturally designed to eat maize/millet rice. It shows that second kind of rice is inferior. But recently, people understand that it is good for health. Without hesitation most of them cook mixed rice (Misaha Bhat) it is healthy and its energy is last long for them.

6 CHAPTER SIX: EXPERIENCES OF IMPACT ON AGRICULTURE AND LIVESTOCK

This chapter shows how the fluctuation of climate affects local agriculture and livestock rearing system of the particular communities and it also shows local people's long experiences and kin observations throughout their lives.

6.1 6.1 AGRICULTURE

Village people's livelihood depends upon subsistence agriculture which is highly depend on climatic factors like rainfall, temperature, dews and mist, fertile soil, moisture and animal dung. Not only these mentioned factors, but human labor is also essential in agriculture. But in Logwa, there is shortage of labor. They have gone abroad for employment or other place to study and job purpose. Women of 40-60 ages argued that burden of work and family responsibility fall upon them. Older women cannot do hard-work and daughter-in-laws and daughters do not have ideas about agriculture. Agriculture is also not very favorable now. Water scarcity, drought is increasing. So, all burdens fall upon active women of second generation aged 40-60.

Much unseasonal water is bad for the garden. Potato, vegetables in the garden and there are many insects. Water and cold both we feel different than before, means we plant potatoes a month later some not grown until July (Crate S 2008). The women in Logwa express their grievances as, "Our potato, spinach, carrot, and mustard, all are destroyed by 'laai (Aphids) insect'. We women have to cook food and are in a difficult condition to fulfill and manage daily curry. Before 10/15 years, we had more than enough vegetables in our kitchen garden for consumption and sale. Those times, we used to earn money but the situation is not the same now. Much vegetable grow in the garden and that grown is destroyed by diseases. The taste of fruits and vegetables are also not as good as before because the fruits, crops which

got plenty of enough water and fertilizers so the taste and fruit itself was good but now it is reverse.

Above arguments of women in Logwa suggest that the productivity of each and every crops has decreased. Changing climate has increased the sufferings of the women. Their hard labor and effort has become useless now. According to the women of Hattisar, the production of cardamom has gone down to a large extent. Ginger farming is not that much affected than before. Most of informants in group discussion said:

"This year (2012), our paddy is taken away by hailstone at the time of harvesting. We women have to do both household and field work. But because of long drought and unseasonal rainfall, we are getting a lot of problems. Before there was timely rain fall, manpower management was easy, we exchanged labor but now rainfall is not in time, water is shortage, we, especially daughter-in-laws and daughters have to go miles away to fetch water in winter days. Our children cannot go to school because they are also engaged in household works. Grass and fodder for livestock is not available, no good production is made for household consumption, leaves aside for sale. Our condition is really in a pathetic. We work from early morning to late night in a hope of improving our living but nothing good happens."

Above views of the two site's informants give the clue that in village, women have to do work harder due to circumstances or cultural taboos such as household work is only women's responsibility. Climate hazards create additional burden to the active women. But most of the women in their 60 plus can give the description about the changing climatic and agricultural situations. If there was enough water, timely rainfall and favorable climate farmer's effort could changes into opportunity. So, it can be said that good and timely rainfall is almost necessary for the good productivity which adds the income of hill farmers. The women in between 40-60 age groups are active and they do almost all the works by themselves. They have the day

to day experience of the climate and environmental condition and can express the situation without any doubt and hesitation. But the ones in their age 20-39, actually, do not have idea about the agriculture. They are either engaged in studies or leave the agriculture based work or do only household works and open small shops to carry on their livelihood bringing goods from headquarter Terhathum. So, they do not have in-depth knowledge about the changing situation of climate. The culture of exchange labor is tremendously affected by the climate change in rural areas. Before, there was plenty of rain farmer felt when they needed. Farmers share their labor in mutual and easily all farmer finished their cultivation on time. Many hands produced synergy at work. With relax mood and happily, they finished their cultivation, weeding and harvesting in time. But now, with the shortage of rainfall, cultivation cycle has changed all farmers works fell in same time. There is no time to wait for exchanging labor. So, the mutual support and help between farmers at the work time has gone. It is great problem in hill areas. Youth male are not found in their village; it is also another problem.

Not only young females but also young males have no basic knowledge about agriculture because they are not involved in it. Experiences and knowledge of seniors and elder members are not shared to them. So, when they were asked about their views towards climate change, without hesitation they promptly replied that they don't know that anything as such don't mater them. Rarely, few could answer the question.

Ramesh Subedi (28) of Logwa said, "We young generation do not know about agriculture. Most of the youths are in the city area either for work or for study. Only few of us are here in this village and we do small business here. So, we are not concerned about early or later rainfall, drought and climate change."

It can be said that there are many young generations, who have came out from agriculture to other non agriculture sector. They do not bother about parent's profession. Knowledge of old generation could not transform to young one. They

could not answer question asked about agriculture and climatic linkage. There are many phenomena which are determinant factors for social cultural transformation and climate change is one of them. If there is good climatic behavior life of hill farmers become easy and simple if not reverse is there.

6.2 6.2 IMPACT OF CLIMATE CHANGE IN AGRICULTURE: PEOPLE'S EXPERIENCE

Table 1: People's experience on agriculture due to climate change

S.N	Impacts	Logwa	Hattisar
1	Loss of local crops	Maize (paheli makai), Paddy (pokhrel, belbutti, ramsali, vadaiya) if these crops planted late its production totally decrease and does not ripe properly.	Maize (local pahelo), Millet (white dallae kodo), Cardamom. These crops need limited seasonal water from plantation to weeding, flowering and fruiting but rainfall is not regular now.
2	Loss in the production of main crops	Mustard, Orange, Wheat, Maize, Paddy (winter rain is highly decreased, mist and dews are stopped and warmness increased which is not good for winter crops).	Late rainfall creates the agricultural seasons shift backwards, so, loss of production of maize, cardamom is appeared.
3	Paste and diseases	Additional kalipokae in maize, laai, insect in spinach, mustard increase putali and ghun in paddy and maize (drought and warmness reduced the immune capacity of plants so diseases increased in crops now).	Millet and maize are attacked by kalipokae, some are undeveloped(attack of drought at the time of young plant)
4	Fruits and vegetables	Taste and quality of orange, halwabeed, lemon, pear has degraded (every vegetable is attacked by insects).	Spinach is attacked and destroyed by laai, mulberry (Kafal) and wild berry (Aishelu) size is decreasing and quality is going down
5	Emergence of new crops	Vegetables like cauliflower, papaya and pea started growing, quantity and quality of spinach decreased, dallae chili flourished	Pea, cauliflower, radish could be grown, crops that sustained in lower belts started surviving in uphill

6	Additional backup	Insecticides, pesticides and artificial fertilizers increases the cost of agricultural cultivation, local farmers are in problem of expenses	Pesticides are used in vegetables and fruits for 8 years, it increases not only the cost of such food but creates negative effect in the health of farmers especially women spread the pesticides in vegetables.
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Source: field survey 2012.

In both sites, most of the crops production is decreasing. In Logwa, different varieties of paddy such as ramsali, pokhareli masino are about to vanish because of late rainfall at the time of paddy plantation (it should be planted in usual time, if there is late in rainfall it will not ripe). Decline in the production of local paddy compels women to cook maize rice. It consumes time because the elder family members and small children feel difficult to eat the maize rice. Production of main crop is declining year after year. Fruits like orange, peaches, pear and lemon are affected by the white insect and laai. Their quality, taste and quantity are going down (proof water in time is nutritious for the crop which add proper test in any kind of agricultural crops. It may be because of untimely and insufficient rainfall. Before, 10-15 years women used to distribute fruit to their neighbors and also sold in the market but now it rips before Dashain. All fruits are finished soon because most of the fruit falls before ripping. Therefore, there is no chance for the women to sell fruits in the market. But papaya farming is seen well enough in this area because of the rise in temperature. During the time of flowering and fruiting, hailstone and windstorm sweep away the yield in recent years reducing the local income. Use of excess insecticides and pesticides in fruit plant result in the falling of the fruits before ripening which cause the loss in hill economy which goes in the hand of women. Most of families who do not have sufficient paddy use maize, millet, wheat meal. Most of hill farmers especially, women eat that kind of food which is fresh and whole day they could work and physically they are strong. It is great benefit for local women, but indigenous varieties of crops have been gradually replaced by improved /hybrid one,

so it has no resist power at the time of climatic risk. Decline of indigenous crops directly impacted local knowledge of agriculture, local grain could last for long, farmer used to store it for the time of scarcity but no such condition remains in present.

6.3 6.3 PRODUCTIVITY IN THE PAST AND PRESENT

The informants of both research sites when asked about the comparative productivity of the soil in the last 20 years told that there have been a lot of changes in the agriculture production pattern. In Logwa, most of the informants reported that the productions of overall agricultural products are decreasing. Only few locals said that their productivity is increasing and these people were the local elites. May be the productivity is rising because their land area is increasing by buying more lands. The remaining informants said that the production is not satisfactory and they didn't show any idea about the change in production.

In Hattisar, productivity of soil is decreasing for last 15 years; there is not much production of grains. Most of the informants noticed that there is significant loss in grain production. So, most of the Hattisar people began to cultivate cash crops like ginger, cardamom, amriso etc. 10% of the informants reported that there is no change in agricultural production and 11% of them said that the production has increased.

This shows that there are few informants who are rich and their production hasn't declined. They are not affected by any types of crisis and climatic risk because they have a lot of grain and other cultivation and do not bear any experience of difficulties unlike the poor who are compelled to buy potato, paddy and other essential materials from Bashantapur. Sometimes, long time drought hampers the good production and the other time ripe grains are swept away by hailstone at the time of harvesting. It's not that natural calamities were not faced in the past but that time the frequency was low. But, as compared to Logwa, Hattisar is more affected because it is in higher altitude geographic area and is not facilitated by road. Hattisar

is colder than Logwa. Here, Cardamom farming is affected by long drought due to need of more water. But local people have knowledge which gives adaptive capacity to the community.

Women of both sites are affected by the present trend of low production. Poor women, they serve food to the whole family first and at last they eat whatever remains after serving all. In rich families also, women have very low status because now they are not strong economically. Because of low production the grains are limited to household consumption only because of which women cannot sale the crops and they don't have money in hand. Researcher found that in most of the houses, women are in miserable condition and among them also, the daughters in law are in more pity situation. They even don't have the chance to eat full stomach most of the times. There is situation of reduction in agricultural production.

6.4 6.4 CAUSES OF REDUCTION IN AGRICULTURAL PRODUCTION

Both sites' informants reported that there are different factors which caused the reduction in agricultural production. However, national agricultural enumeration shows that the average national production of crops has increased compared to past (CBS, 2011), but this study has shown decreased in production. For 5 years, paddy was taken by the heavy rainfall and the hailstone at the time of harvesting half of the paddy was gone in the field. Due to the low productivity, local farmers collect grain from the market to fulfill their yearly food need. If there is sufficient grain with landlord family in village farmer who do not have grain, borrows from them. It increased the social linkage but local landlords' production is also just for their consumption. According to local people different factor reduced in agricultural production are shown as follow:

Table 2: Causes of Reduction in Agricultural Production

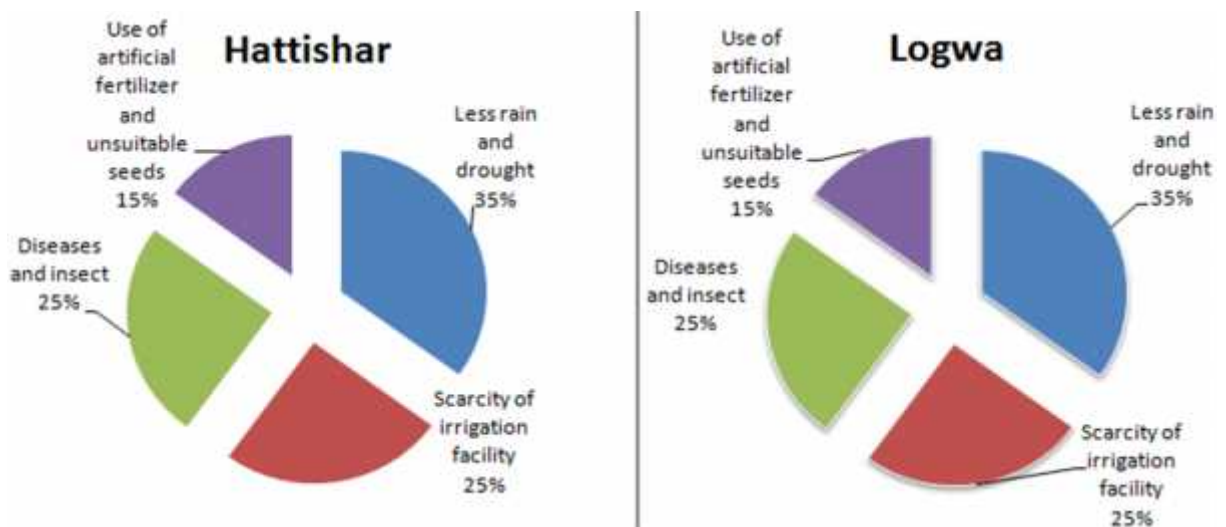
Factors	Logwa (in %)	Hattisar (in %)
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Less rain and drought	35	30
Scarcity of irrigation facility	25	19
Diseases and insects	25	20
Use of artificial fertilizer and unsuitable seeds	15	31

Source: field survey 2012

6.5 6.5 CHANGES IN AGRICULTURAL PRODUCTION OF LOGWA AND HATTISAR

Figure 3: Changes in Agricultural Production of Logwa and Hattisar



Source: Field survey 2012

The above figure (figure no. 3) shows that the main cause of reduction in productivity reported by informants is less rainfall and drought. Logwa is the place where 80% people do paddy farming and in Hattisar, 70% people do cardamom farming. But, these farming need lot of water and the increasing drought cause the reduction in this particular production. Most of the women informants said that if

there was timely rainfall and cultivation finished in time, women would not suffer from overload of work and production would also increase. But, for last 15 years there is no timely rainfall and with this situation work load has increased. Women couldn't even full stomach lunch and dinner because they have to manage the feeder and the distributors. Most of the damais and kamis (Dalit) are poor and they have their self owned grains only sufficient for $\frac{3}{4}$ months.

In Logwa, most of the farmland is in Danda khet (upland). There is no irrigation facility and at the time of long drought there is no good production of paddy. But, maize, millet, wheat production is satisfactory. Irrigation is also directly or indirectly affected by the change in climatic situation as well as disaster and risk. So, people change their crops if there is no rainfall in time. In Logwa, farmers are attracted towards the cash crops.

In Hattisar, maize, millet, ginger and cardamom farming is carried out. Paddy is rarely cultivated. Cardamom needs a lot of water than other cultivations. Women of Hattisar need a lot of time to grow maize, millet and paddy. Poor people have no income to buy paddy for daily food. So, poor people, especially women are in a critical and difficult condition to manage life in the changing climatic situations.

Another factor for the reduction in the farming production was the inflow of different diseases and insects. In Logwa, 25% informants told that by the cause of diseases and insects, their agricultural production was decreased. In Hattisar, 20% informants argued that means Logwa 2nd main cause for reduction in agricultural productivity but in Hattisar 3rd cause.

For 8/10 years, the outbreak of diseases like laai (Aphids), khorla, gabara, kalipokae are the main diseases. The main crops of Logwa, paddy is affected by rate disease which makes all the leaf of plant red and brown fly (khairo putali) destroy the paddy in the field. Vegetables are destroyed during winter by laai. In Hattisar and upper side of Logwa, mustard is destroyed by laai (aphids) which did not prevail before 12/13 years. Maize, millet, wheat are affected by kalipokae, gabaro and khumrae kira.

When researcher asked the informants' views of why diseases and insects have increased, most of them replied that time is not good; there is no timely rainfall and drought is increasing which caused the increase in temperature. There is no sufficient mist and dews necessary for winter crops. They unknowingly use modern genetically changed crops which has no tolerance power for increasing diseases and attack of insects.

Next factor for the loss of agricultural production was the non-availability of the good local seeds and fertilizers. Only chemical fertilizer reduces the capacity and moisture of the soil. Hybrid seeds make the farmers dependent. In Logwa, it contributed 4th least affected factor (15%) for the reduction of the crops whereas in Hattisar, it is considered as the largest factor (31%). This difference is because of the availability of the road, geographical location and ecological setting. Logwa is in touch with road facility and is near from Terhathum but Hattisar is a bit far from the District Headquarter and not in touch with road transport.

Above facts by the informants, give the clue that the situation and time is changing in villages and in every locality which shows that climate change is not a small phenomenon which is limited in a small geographical area. The trend of Logwa air, water, temperature, dews, mist etc is changing. This affects not only season of crops cultivation but also the daily life and social relation of the people. Likewise, Hattisar is also affected in the similar manner. All people are suffering from the day to day increase of drought, unseasonal rainfall etc, researcher found yet, women are burdened.

7 CHAPTER SEVEN: EXPERIENCES AND EFFECTS ON RURAL WOMEN'S LIVES

This chapter describes the existing effect of climate change on rural women, especially who are involved in farming and livestock management system. This is understood from the observation of the local people's experience. The experience of the climate change is taken from men and women.

For the women, in the hilly region of Nepal; agriculture, water, forest, livestock are the source of production which is useful for household economy. Forest is the source of firewood for cooking and heating, leaves for fertilizer and fodder for animals. But the day to day increase in warming and drought has inverse impact in the production and survival of the local people and degrade environmental condition.

Discussion with communities revealed that there was irregularity inflow of different species. Hattisar women informant of above 60 indicated that the rhododendron, cardamom, uttis that used to grow in hills before, now, is seen only in the higher altitude. Therefore, the production of cardamom is decreasing in their locality. Women work is increasing while their income is decreasing. With the decrease in income of women, their decision making power is also decreased and they are suppressed by family and the community. 'The agricultural calendar, everywhere in the world, must have been developed based on the seasons. Thus, farmers generally understand and interpret weather, season and climate by associating it with agriculture. The ongoing weather fluctuation and climate change has adversely threatened agricultural yields. Therefore, change in the weather pattern and climate can be understood in terms of cognized structure of crop-weather interaction' (Vedwan & Rhoades 2001).

According to most of the women informants of study sites, their parents and grandparents must not have faced the same situation as they are facing now. They

further said that their offspring must be ready to face more difficulties, complexities, scarcity and severe climate fluctuation than they are facing now.

This argument supports that year by year, climate is changing and difficulties are cumulatively increasing. All people are facing problems but women are culturally more susceptible.

Before 20 years, there was routine of each and every thing like fruiting, flowering, ripping and cultural ceremonies and seasons. But now time is opposite, all farmers are suffering from the problem of uncertainty and complexities. Before, paddy plantation was done early, paddy was ready to consume in Dashain but now because of late plantation it would not ripe in Dashain. Since 10-15 years, at the time of Dashain and Tihar, there is still high temperature in comparison to the past because of which orange, banana and lemon ripe early and almost all are eaten by the visitors of these festivals. So, no fruits and vegetables are left behind for sale. Women's source of income is decreasing. Before 20 years, one person from each family gathered in one place and went to collect Kafal, walnut, wild berry. There used to be enough fruits in the lower branches of the trees but now the fruits are small and not found in lower branch of trees (even in branches of the young trees), It is because of drought and not getting proper quantity of water at the timing of flowering and fruiting. Therefore, the collection culture of going in group to collect such fruit is no longer seen now according to local women. Women of 40-60 age groups in both study sites argued that they are the more sufferer ones of the localities because every household and field work has to solve by them. The trend of male migration is increased. One of the many causes is cultivation is not good because of fluctuation of climate. There is no time for daughter to study, they have to involve in day to day overload work created by climate change. Some women of community are involved in non-agricultural sector after the decreased in agricultural production. Some left the community and established their own shop, others established hotel and some established teashop and many more. There is beginning

of work diversity in local areas. There are poor women who suffered more and started to rear goat kids given by the government and non government offices for the women welfare. The trend researcher got is that married women (29-40) whose husband have income source, shift to Terhathum bazaar to send their child in English medium school. These age groups women have not that much knowledge about the climatic condition.

7.1 7.1 EXPERIENCE OF WOMEN AND MEN

Most of the informants argued that the agricultural calendar is shifting backward. The increase in temperature and unseasonal rainfall creates drought which decreased the production of crops. The seeds and small plants are destroyed due to drought and unseasonal rainfall. There is no male member in the home to plough the field and women have started to plough the field. If the women are unable to plough the field, they have to dig it which in fact is more time consuming and difficult job. Rich households hired labor with grains they possess but the poor ones do not have any other options. Both study sites' poor women are more sufferers because the agriculture calendar of both the sites has changed. Late plantation creates additional works; most of farmer in recent time starts to do their work with their family members who are present at home. With the change in cultivation time, different diseases and insects increased, minimizing the agricultural yield. The small income of poor women vanishes once no sufficient yield is made. There is no money in the hand of women to purchase insecticides and pesticides.

7.1.1 7.1.1 GENDER AND WATER/FOREST

Water is being scarce day by day; rainfall is becoming uncertain day by day. Most of the women said,

"It doesn't rain when we need and it rains when we don't need. So, it creates burden and overload for us. Most of farmers have tap on their home yard but because of drought, most of the time tap dry up in winter and this is burden

for women. Males generally do not stay at home, and if they are in home also they don't help us in household works. We have to cut and collect firewood from the forest. Most of the trees are not in good condition. Their leaves fall down and these kinds of trees have now started sustaining only on uplands. The place where Uttish and Chilaune were well grown before, now are not good in that place but are grown nicely in uplands. So, firewood collection is difficult for women. It takes time to fetch in time. So, we need to spend more time for water, firewood, grass cutting etc. We cannot give more time for production and earning activities. This time is not good for us. We farmers were satisfied in the past times because there was plenty of rainfall when needed. So, everything was good for farmers, especially women who had no burden of water, firewood, grass etc. because they were available everywhere. Our children help us in these activities now to reduce our burden. So they quit school for involving in domestic affairs."

Women's life is most seriously affected by environmental damage and the shortage of the forest products. Women together with their children are the main collector of the fuel and other forest products such as animal fodder and leaf compost. They also take primary responsibility for herding family livestock including cattle, sheep and goats. In a study carried out eight villages women's total in village work was found to be approximately 11 hours daily as compared to approximately 8 hours for men. Looking at wage earnings and household income, boys and girls contributed six percent and adult male 44 percent. (A. Molnar1987)

From the above paragraph, we can conclude that women are burdened by the changing climatic scenario of the climate. Their domestic as well as out sphere responsibilities are increasing. The trend of young and potential male manpower towards international employment market also increases the burden of women. The change in climate gives rise to problems like scarcity of water which leads to overload of work to women. They do not get time to do work. So, they are

compelled to work in rush because of absence of rainfall and drought. Women in group discussion said "In village we are affected by workload because no rainfall in time increases the burden of work. Social attitude is that women have to bother with household works and additional pressure to bear, no free time for women." It increases the domestic as well as farm activities of women in local area. There is vast difference between women's interaction with local resources such as: water, fodder, grass and firewood before 15-20 years and afterword. *Devi Maya Sundas (Nepali) of 64 expresses her feelings as follow:*

"My husband died 20 years ago. Now, my both sons are abroad for employment. I brought up my two sons with hardship. I used to go other people's houses to work daily and put tiffin in my pocket to feed them. I am poor Dalit women not that much land I cultivate. In past, if there was favorable climate we got proper grains for wages. But now, time is not as before, instead of grain we get money as wages labor and we can buy only few grains with that money. So, it is difficult to manage daily food for us. Since I am a Dalit woman, I had to fill water after other high class women filled their pots. My kids stayed alone at home; they cried and slept with snails, tears and excrete when I come back home. I had to look after cows, goats, buffaloes and farmland. Fetching water from rivers and managing the household chores used to be my regular work. After doing all the household works, I had to go to other's house for labor. I had such a hard time.

Women have to dig field, collect firewood, cut grass and look after livestock as well as household chores. Women have duty to look after children and elder family members. I also have 90 years mother-in-law who cannot see and walk. I have to serve food for her and should help all her works. My neighbors' two youth return from foreign labor but they are not healthy as before, they have unknown disease. So, not only me but neighboring women are also in family problems"



Picture -2 Damain Gaon Dalit women and children, at left, Devi Maya Sundash.

Above lines says that women are in very critical condition because of overload of work due to climate change or absence of young male members in present situation. Before 20 years, all the family members were in home. Male and female both had mutual support in farm cultivation. For 15-20 years climate is changing drastically. Rainfall is not certain for agricultural cultivation, productions is not good as before. So, with the beginning of open economy of Nepal, young people started to go abroad for employment. Most of young are attracted towards the foreign labor it has became the trend of whole Logwa community. Most of youths have attracted to non-agricultural sector. According to women informants most of male are returned with ill health, e.g. backache, headache, chest pain, swelling whole body, weakness, homesick etc. And women hard labor will have been gone without any benefit for long in local context. *Mana Maya Nepali of 58 said,*

"Time is not as good as before; we have only 3 ropani of land. My old mother-in-law cannot do anything. We have to serve her food in time. We cultivate other rich people's land. But long drought and irregular rainfall affect our farming negatively. We, especially daughter-in-laws, have to do hard labor. Son

has gone for foreign employment. I have to decide the farming schedule of when to plough the field, when to plant and weed the crops etc. My daughter obeys my every order and works accordingly. Because of the increasing drought, the only mill that was running for making rice, flour, mustard oil etc has stopped to work now. This has added additional burden for women."

Rupa Nepali (29) of Logwa said, "We, daughter-in-laws have to do household works like carrying water from far away taps. We don't have slippers to put on. We Dalit women cannot fill our pots unless the Bista people fill (before). We also have to search and cut grass. Whole day I work in field and in the evening I have to prepare food and clean utensils with tired. I eat only after all the family members finish eating and sometimes there is no food left back for me. Early in the next morning, I work with Dhiki and Jaato to un-husk rice and maize."

Above experiences say that the poor women and the daughter-in-laws have to suffer a lot due to the present climate change effects from drought, irregular rainfall, hailstone, flood etc. Rupa Nepali looks lean and thin; she has a two years young son who cries catching her sari when she goes out in the field. Researcher found her working with bare foot and in hurry at the field site. Her hands were also cracked and dried to wound. She serves her mother-in-law and also her grandmother-in-law.

Mana Maya Nepali again reported that they ate big juicy orange and also sold in the market in the past but now, there are no such big and juicy oranges and the quantity of oranges have also decreased. From before seven years, papayas and litchis also started to grow in these areas. She further said that there were no snakes seen in the area in the past but now, during summer sometimes people cut snake along with grass. Rearing one cow also has become a difficult task because of scarcity of grass locally now.

These lines reveal that the temperature is increasing in the hilly region of Nepal and increasing drought has made life of people difficult. The fruits that used to survive in the past in this area are in a degrading condition and those fruits like papaya, litchi

etc which were not seen in the past are available in plenty in these areas. This increasing warmness is not good for agriculture as well which is directly related to women's decision making capacity and networking ability. If lot of production is held, women can have enough income source and they can have social leadership. On the one hand it brings opportunities for some women; they improve their village life by opening shop, hotel, involving in the various other non agricultural sectors. But, on the other hand reversely, poverty is increasing because of the effect of climate change, making the women physically, socially and mentally weak. Physically the work load is increasing, socially women, even now are bounded by social culture that they are bound to do all kind of household works. Mentally they are not conditioned to go school with free mind but have capacity to deal with any kind of challenges created by the situation in community.

Shiva Prasad Rimal of 57 said,

"Snowfall in mountains is directly related to rainfall in time. White Mountain signifies that there is timely rainfall that year. But since 2009/2012, the mountains are looking brownish black. Production yield is also that good. Scarcity of winter rain and absence of dews result to less productivity. The quality of straw and grass is not good because of which cattle and livestock rearing is very difficult. This affects both males and females but females are limited only to household works and agriculture, so they don't have any source of income. There are only few women who work in local school as teacher. Rests do not have alternative occupation. Males do other alternative works like wage labor, trekking, business, hotels etc. Women simply assist their husband and become dependent."

This is not only the simple sentence describing the dark color of mountain but shows a long term observation data explaining climate change. Above saying clears the gender differences and the overload of work to women as compared to men.

Compared to men, women of the area have less access to resources like education, knowledge, skills, credit facilities and social network.

Due to limited resources, women are often hit worst and are less able to recover from the effect of disaster. This in fact accelerates the gender inequality and gender inequality has deeply rooted the hilly rural Nepali society. It is extremely difficult to change the cultural behavior of people in the hills. According to one woman, some women are involved in forest Conservation program but their role/participation is not active. Their selection is nominal. Women independence and changed concept towards women is restricted by the overload of women with household responsibilities.

Several factors explain the differences between men and women work load. First, in addition to agriculture and animal husbandry, women have primary work of collecting firewood and fetching water, cooking, cleaning, and looking after children and elder members in the family. Second, in many households, men have migrated to other parts of Nepal, India or some other gulf countries for wage based labor and temporary employment to supplement household income. Therefore, women should bear a greater responsibility in agriculture as well as household works.

As forest products become scarce, the burden on women and her family becomes even greater. Krishna Devi, hill women of Magar ethnic group, must spend a full day travelling to and from the forest to get fuel and fodder. When she was young, the forest adjoining her village provided plentiful supplies of wood and animal grazing land. Now, the increasing animal and human population of the village has depleted the supply and she and her fellow villagers must now travel much further for these products (Molnar A, 1987). *Kausila Nepali of 45 said,*

"I've two sons and one elder daughter. My daughter helps me to do household as well as other daily works. Grass and water scarcity is increasing. So, I must now bring my daughter with me to fetch water, collect firewood, and cut grass. Now, she doesn't have time to go school and often skips school to help me in

doing household works. She is deprived of the good study environment. What to do, there is no any other alternatives to me, work load has increased."

Nepali's voice reflects the overall daughters of village women who are poor and involved in agricultural activities. Day to day changing environment increases additional burden for women. This creates the situation that those who are back in property are prone to backwardness economically, physically and psychologically with daily activities. Women had never attended group discussion with men because they are always busy in their daily household activities. Drought has destroyed the crop yield and they have to go to work in other people's house in search of food to feed their family members. They go out from house to fetch water, search fuel and collect grass and fodder for the cattle. Scarcity of anything is the main problem of women and with this they are deprived of education, job and employment. Destiny has made them strong but because of the cultural practice and the impact of the increasing change in climate, they are pushed towards the deeper ditch of poverty. Therefore, to get rid of the negative effect of climate change and social practices, the residents of this area should be united to raise their voice and go hand in hand to bring a solution for their common problem. *Tulasha Shrestha of 56 said,*

"Nani¹¹, the mill which was made before 25 years stopped operating 6 years ago because of the dryness of the river Khorunga. It is misfortune for us, poor women because we have no capacity to grind in mill now, it is so costly (to operate by petrol)".

Culturally women are bound to do more work. After water mill stopped to operate there is problem for women, young women who are enrolling school and college are in problem. They have to involve in domestic affairs. The education level of women is very low. Dropout rate of young women is higher than men. Most of the daughters quit school before class 10 because they lack time to go to school most of

¹¹ *'Nani'* is a word for politely addressing to younger people in the hill villages in Nepal

time and they have no proper time to study, so, they fail the exam and finally they quit the school. They arrange time in such a way that younger sister go school one day and the elder one goes next day. Girls are overburdened from their young age and this change in climate brings additional burden to women. Seasonal and timely rainfall is very rare now which increased the work duration and the girl student dropout rate is very high.

7.2 7.2 SCHOOL ENROLLMENT SITUATION OF MALE AND FEMALE STUDENTS

Table 3: School Enrollment Situation of Male and Female Students

Primary		Pre-Secondary	Secondary	Higher Secondary	Total
Girl	109	125	74	30	396
Boy	102	131	104	65	344
Total	211	256	178	95	740

Source: School register of Siddhakali Secondary School, Jaubari, Oyakjung

In the beginning, the number of girl students is high but because of high dropout rate the number is decreasing at +2 levels. Girl student has no time to study at home. They have to face the situation created by the changing climate.

Drying of water source in both study area was not only causing problem for drinking water (according to most of the male and female informants) and irrigation but also the water mill which were opened before 20 years that eased women's life are now in a condition to close/stop. There were three mills but one is not operating for 8 years. The other two are also in a very difficult condition to operate because of drought. The poor women have to wake up early to wind paddy using *Dhiki*¹² and

¹² *'Dhiki'* is a traditional local mill made by wood in the house of local people in the village for un-husk rice and other grains

*Jaanto*¹³. Drying of springs has caused adverse impact on paddy cultivation that depends on rain fed system. Most of the male and female informants mentioned that the water level in the local Khorunga River during winter season has dramatically decreased than 10/15 years before. Now, there is no enough water to run the mill, it has stopped to operate. It is great problem for women. In five minutes, women could take out rice, oil, flavor on time. It is because of negative effect of climate change. When researcher passed the local Khorunga River, water was not as much as before and when asked the people who were near, then replied that the time is not good and we will die in near future without water.



Picture -3 Khorunga River taken in 2012 from upper direction

The change in the society is scarcity of water in Khorunga River people are not condition to wait for the hydro electricity power and water mill but, people have kept solar power for electricity it is a permanent source for the light and women are not bound to work in dark from early in the morning to late night. Whole the community of Logwa and Hattisar are seen bright at night. It shows that human being invented some kind of mechanism at the time of scarcity. In Logwa and Hattisar people established the petrol and solar energy mill to grind grains. It becomes permanent

¹³ *'Jaanto'* is a local traditional tool made up of stone to grind the grains

solution but it does not signify the poor one (does not makes poor women lives easier) after the water mill was stopped to operate. But new kind of mill is costly than water mill so, poor women are not benefitted; they are overloaded by the situation caused by scarcity of water.

People who have lot of paddy, sold rice in Myanglung Bazaar and those people who didn't produce more paddy had vegetables and fruits to sell in the market in the past. But for 8/10 years most of village women do not have enough production to go to the market for sale. Increasing drought has made their life difficult to survive because no enough grain is produced for daily consumption. They do not have communication with each other, they gathered together and did in the market before; they used to share their joys and happiness weekly~~w~~monthly in market. Most of women whose production is decreased now are rarely go to market. They are always involved in doing hard effort to make good production but their efforts do not give them deserved quantity of production. One informant said "I went to the market six month ago and till now I haven't gone again". They don't have the idea about the market rate of commodities. If sometimes luckily they happen to produce extra crops they don't get good income from sale because actually don't have the idea of market rate".

Above saying shows the misery of women in absence of mill and its impact in the income of women. They are burdened with the work of winding paddy in Dhiki to make rice, making flour and grinding mustard to make oil. "There is no chance for us, (poor women) to exchange our ideas and feelings with near and dear ones". Besides, as they don't go to the market, they don't know about the economic activities in the market and they do not have chance to gather and exchange happiness and bind harmonious relationship with friends, relatives and new peoples. *Devi Parajuli of 32 reported,*

"Before, we made pickle and ate it for many days, but now we have to finish it within one to two days because it gets spoiled because of increased warmth.

Few years back we used to eat stale food because it didn't get spoiled but now if we eat such stale food, we suffer from diarrhea and the food is also found smelling bad because of increase in temperature. Nature has gone opposite nowadays. Our forefathers were lucky to survive but our offspring will find it very difficult to survive in this situation. Increasing temperature and drought has spread new kinds of diseases that were not found in the past."

Most of the daughters and daughter-in-laws who are between age group of 20-40 have little knowledge about climate change and they don't want to get involved in agriculture. Some get engaged in household activities while others open small tea shops in Myanglung Bazaar and still others are seen moving to the district headquarter for enrolling their children in English medium school. Women above 40 years are found involved in agriculture and those have lot of information they can fluently say about the situation regarding the changing climate. Most of the men and women of 40+ gave observational data and information. Not only visibility but people sometimes add cultural frame for shaping their understanding. Some old men and women pointed to the public Pandhera¹⁴, spring, stream and ponds and told that they were the homes of gods and goddesses (Sime/Bhume). Local people believed that the proper use of resources and good behavior of people brings order in the nature and improper use of it leads to disorder of the nature and seasonality. For example, *old women of 76, Dhana Maya Dhakal said:*

"All the fruit trees dried after they were touched by my daughter-in-law at the time of menstruation. There is long drought because god is angry with us. Our 'Hiti Padhera' dried up because women here used to bath and wash clothes during their menstruation period. All of them are not daughters and old

¹⁴ **'Pandhera'** is a public place for local people to fetch the drinking water such as well, tap, tube-well spring etc.

women but are daughters in law who came here after marriage and they violated the rule. Local Naag, Indra became angry and the rain stopped to fall."

Anyway, women themselves are victimized by the day to day, year to year changing behavior of climate but yet they are themselves accused by the local cultural belief/system of people.

Thus, different people defined climate change in different ways, yet a common notion is from the 10-15 years rapidly changing climatic situation in their locality. Women are more victimized and the blame of imbalanced nature also falls upon them most of the time.

During field observation, researcher found that men were talking and drinking tea with other males in the morning whereas the women were seen working in the cowshed, farm and also in household works. Before 10-15 years, there were almost all young males in the village who attended the funeral but now there are only males of 50+. In both study sites, people complained that because of unfavorable climatic condition and season variability, people are not being able to store seeds properly for the next year plantation. Increasing warmness produces more ghun and putali in most of the grain seeds, which destroy the grains. So, women find it difficult to search proper seeds for plantation. It is pushing them towards the uncertainty of agricultural practice making it more vulnerable.

Likewise, Chandra Lal Dhakal of Hattisar expresses his feelings about the relation between snowfall and soil moisture as follow:

"Before, when I was young, there used to be thick, white cotton like snow in the mountains. That time crops production was good, but now nothing is as such. Now, I guess, snow and the fertility have direct relation. There is no much snow and hence the fertility is also low. In my view, soil used to be fertile in the past because the snow recharged the soil moisture. Nowadays, in mid winter there is no snowfall for 9/10 years."



Picture -4: Rajan Upreti, January 2012, through personal communication

Therefore, according to Dhakal, snowfall shows not only climatic phenomenon but it is symbol of goodness for community, farmers and the people for day to day food for survival. Dhakal further expressed that when he was in grade three, it snowed so much all of a sudden that the school was fully surrounded by snow all around. They all played with the snow and made creative art with the snow. Each year was snowy year before 20 years but now snow fall is rapidly decreasing. The snowy mountains have converted into dark block hill. So, the water current of rivers is decreasing and the moisture of the soil is also decreasing.

8 CHAPTER EIGHT: CLIMATIC VARIABILITY AND AGRICULTURAL CALENDAR

This chapter deals with climatic variability and its effect in agricultural calendar. It shows the people's observations and experiences in communities in agriculture and livestock management practices.

8.1 8.1 AN OVERVIEW

Climate change and variation in system cannot be viewed in isolation from those of the human system. The informants of both study sites said that they have the compulsion to change the planting and harvesting time of many crops whatever was held in their location. In Logwa, 15 years ago, rice plantation was done in the first week of June (Ashad), but now, because of drought, it is planted at the last week of June or the first week of July. The informants of Logwa have reported that the timing and the amount of rainfall has really been changing over the last 10 years. At that time, there was enough summer rainfall; not only in summer, there used to be 3-4 times winter rainfall in the past but now there is only long drought because of unseasonal precipitation. In Hattisar also, people argue that rainfall is quite late. So, it is difficult to plant their farm in time.

In short, the informants of both study sites clearly told that it is their compulsion to change their planting and harvesting time for many crops, especially paddy in Logwa and maize in Hattisar. In Logwa, planting time of paddy has shifted in order to cope with long drought. Before 10-15 years, people used to sow maize in last week of Magh (first week of march) or first week of Falgun which ripped after seven months but now people cultivate maize in last week of Falgun (2nd week of march) and it doesn't need seven months to be ripped. They harvest within six months because of the changing pattern of season. Some farmers sowed new variety of seeds that ripe

within five months also. But people said that the former native maize taste is good and last long without being destroyed when stored.

People connect the rain, drought and the irregular season with the society people and their proper following of traditional ritual and celebration of culture. *Krishna Prasad Subedi of 74 from Logwa expressed,*

"At the time of drought, people used to get together and celebrate 'Sansari Pooja', 'Biswa Santi Pooja'. All the people of the community, men, women, children and old people used to gather in one big paddy field and enjoy by singing, dancing, baking bread and cutting he-goat and they enjoyed whole day by eating the food they have made. There used to be a heavy rainfall immediately after the Pooja. But in the present, people gradually left such kind of rituals for which there is no timely rainfall. Now, people disobey the God, they don't have faith on God, so God is angry with them and there is no seasonal rainfall and cultivation is very difficult because of scarcity of water."

People's understanding of climate is different. Some of them connect it with society and the culture. Any event which is held in any place is related to the society people, their activities and their day to day life. Society and events go side by side. Anyway, people are feeling that the climate is changing. So, we can say Climate Change is not only natural phenomenon; it is anthropogenic phenomenon as well.

Most of the farmers in Logwa who used to plant paddy in the first week of Ashad (2nd week of June), do not plant paddy in the same time because of the effect of change in monsoon. At the time of planting, there is scarcity of rain and at the time of harvesting there comes heavy rainfall or hailstone. The villagers complained that last year they had to face same problem which damaged both grains and straw. More than 60% paddy was wet on the field and they couldn't harvest sufficient grains.

Before, there was seasonal rainfall and it didn't harm the cultivation, but now, it is not so. The rainfall pattern is fluctuating and most of the times rainfall is experienced

when it is not needed actually, e.g. at the time of harvesting. One of the main causes for the shift in planting and harvesting is Climate Change, but there are other many causes for this such as new breeding practices, genetically modified seeds, new invention in technology etc. Winter rainfall used to occur 3-4 times and it was very essential for winter crops. Dews were also one kind of water source for winter yielding. But now, there is scarcity of rain and dews. According to the local farmers, winter precipitation has almost vanished. In this context, an old farmer Chandra Lal Dhakal of 78 expressed his experiences about uncertainty of precipitation like this:

"When I was young, there was certainty of rainfall in summer as well as winter. Winter rain fell 3-4 times, the first brought cold winter, 2nd time rain added more chilly cold, 3rd time rain which occurred in Magh started lessening the cold and increasing warmth. All the rain is very much essential for balancing the nature. If winter is much cold, it is good for both summer and winter crops cultivation. If there is high snowfall in winter season, it becomes nutrition and moisture for summer crops and time is regarded well. This is my life long experience when I was a child, Kumbha Karna mountain used to be young too, white milky, shiny and tall because of a lot of snow and it's snow didn't melt even in summer. But now, with the change in time and condition, the mountain scene is just opposite. My black hair is changing into white and that White Mountain is converting into black hill. It looks old like me. The flow of rivers and spring has also reduced the strength. It seems as if they don't have the energy to produce that current prevailed in the past. Therefore, I like to say that the good time is finished, big Ropain¹⁵ and Bethi¹⁶ system is almost finished without timely rainfall, time is dangerous now, and there is no good cultivation. What to do! Now, the generation is in crisis and tomorrow's

¹⁵ **'Ropain'** is the main cultivation time and the day for plantation of paddy

¹⁶ **'Bethi'** is the enjoyable Ropain system with playing of musical instruments and singing and dancing by the farmers in Nepal which is played at the main day of paddy plantation.

generation is even in more dangerous situation. There is no any good symbol. Now, in river Khorunga there is no sufficient water to clean the ass of dead body of local people. In people's view if the farewell is done with pure water the spirit of dead body will go to heaven. "

The long time observation and experience of elderly people shows the picture that rainfall has been decreasing a lot and it has been shifting backwards also. Rain is not seasonal now. Long time drought causes the shift in cultivation. Without water, it is not possible to farm the land. Over the last 10 years, local farmers have been facing low, late rainfall. So, it is continuously late for paddy plantation, before local farmer had planted paddy one by one helping each other in time. But now, big pleasant Ropain system is completely lost, village is not pleasant as before. Bethi system is completely gone from the village, people dance sing with the rhythm of 'Panche baja' and 'Aashare geet' and have food in collective manner. It has gone far behind. But one great change in the village researcher found is that women labor is becoming easily acceptable now but they have no time to go for wage labor because they themselves have to work in their farm. Water is not only connected with the living life. It is essential for any culture of human beings from birth to death water is closely connected with people. It is symbol of life and purity. So, local people are very much shocked by the problem of dryness of local river stream taps.

Before 10-15 years, farmers completely finished the plantation of paddy at the first week of June but now the seeds of paddy that are sowed for planting later grow high in two months but still they are not planted in absence of rainfall. So, the old seedling is not good for plantation later and the production becomes low.

This kind of unseasonal and less rainfall need more labor for plantation and weeding and the crop is also difficult to protect from diseases. In recent years, communities have started focusing on vegetables and fruit farming than cultivating cereals and grains. They started to grow fruits and vegetables like cabbage, cauliflower, onion, garlic, carrot, ginger, pears, papaya, etc. Similarly, some farmers of Logwa plant maize

due to low precipitation instead of paddy because paddy needs more water compared to maize. Most of the farmers of Logwa and Hattisar who involved in group discussion reported their experience about the variability of rainfall situation at the time of researchers field visit in 2012.

For last 10 years, rainfall has been shifting backward and there is no timely and enough rainfall. Sometimes it rains when the sowed seeds are not ready to plant and sometimes it rains so late that the seedlings dry in field in absence of water for plantation. The farmers carry water in pots and buckets to pour in the bed farm so as not to let the seedling die of dryness. This increases the cost of labor and it has been many years that the farmers cost has not been recovered. Such kinds of experience directly show that farmers are observing the rain and drought for a long time in a sense of weather plant interaction. Though they cannot say the actual quantity and quality as the meteorologist do. The time has come where the farmers should be satisfied by using stored water in farms for cultivation and stored water is not good for better production.

Likewise, some farmers in the study area reported that some ponds, springs, taps, streams, canals were drying up and some of them are in the state of disappearing due to low and erratic rainfall. One women informant, when asked about the condition of water sources, said:

"Until around 15 years ago, there was enough water in the canals. There was timely rainfall and no shortage of water. We used canals for irrigation of the field, mainly paddy, potato and wheat. That canal blended together people with cooperation and interaction along with their helpful behavior of the people. At that time we all farmers used to go together to repair the canal in the third week of Jestha to drain water to each of our fields. We used to plough the field and stored water in the paddy terrace for 10-15 days for the good fertility of the soil. In certain time we used to transplant the paddy to the field. Production was sufficient that time. But since last few years, the quantity of production have dramatically gone down because of less or untimely rainfall and long drought. The canals have dried up now due to drought. We have to

wait for the rain to irrigate and plough our fields for transplanting paddy seedling. We think that God is angry with us so that he is punishing us. Women touch tap and wash their clothes in pandhera during their monthly cycle and this has brought great misfortune for us. So, God doesn't pour water as rainfall in the summer season also. Now we shift our paddy plantation period later than in the past. I planted paddy on 2nd week of June in 2006, in 2007/8, I planted in third week of June and in 2009 the plantation was done in last week of June. Similarly, last paddy was planted by most of us in the first week of July. This all happened because of the low rainfall. No timely rainfall resulted to the ripening of the crops late. Canals dried up few years ago because of which we don't have any other option than to wait for the natural rain to cultivate the field. Some of my neighbors have started cultivating maize and millet instead of paddy due to the scarcity of water."

These statements are not simple statements about the drying up water sources, drought and shift in cultivation time. These statements are the farmers' day to day observation data for many years throughout their lives. Their long term observation and experience data provides and explains the change in climatic aspect in that particular geographical area, Oyakjung VDC, Logwa and Hattisar community over the period of time. According to the informants, there is no trend of population growth, no new settlement, no any army/police responsible for maintaining law and order, no road construction even after the destruction brought about by erratic rain and drought. The villagers also have the feeling that this disorder of nature is because of disobeying God. Due to the corrupt nature of men, God is angry with them so that he doesn't give enough rainfall in time. So, time and season is not good as before because the climate is changing in unwanted way.

This agricultural calendar which is reported by the local people in group discussion and personal interview shows that climate is fluctuating. There was no timely rain fall at the time of paddy plantation. The scenario proves that seasonal rain is essential

for good productivity. When farmer planted late, the cultivation did not ripe nicely. Sometimes they cultivate in time but at the time of harvesting hailstone and water destroyed the grains in field, straw also becomes useless. So, for 10-15 years, farmers are in difficult condition. Both study sites' farmers complained that since 3 years their paddy was destroyed by the hailstone in the field they collected some with broom and naked hand. Therefore, we can say that farmers are struggling with the challenging situation created by climate change, women are the main victim where they have to face with many other burden and difficulties. Less production may cause women mal nutrition as well as additional work to search grain in village from expensive market.

8.2 8.2 AGRICULTURAL CALENDAR: Paddy plantation

Table 4: Agricultural Calendar

Field Preparation	Plantation	Weeding	Harvesting
In 1964 June/July (2021 Jetha and Ashad) plantation of paddy was possible.	Paddy plantation was done in July (Ashad).	Weeding was done in Bhadra. As this work of weeding was done in time, it didn't coincide with other work.	Harvesting was over by end of Kartik and the production was also good at that time. The quantity of paddy production has never been as good as that time.
The heavy rainfall of June 28 1969(Ashad 14, 2026) drained away the entire paddy that was made ready for planting and eroded away the field.	Plantation was made again after June 28 (Ashad 14).	Time was suitable only in Aswin for weeding. It brought additional burden for women because at the same time, they were busy with cultivating millet.	By the end of Mangsir, harvesting was complete but there was no satisfactory but average production.
In 1977 (2034 B.S), rainfall occurred only in Shrawan.	Paddy was planted at the end of July (Shrawan).	Weeding was done at the end of Bhadra and beginning of Aswin.	Paddy didn't ripen.

In 1984 (2041B.S), plantation was made ready in June (Ashad).	Plantation occurred in July (Shrawan) only.	Weeding was done in Bhadra.	People were thinking to harvest in December (Mangsir) but in November (Kartik) hailstone took away whole production. Out of 20 muri, only 2muri was collected.
Because of absence of rainfall paddy was planted only in July 2009 (Shrawn 2066).	Plantation was done only in August (Shrawan).	Weeding was done in October (Aswin).	Harvesting was done in December (Mangsir) but only 50% paddy was produce.
In 2011 (2068 B.S) paddy was made ready for planting in July (Shrawan) only.	Cultivation was also done in August (Shrawan).	Weeding was done in September (Bhadra).	Because of hailstone, half of the production was destroyed. Only some farmers collected two/three muri of paddy.

Source: Field survey 2012.

8.3 8.3 IMPACT OF CLIMATE CHANGE ON AGRICULTURE

8.3.1 8.3.1 CHANGE IN CROP PRODUCTION

Climate change affects agriculture in different ways. Minor climatic variation can have major impact in agricultural production both in short term and in long term productivity. Not only humans are affected but it equally affects vegetation and livestock.

Most of the people of both study sites depend on agriculture for daily livelihood. But in the recent year agriculture is affected by unseasonal rainfall and long drought to a large extent. Nowadays, there is no rainfall at the time of cultivation while there is excess rain and hailstone to destroy the crops at the time of harvesting. Both sites' farmers had the bitter experience of this in 2009/2010. In Logwa, half of the production was destroyed in the field and almost all the straw was spoiled by the rain which brought difficulty in feeding cattle. Women were complaining so badly at the research time because they are more susceptible than men to the problems brought around by climate change.

This climatic fluctuation and variation is challenging the economic well-being of the local people. High, low and intensive rainfall, prolonged drought, change in time of cultivation because of untimely rainfall and frequent erratic weather events have affected the agricultural production making it more difficult for the farmers, especially women to continue the traditional cultivation practices. So, people of Logwa changed their cultivated crops to ginger, round local chilly etc which doesn't need much water like that of paddy. The people of both study sites are facing the problem of hailstone at the time of harvesting. Two years back there was the probable production was very good according to them but it was totally destroyed by heavy rain and hailstone.

The people voice in the group discussion reported that in April 13 2004 (Baisakh, 2061), all the effort of the farmers like wheat, maize, beans, potato and other winter crops were destroyed at the time of harvesting by heavy rain and hailstone.

Likewise, in the same year in Mangsir, big hailstone swept away the paddy on the field. One third of the paddy was gone and remaining was also not good in taste. All the straw was spoilt in the field and was not good even to give to the animal. So, it increased the risk and crises for the local farmers. According to the informants of Logwa, people no longer grow bhatmas (soybean), bodi (beans), gahat (horse gram). Because of seasonal fluctuation these crops were swept away and these crops are no longer held now.

In recent years, communities have started to cultivate vegetables and species like garlic, onion, ginger, cabbage, cauliflower and chilly. The production of cereals is reduced than before. The main reason of such decline in the production of crops was attributed to the lack and late winter and summer rainfall. Grains were produced in limit only for day to day household consumption. Poor family had to suffer from the appetite for half of the year in both of the study areas. According to the informants, the situation is unfavorable for previous cultivation mainly because of the rising temperature and irregular rainfall but it is favorable environments for other vegetables and fruits to grow in study area such as bethu sag (partheninum hysterophorus) lude sag (amaranthus spinosus), and fruit kimmu, papaya.

In Hattisar informants reported that seedlings of millet, maize were found to be pale yellow and dry which are the main problems faced by the local farmers and productivity of these crops has been dramatically decreasing. Chemical fertilizers and pesticides are used by some farmers but yet the productions of crops are decreasing. In Logwa and Hattisar, it is hard to harvest mustard seeds without using pesticides because of the laai (aphids) insect which were not prevalent before 10 to 15 years. It is so because of the inadequate rainfall and rising temperature, according to local people. At the same time, the paddy planting is pushed back by almost one month,

it is difficult to ripe in time and definitely production is decreased. It also impacted the local harvesting system. Informant farmer linked it to the change in the seasonal quality. Most of harvesting time is attacked by rain and hailstone and it is hard to store seed for next season. This problem is frequently happening for 15 to 18 years.

8.3.2 8.3.2 CHANGE IN THE SEED/CROP VARIETY

During the field visit, both sites informants farmer reported the past seed varieties are not available in present. Local seeds are no longer available. In Hattisar, local paheli makai (yellow maize) has disappeared because farmer has started to cultivate genetically modified varieties. It gives additional production than local crops. But recently, farmers realized that local seeds are valuable and last more than genetically modified seed and its nutrients as well as test is unforgettable. They now regret that *"We made the local seed vanished, we can never forget its test in life"*.

In Hattisar, local millet seed is used till now, it is nicely yielding. In near future also they are not thinking about changing the cropping variety; climate change is not affecting the millet because it does not need lot of water like paddy cultivation. In dry land also, if it rains some times, maize farming goes nicely. In both study sites people started to cultivate ginger. The local seed of ginger is replaced by developed seed in both study sites.

8.3.3 8.3.3 CHANGE IN THE HARVESTING TECHNIQUE

According to informant traditional harvesting technique are not suitable in present context. Before 15-20 years farmers used to collect grain in open space. There was no problem of rain and hailstone frequently, it was predictable. But, in present context climate change is unnatural. Immediate rainfall enriched in harvesting time. Since 3-4 years, farmers' grain is destroyed in the field by the hailstone and rain. Therefore, traditional way of storing maize outside the house (makai ko thangra rakhne) by arranging of maize near the house yard on bamboo tree is not applicable due to the irregular and unpredictable weather and changing climate.

In Logwa, for 15 years, because of changing climatic context, farmers are not being able to store seeds which is needed to plant for next cultivation. According to most of informants, seed spoilt immediately after harvesting time. Most of the farmers depend on market for the seed which are hybrid and genetically improved varieties. Local seeds are disappearing and agricultural practice is going uncertain and vulnerable. It is, because of market seed, chemical fertilizer, changing situation of climate make the local farmer dependent. It adds more labor for women. They have to go to the market for fertilizer and have to spend money for seed. Total agricultural system is being costly and the productivity level is decreasing with the context of season change. Unpredictable rainfall pattern has severely affected and caused shift in agricultural calendar. The change in temperature and rainfall pattern was the situation by putting additional risk in the livelihood of communities. Both study sites, local communities reported that they were compelled to change the planting and harvesting time of many regular crops especially rice, maize, millet etc. In Logwa farmer told that the planting time of paddy was pushed back by one month due to the delay in the monsoon. So, rotational cropping system was consequently affected. *Devi Maya Nepali reported that:*

"We poor women are in very difficult condition, the delay in rainfall reduced half of our productivity and we are not able to have stomach full of food even three months. We have to buy grains from rich Bista people's home in expensive cost. If they do not give we have to go Terhathum Bazaar spending whole day".

These experiences proved that poor women are in very difficult condition. Rich people afford with their grain for 2-3 years. Marginalized women's situation is becoming additional pathetic by this changing climatic situation.

8.3.4 8.3.4 CHANGE IN CULTIVATION

For the last 15 to 20 years, the cropping and cultivation pattern is changing. Farmers are changing crops variety and vegetables. In Hattisar, mustard, maize millet were

common crops. But now, for 10 to 15 years ginger, cardamom have become major crops, mustard, maize, millet become secondary crops. It is because of the change in the climatic parameters, risk and crisis.

Before, there were only spinach, potato, radish kind of vegetables in study sites, but now cauliflower, bitter gourd, onion, brinjal, broccoli are also equally grown. Soybean and peanut have totally displaced now in Logwa which were grown nicely in the past. Papaya has become main fruit nowadays. Before only pear, peach, oranges were grown. Litchi is coming to existence in village. This changing pattern of fruit, crops etc are because of climatic change express by local elders. They also pointed out other reasons such as availability of varieties of seeds and demand of cash crops and many other reasons. Ever changing process of climatic change has disturbed rain fed agricultural system in study sites. This has contributed to decline in production of agricultural crops and has challenged the people and brought severe consequences, particularly for poor among them women are the main victims.

Local people remembered that extreme events occurred in their life. So, researcher asked to the local people about time, event and impact at the time of group discussion, informants expressed their remembrances as below:

8.3.5 8.3.5 MEMORABLE EVENTS: LOWGA

Table 5: Memorable Event (Event faced by people in their life time was recorded in group discussion, asked with local people of Logwa)

Time	Event	Impact
1954 (2011B.S.)	In Magh, there was heavy snowfall which brought around huge damage in the area	-The road was covered by snow restricting people's movement and the winter crops were damaged. -The ceilings of local people's houses were blown away with all the water overflowing inside the

		house
1955 (2012 B.S.)	There was hailstone with heavy rainfall	-The wheat field and the maize field were swept away and the farmers had to re-cultivate those fields.
On 28 June 1970 (2027 B.S Ashad 14)	There was heavy rainfall that lasted for maximum of 15/20 minutes. Before this, there was long drought.	Flood was seen in rivers and ponds. Cattle were washed away and production was destroyed.
June/July 1971 (2028 Jestha/Ashad)	There was drought even in Jestha and Ashad	Paddy was planted only in Shrawan
October/November 1973 (2030 Kartik end/Mangsir)	Hailstone and heavy rainfall was experienced	The paddy on the field was not harvested and only 1/4 th of the total paddy produced was left good for consumption
1977 (2034 B.S.)	There was no rainfall in Jestha/Ashad. Paddy was planted only in Shrawan. Because of drought, timely cultivation was not done. Jestha and Ashad passed without any field work. Paddy was planted only in Shrawan.	The crops had negative impact because of late plantation. No good production was held; there was scarcity of paddy in the village but the poor anyhow survived eating maize and wheat. There was very low production. People survived with difficulty with the less productivity.
1988 (2045 B.S.)	There was big rainfall with hailstone	Not only farms affected but the flood killed a daughter of Puspallal Dhakal in Keureny. In the same year, hailstone

		destroyed the crops at the time of harvesting.
1994 (2051 B.S.)	There was heavy rainfall with hailstone	The cultivation was all swept away by rain, even big trees were shut down, most of cover part of trees were gone, leaves and branches were broken.
April 2011 (2068 Baisakh)	There was heavy rainfall with hailstone	Wheat, Maize, millet, beans, potatoes were destroyed, 2/3 rd was totally damaged
October 2011 (2068 Mangsir)	Hailstones were experienced again	Before the paddy could be stored, more than half was destroyed

Source: field survey 2012.

From the above life table we can say that season and climatic conditions were not same in all years. With the change of time, there was trend of fluctuation in rainfall pattern, dryness, coldness, hailstone etc. There was fluctuation in rainfall long before but in recent years, hailstone falls regularly; the climatic trend was changing time and again. Local communities' life was closely related with the climatic situation. It was great problem for the local farmers especially women to grow good production if climate was not good. According to group discussion, people opinions proved that for 7-10 years ripen grain was destroyed in the field. They were in unbearable problem. They said that they were punished by nature. One old person said *"We do hard labor for whole season but return is zero for three years, what to do Nani? We ate nicely when we were young but our grand daughter and son will be hungry and will remain thirsty."* This is not a simple statement, it symbolizes that new generation will have to be suffer more in near future not only in town but in local communities

too. After analyzing these events women have to do more labor throughout her life in local communities. But in group discussion women accept that before 10 years there was priority for male labor in local community but since 10 years there was absence of male member and the agriculture in local surrounding was carried by women, old seniors and children. So, women labors are accepted with inner heart which is a great change in the society.

8.3.6 8.3.6. MEMORABLE EVENTS: HATTISAR

Table 6: Memorable Event (Event faced by people in their life time was recorded in group discussion, asked with local people of Hattisar)

Time	Event	Impact
1964 (2021 B.S.)	There was enough and good rainfall in Jestha and Ashad	There was good production
1970 (2027 B.S.)	There was heavy overflow of rainfall	The paddy that was just planted was swept away and farmers had to plant the paddy again
1977 (2034 B.S.)	There was rainfall only in Shrawn	Paddy didn't ripe
1984 (2041 B.S.)	There was hailstone experienced	Before harvesting could be done in Kartik/Mangsir hailstone and rain took away almost all the productions, only ½ muri ¹⁷ paddy was left out of 15 muri
1988 (2045 B.S.)	There was heavy rainfall in Bhadra	The rain swept the electric pole and washed away 2 people. The maize farm was totally destroyed
2011 (2068 B.S.)	There was hailstone and rainfall in Baisakh	Wheat, maize, beans, potatoes were destroyed. The production was half damaged
2011 (2068 B.S.)	Hailstone in Kartik	1/3rd of the paddy was destroyed

Source: Field survey 2012.

¹⁷ 'Muri' is a measurement of grains. 20 pathi contains 1 muri and 1 pathi contains 4 Kilo grams

In Hattisar also, people felt different experiences in their life. Seasons were not similar; time was not good enough, means climate was fluctuating. Some year seasonal rain was fall in time; productivity was also high but in same locality next season big flood swept away not only cultivation and grain but also the people. It was big problem for society; especially women were victimized from the situation because evening and morning agricultural, livestock management and household works were directly related with women in local surroundings. Sometimes, paddy did not ripe, sometimes drought made cultivation so weak, sometimes hailstone destroyed maize and paddy on the field. It is a big problem for family. Therefore, in society if there was scarcity of food, people went to the market Terhathum and buy the rice suppliers brought from the Terai. And, women who had to work without rest could eat stomach full of food in recent years when the road of Dharan to Terhathum became good. This is a change in society according to local people.

8.3.7 8.3.7 SITUATION OF STREAMS, PONDS, MOUNTAINS, AND ANIMALS

Khani Khola = water flow is not as before

Gharte Khola = water is drying out

Guhea Khola =totally dried up

Mool of Khorea = dried up

Rate seem Dhara = as it is

Amende Tap = becoming small so it does not flow

Mountain Kumva karna = Snow is decreasing, looking black spot.

Mountain front side of both study sites = No more snow for 5 years.

Animals disappearing from both study sites = jackal, tiger, vulture are totally vanished etc.

According to local people of Hattisar most of original local stone taps are being smaller. Local rivers, streams and springs are not same as before and water is decreasing day by day. After listening to the situation of local area about water sources like river, streams, local tap, mountain, animal disappearances, researcher asked to the informant that what the cause for the situation was? Were there any causes for the dryness of water? They simply replied God is angry with the corrupt nature of people so they got these situations in their life. Local people said that there was no timely rainfall; they had to bear long drought, unseasonal rain was not suitable for the source of water and winters rain has completely disappeared in recent years. So, the capacity of storing the snow in mountain is becoming less. It has direct and positive relation with summer and winter crops and for the river capacity to blow the fresh water. Researcher again gave glance to the surrounding of village settings, cultivations, crop types and whether there was any big infrastructural change in local community or not but did not find any cause for the situation. The only cause, found was that in the place of high altitude, most of people started to cultivate the cardamom farming for 10-12 years. It needs lot of water, and people used water for its farming. So, one of the many causes for the dryness of tap, streams, pond, river was draught as well as cardamom farming. In informants view dryness of seasons, unseasonal rainfall and drought all were the causes for dryness of the sources of water. In one word, climate change affected the surroundings.

Researcher again asked the questions to the local people in group discussion, why this local surrounding was becoming dry? The answer was, no rain in time, long term drought, increases dryness in mool (spring), stream, and tap. This kind of shortage of water in the village increases difficulties. It is the view of both male and female informants. Because of Kali Yuga, time is not good. So, we people and other living being are tolerating difficulties day by day. Actually, local people are not familiar to

the term climate change but indirectly they are expressing idea about climate change. There is a shift in agricultural pattern, focus of the communities are increasing on cash crops like, cardamom, broom stick, vegetable farming instead of paddy in the field. In both study sites cereal crops cultivation has decreased and cash crops are increasing. Some crops like papaya, cabbage, cauliflower, broomstick, guava were previously not grown in the study sites have becoming very well known crops now. But local rice, millet and maize are lost or replaced by new crops. This process of cultivating cash crops increases the before cash crops, farmer used to exchange goods in village and market than to sell. But when cash crops started to cultivate after than farmer rate their cash crops previously and get cash at the time of harvesting. Business men came and take away the goods. Money is taken away by head male member of family or mother in-law. After the availability of cash crops daughter-in-law have no chance to get money. Women had control over minor crops such as Millet, Junelo etc. Cash crops are grown for market but women access is very low. Before, cultivation of cash crops women used to go to the market (Terhathum Bazaar) and they got some money from the sale. But present context is different. There is gap between the power relation of daughter-in-law and father /mother-in-law. Only the hope of daughter-in-law is that their husband sends them some extent of money. So climate change effect is less for them to some extent.

After the dryness of water the social and cultural change researcher found was that all people from community started to use water safely. They collected water in one place by making pond and took water for household use. If there was no rain at the time of paddy plantation people cultivate the cash crops like ginger, round chilly etc in Logwa and Millet and ginger in Hattisar for the coping mechanism.

Because of climate change farmers have started to change in the varieties and choice of crops and vegetables gradually. So, at the time of field study daughter-in-law as well as all members of family ate curry and nutritious pulses equally than before. At the time of field study most of family members including daughter-in-law were asked

about consumption pattern and nutrition the answer was positive from them including daughter in-law. Awareness increased in village women that their consciousness feels enough curry is good for their health. But on the other hand climate change has impacted the traditional cultivation and harvesting technique as well. If rain is not regular their farming time pushed back by 15 to 25 days in average due to delay in the monsoon and whole year cropping systems were consequently affected. Mainly women and among them daughter-in-laws were very much affected because there is no time to ask help for neighbor labor. All work of community fall in same time in whole area. Most of daughters in the community drop out the school when the monsoon delays in the area over load fall in same time. Yet, the production of the crops declined. They cultivate with hard labor but no satisfactory income was received. In wet land also the production of wheat was drastically reduced due to a little rain or late precipitation. Both communities' farmers felt the scarcity of green grasses for feeding their cattle. Under such conditions, women were forced to purchase or search supplementary foods for cattle and themselves. Both sites farmers, especially women informants complained that because of the unfavorable and bad seasonal condition during crop harvesting, farmer were not able to store seed for next cultivation. For the continuity of cultivation and farming activities most of farmers are compelled to dependent on market seeds which are genetically modified. Therefore, climate change had certainly affected the traditional agricultural practices. Most of the farmers have no native seeds. The original previous test of food has lost now because of the use of genetically modified seeds. Farmer felt guilty for the originality and of vanished situation of farming. They used the chemical fertilizers to cope with the situation. Unfavorable climatic situation, use of hybrid seeds as well as use of chemical fertilizer reduces the straw quality and its last duration. This kind of using different coping mechanism increases various new diseases in crops, animal as well as human being. For upbringing the crops farmer used pesticides since 10-15 years which affected the grains and vegetables. These directly affect the farmers' health. When it was spread

on cultivation poison goes indirectly when the local people eat the food. For 15-20 years new kinds of diseases are spreading in the community. It is may be the cause of the present food. It is because of the changing situation of climate like, ongoing increase in temperature and unexpected kind of drought at the time of cultivation since 10-15 years as the informants view.

Really, the village is suffering from the changing climatic situation. In winter (December, 2011) when researcher was in the field, workers were not feeling that it was winter days. Days were as hot as the summer days. Morning was not as cold as before. Researcher thought that winter was finished in the days of January (Poush). According to the informant winter rain was also pushed back. So, winter crops were not good as before. Most of the informant of both study sites argued that winter crops have drastically decreased. Only potato, spinach, cardamom, chilly is main winter crops for six years. But before that wheat, paddy, potato were winter crops. Climate change is not only change in air, rainfall pattern, coldness and warmness but also change in cultivation, life style, daily food habit which increases difficulties, as well as add opportunities. Most of the villagers, especially women are facing problem in grass-root level. It is more difficult for hill women farmers who are limited at the four walls of house and farming as subsistence. The opportunities created by the climatic situation are that some people started non-agricultural sector business such as hotel, local teashop, grocery, tailoring, some went for foreign employment. So, in community there is variation in profession of local people.

8.4 8.4 SOCIAL INTERACTION AND SHARING

Both people of Logwa and Hattisar communities are cooperative. At the time of field work researcher found they were interactive, helpful and generous. When new guest and neighbor come in their home, most of them give respect and become happy. They speak politely and respect others; they have broad social capital and linkage with whole community. There is anger and conflict between them but yet they can

solve the problems in cooperation and again become intimate. This kind of capacity is wealth and social synergy. They talked with close manner and did not give permission to go out eating some things. They talk with their neighbor whenever they meet, about day to day difficulties, farming, seeds, plantation, drought, productivities, disease in cultivation etc. They themselves take out some conclusion for the present problems. They have capacity to take out solution in consultative manner. Local people are aware about the dryness of river tap stream etc. At the time of need they have belief in helping each other, take supports from nearest neighbor and relatives. Conflict and anger was seen between some families but at the time of disaster and hard time society and neighbor forget their bad time and conflict and helped the needy one. Within the family also there was conflict between members. Most of home there was conflict between mother-in-law and daughter-in-law, sisters-in-law. But they did work as their works were their own duty. Members of community share their difficulties and problem and take out best solution by sharing with many knowledgeable experiences neighbor brain storming final conclusion. When there was long drought, they did Sansari Pooja for good and timely rain fall. With the cooperation with community, they all made drainage annually, they cleared and made narrow walk path at the time of the Dashain festival. Share problems, joys, knowledge between the community members. There farming decisions were made according to the local weather and climatic prediction with the past experiences. Farmers especially women who are active in cultivation discussed about seed selection, plantation, harvesting and decision of alternative income sources etc at the time of meeting or when they go to fetch water. They did their work in one day with the labor power from neighbors during cropping and harvesting time and the next time they help other. Turn by turn they regularly exchange their labor. Many people work in one time give the synergic effect, and work is finished quickly. This kind of social network and mutual help plays vital role for their year to year adoptive capacities to the bad impact of the ongoing change. Both study sites' people get moral and financial support from relatives and neighbor. Most of the informants

argue that there was conflict between villagers at the time of putting water in their paddy field. Sometimes, villager's theft the drain water when it is others turn. Sufferer farmer comes with the stick and knife in their hand at night to look after the water. Time and again farmer bargain with rubbish words. One farmer told that five years ago there was fight between two farmers. They remembered, anyway it was for the adaptation but now their relation changed into mutual support.

Social networks are the glue between many of the elements of adaptation hence itself is an important adoptive strategy for any kind of disaster and calamities. It is visualized as a web of connections that link diverse individuals and institutions, either directly or via other actors. The actors are inter dependent and through their relationship they create opportunities for resource and information exchange, and form the social, economic and political structures that defines how they, as individuals or groups may act (Ensor and Berger; 2009 : 21 Cited in Poudel thesis 2010).

In both study sites, women members are main figures to maintain social networks. Women gave respect and request guests to have something (tea or milk). They swept the floor, arrange the house, and maintain house and surroundings neat and clean. Most of the male member's absence is fulfilled by the women members of society. Increasing work load is done easily in hurry. They laboriously finished but this overload and changing climatic situation hamper the young schooling and collage girls study opportunity. Because of work load they are compelled to leave the school/collage were made according to the local weather and climatic forecasting, experience. Women were culturally trained and tough that in any kind of social situation they easily adopt and face the problem with courage and strong heart. They share their problems easily with their companion and neighbor when they met them at tap, grass cutting field, working at field or forest. In short, women easily built social interactive network.

8.5 8.5 SHORTAGE OF LABOR

In both study sites people asked for the labor from the neighbors. Many hands produced energy to do work in hurry. It was the main idea of villager which increases positive networking and closeness within the communities. It increases the 'we' feelings between them. But nowadays, the main noticeable difficulties faced by the people of both study sites, is the shortage of labor.

Kendra Prasad Subedi of Logwa said "It is difficult to fulfill the farm activities. Nowadays, we get no laborer; most of young people are not in home. So, most of elite people who have no laborer in their family are displacing for 15 years. I have been facing the same problem for many years. Elite people are displacing, locality I feel is not as before. I have four wives, eight sons and six daughters but no one is in the home. If there is no Damai maila I have no alternative to stay in the village. This is the big problem of laborer less people of village weather live without son and daughter or leave the lovely original place".

For 10-15 years, migration of young people especially male member primarily to overseas countries or to urban areas. This creates the absence of youth male laborer into the village. Moreover, in recent years trend of women migrated to Gulf countries in search for job is increasing. Villagers were showing problem that their field would remain unfertile because of scarcity of agricultural labor in near future. For the balance coordination of community, there should be both elite, middle class, poor people in society. But now most of rich people are leaving their village because of shortage of labor, and poor people will be in more crises in near future. Elite has idea to generate new things, they spread new knowledge in society but when they are absence in the society village will be more backward.

8.6 8.6. PROBLEMS OF WOMEN FARMER IN STUDY AREA

In both of the areas, women complain about some problems. Most of them felt that they were cursed by the nature. Some of them said they were exploited by

traditional social rule. Society made women housewife to do total household works. From early morning to late night, women were in hurry to do household works as well as field works. They had no time to take rest even returned back to home. After finishing household works they had to go for day labor. Some of the male member of that family gone for chat and play card in local teashop. Most of daughters and daughter-in-laws left their school when they were in grade ten. The cause of drop out is because of overload of works for them in agricultural field. Unseasonal rain cause overload of work. Farmer has to do work in hurry if there is late rainfall. Most of the daughters and daughter-in-laws were accused that no and late rainfall is because of their misuse of menstruation period. Daily, after work women have no rest. They have to involve in domestic to out sphere, whole day they are very busy. There was no culture to help women for household works. It is not mind by the society. Women sleep late at night and get up very early. Whole day would be busy time for them. Therefore, in villages women suffered from disease in very early age. Researcher found ten women informant who have backache, shoulder-ache, miscarriage, uterus swelling, terrible headache, chest pain and wait loose at their early young age. Most of them are unnatural thin and fat.

9 CHAPTER NINE: CONCLUSION

From the field visit and discussion with the hill farmers, especially male elders and women, it is clear that climate or weather fluctuation is being experienced from the past. For 20 years, they are facing drastic changes in the climate. Hill farmers are much close to nature and natural surroundings. They are keenly monitoring rainfall pattern, dew, fogs, snowfall quantity in mountains, shifting of crops, crops ripping pattern, size and taste of fruits, decline and disappearing of resources, existence of new plant and animals. These directly observed phenomenon give the true interpretation of the climate, whether it is changing or not.

With respect to the above parameters, what are the situations of resources like water, firewood, grass, fodder, agricultural crops, shifting planting and harvesting time, is the researcher's main concern. With the changing situation, researcher has tried to analyze the farmers experience as regards the work load, income, day to day activities and reached to the following conclusion:

Hill farmers have been observing and experiencing fluctuation in rainfall. Timely rainfall for cultivation is slowly shifting back. Winter rain is also not being experienced nowadays. Water resources are drying up, shortage of grass and fodder, plantation and harvesting time is shifting. Straw quality has also decreased because there is no rainfall in time at the time of plantation but farmers face hailstone and rainfall during the harvesting time. Because of scarcity of good quality straw and grass, livestock management is difficult. Good production of grains and livestock are the major income of farmers, especially women. Women have higher access to agricultural production than other assets. They are primarily producers and consumers of food grain. Adverse effect of climate change primarily victimizes the women. But yet, farmers are optimistic. They cope with the situation. Insisted of paddy they have started to cultivate cash crops, ginger, chilly, broomstick, millet in Logwa and cardamom, ginger, maize, millet in Hattisar. To cope with situations they are changing crop pattern and seeds.

Farmers of both study sites are facing water scarcity. Women are in difficult condition and poor women are affected more. To get rid from the effect, they have started rearing hen, chicken, curry farming. Women and elders of both study sites pointed towards the symbols of warm winter i.e. availability of papaya, mosquito, diseases in cultivation, unseasonal rainfall. Farmer's only source of income, agriculture and livestock, will be affected in the near future. But still, farmers have their own ideas to sustain in their locality. Some have gone abroad for employment and some changed the pattern of farming. New kind of crops, which can be easily cultivated even at the time of draught, is introduced. According to the local people, water is not only necessary for living beings but also the symbol of purity after death. Water is used in welcoming life and is important for farewell of life. People have developed and conserved the resources from the very past and they have started to give respect and pray the rivers, taps, tree and stones of Devithan. It is their peculiar way of dealing and conserving nature.

Perception and experiences of farmers vary according to their social status and geographical locations. Farmers, who have 'Sim Khet' are not much affected from the drought but the dry land farmers are tremendously hit by the problems. The new adaptive mechanism adapted by the dry land farmers is that they have started to cultivate the cash crops. Women farmers suffer because businessman reached to the field and buy all cash crops from the head of the family. So, women are left empty handed. The income source of women has been affected by the effect of climate change. Girls who come from poor family are deprived of secondary level education because scarcity of grass, fodder, water, straw cause overload for them. They have no time to read and write in home. So, they fail the exams and ultimately drop out schools. Especially, Dalits are in problems. Young daughter are blamed for the situations as at the time of menstruation they bath and wash cloth in local taps. So, the God is said to have been angry because God could not tolerate it and cursed the water sources. This kind of cultural frame proved that women are not only blamed but are victimized by the situation.

Analyzing from anthropological perspective, researcher has noticed the following main concerns from the research work:

-) People have started to cultivate new crops.
-) Males are not in a condition to waste time for farming activities due to shift in cultivate time and women have to face all kinds of burden.
-) Perma and Bethi systems have completely disappeared.
-) Women laborers are becoming easily acceptable in the villages.
-) At the dryer land, people have started to cultivate cash crops to cope with the problems.
-) Streams, ponds, rivers are drying up day by day.
-) Snow in mountains and soil moisture or productivity has direct and positive relationship.
-) Culture of collecting kafal, wild berry, wall nut gathering in one place is declining.
-) The culture of big and joyous ropain system has almost vanished.
-) Water for the funeral is being scarce in the local Khorunga River.
-) Social conflict emerges due to the shortage of water in the canal but within no time, they change the conflicting relation into coordination.

Analyzing all these events reported by the hill farmers including women and men elders, there is great impact of agriculture on water resources. Their experience shows that climate is changing and to cope with the situation, they are changing their agricultural cycle.

9.1 9.1 FURTHER SUGGESTIONS FOR RESEARCH

From this study, community people raised different issues like new kind of diseases spread out in animals and plants. People are also suffering from new diseases. Snow in mountains is decreasing year by year and the temperature is increasing. Productivity is decreasing in every year. These issues need to be studied in detail in the future. Likewise, the local farmers should be sensitized on the increases of temperature and effects and impacts of climate change for their further cautiousness. The new seeds for grains cultivation and changing of seasonal planting should be adapted by the time. The local people should be sensitized for the pre-caution on newly emerged diseases for human, plants and animals. The climate change might

cause disasters and calamity such as flood, drought, hailstone, diseases; so, farmers should be trained for how to save their lives and other happenings. Every sectors of the state should give their attention and concentrate on the study and action in the climate change.

9.1.1 A) APPENDIX 1: AN OVERVIEW OF INFORMANTS OYAKJUNG,
LOGWA

S.N	Name of informants	Age	Sex	Occupation	Perceptions on Climate Parameters		
					Rain	Temperature	Frost
1	Sivha Prasad Rimal	57	Male	Farming	-	+	*
2	Kendra Prasad Subedi	72	Male	Farming and livestock	-	+	-
3	Mana Maya Subedi	60	Female	Farming	-	+	-
4	Netra Prasad Dulal	60	Male	Farming	-	+	*
5	Ram Prasad Dulal	70	Male	Farming	-	-	*
6	Kaushila Bhattraai	68	Female	Farming	-	+	-
7	Bhim Maya Shrestha	66	Female	Farming	-*	+	*
8	Indra Maya Tumbahamphae	80	Female	Before Farming	-*	+	+*
9	Padma Maya Limbu	52	Female	Farming	-*	=	*
10	Mangal Maya Tumbahamphae	51	Female	Farming	*	+	*
11	Renuka Limbu	35	Female	Farming	*	=	+
12	Krishna Prasad Subedi	74	Male	Farming	-	+	+
13	Punya Mata Subedi	58	Female	Farming	+	+	+

14	Didn't agree to tell name	39	Female	Teaching and Mill	*	+	+
15	Devi Maya Nepali	54	Female	Farming	+	+	+
16	Kausila Nepali	35	Female	Farming	+	+	+
17	Pabitra Nepali	64	Female	Farming	+	+	+
18	Mana Maya Nepali	50	Female	Farming	+	+	+
19	Rupa Neplai	35	Female	Farming	*	=	*
20	Didn't agree to tell name	58	Female	Hotel	+	=	*
21	Didn't agree to tell name	34	Female	Hotel Pig farming	+	=	*
22	Didn't agree to tell name	36	Female	Teaching and Hotel	+	=	*

Source: Field Survey 2012.

Note: (-) Decrease, (+) Increase, () Uncertain, (-*) Decrease and Uncertain, (=) Stationary*

9.1.2 B) APPENDIX 2: AN OVERVIEW OF INFORMANTS OYAKJUNG,
HATTISAR

S.N	Name of informants	Age	Sex	Occupation	Perceptions on Climate Parameters		
					Rain	Temperature	Frost
1	Chandra Lal Dhakal	78	Male	Farmer	-	+	*
2	Dhana Maya Dhakal	76	Female	Farmer	-	+	*
3	Ganga Devi Dhakal	35	Female	Farmer	-	=	-
4	Ram Bahadur Bhattarai	48	Male	Farmer	-	+	*
5	Laxmi Prasad Dhakal	33	Male	Farmer	-	=	_*
6	Puspa Dhakal	56	Female	Housewife	_*	+	*
7	Pitambar Khadka	52	Male	Teacher	-	+	_*
8	Devi Parajuli	45	Female	Hotel Owner	+	+	*
9	Tulasa Shrestha	32	Female	Farmer	_*	=	_*
10	Aieta Rani Limbu	75	Female	Farmer	=	+	*
11	Narbada Limbu	32	Female	Housewife	=	+	*

12	Ram Bahadur Nepali	64	Male	Hotel Owner	=	+	-
13	Tulasi Maya Baraili	58	Female	Farmer	-	=	-*
14	Dil Bahadur B.K.	68	Male	Teacher	-	+	*

Source: Field Survey 2012.

Note: (-) Decrease, (+) Increase, () Uncertain, (-*) Decrease and Uncertain, (=) Stationary.*

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