

Chapter- I

Introduction

1.1 Background of the Study

Climate change is a change in the statistical distribution of [weather](#) patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer-term average conditions (i.e., more or fewer [extreme weather](#) events). Climate change is caused by factors such as [biotic](#) processes, variations in [solar radiation](#) received by Earth, [plate tectonics](#), and [volcanic eruptions](#). Certain human activities have also been identified as significant causes of recent climate change, often referred to as [global warming](#). [Scientists](#) actively work to understand past and future [climate](#) by using [observations](#) and theoretical models. A climate record—extending deep into the Earth's past—has been assembled, and continues to be built up, based on geological evidence from [borehole](#) temperature profiles, [cores removed from deep accumulations of ice](#), [floral](#) and [faunal](#) records, glacial and [per glacial](#) processes, stable-isotope and other analyses of sediment layers, and records of past sea levels. More recent data are provided by the instrumental record. [General circulation models](#), based on the [physical sciences](#), are often used in theoretical approaches to match past climate data, make future projections, and link causes and effects in climate *change* (NASA Earth Observatory. 2011).

The most general definition of *climate change* is a change in the statistical properties (principally its [mean](#) and [spread](#)) of the climate system when considered over long periods of time, regardless of cause. Accordingly, fluctuations over periods shorter than a few decades, such as [El Niño](#), do not represent climate change. The term sometimes is used to refer specifically to climate change caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes. In this sense, especially in the context of [environmental policy](#), the term *climate change* has become synonymous with [anthropogenic global warming](#).

Within scientific journals, *global warming* refers to surface temperature increases while *climate change* includes global warming and everything else that increasing [greenhouse gas](#) levels affect (Mike, 2016).

Climate change is defined as a variation in climatic parameters and is attributed directly or indirectly to human activities (Lange, 2005: as quoted in Crate and Nuttall, 2009). In the beginning of the 21st century, climate change has become a global issue for environmental scientists, policy makers and planners as well as academicians (Salick and Byg, 2007). Most of the researches have been carried out about the biophysical aspects by neglecting the local people or their perception, but how the physical manifestation of change are perceived, experienced, interpreted, and negotiated at community level (Crate and Nuttall, 2009).

The study mainly focuses on the effect of climate change in the agricultural crops on the one hand, and on the other hand, change in adaptive/coping mechanism, especially farming due to climate change in the hilly village of Nepal. This study also describes the local farmer's perception on climate change and due to effects of climate change existing pattern of farming has been changed and local farmers started working on poultry farm, brick factory as well as cash crop production in the dattu VDC of Darchula District. .

1.2 Statement of the Problems

Climate change is expected to have a wide range of direct and indirect impacts on human health, ecological systems, and socioeconomic sectors. Both the magnitude and rate of change, as well as possible changes in climate variability, will be important in determining impacts. Many impacts will be adverse, and some, like species loss or ecosystem changes, may be irreversible. Others may be beneficial. The ultimate effects of climate change on socioeconomic or ecological systems will depend on three broad factors: the characteristics of the change in climate, the sensitivity of the system to a given change, and the capacity of the system to adapt to climate change. The vulnerability of a particular society is generally defined by the

combination of sensitivity and adaptability. Those societies or sectors that are especially sensitive or are least able to adapt are the most vulnerable.

In the Nepalese context the issues of climate change is talking about physical aspects as well as cultural aspects. Its impact on snowfall, melting of glacier, flood and green house gases can be seen in the context of Nepal (ICIMOD, 2011). The issue of climate change is first started in subject matter of physical aspects for example snowfall, melting of glacier but later on it started to focus on cultural aspects of local people. Farmer less understands the meteorological data and uses their own seasonal calendar so that changing climate and weather fluctuation badly affect to their farming system.

There is clear evidence and an increasing recognition among a number of sector for the importance of agro-biodiversity to build adaptability and resilience of ruler communities and agro-ecosystems and, thus, supporting adaptation to changing condition under climate change. The conservation of local crops and livestock and landraces and traditional practice can help farmers cope with many different types of adversity. The study will have the following research question to be addressed:

-) What are the indicators of climate change as reported by the local people?
-) What types of coping mechanism/adaptation strategies are make by the local people in the field of agriculture in the context of changing climate?

1.3 Objectives of the Study

The general objective of this study is to understand the perception and knowledge in the changing agriculture practices, and their adaptive strategies to cope with climate change .Objectives of the study are as follows:

-) To examined the socio-economic impact of the selected farmers.
-) To analyze the local adaptive strategies or coping mechanism in climatic fluctuations over the last a few decades or more

1.4 Significance of the Study

Climate change is an overriding challenge issue. Nepal has expressed its commitments through international conventions and treaties to develop national strategies to minimize the impacts of climate change. However, inadequate understanding of climate change impacts particularly at community level is still less. Therefore, it is essential to study from community level. The hazard scenario of agriculture by the condition of climate change suggests that the studies are urgently needed for better understanding of the linkage between changing climatic pattern, increasing natural hazard and its effect on livelihood and agriculture. Although, few national level study and reports have been published on community vulnerability. Local level studies are sporadic in spite of the fact that micro level assessment on climate change issue is more relevant than mega-scale in Nepal with high diversity in natural as well as human system within a short spatial variation. Hence, local level study is important.

Some of the significations of this study are as follow:

-) This study is useful to some extent for the researchers, students and for those who want to have further study in detail. Similarly, this study may be fruitful to government, planners, policy makers, social workers and others.
-) It is also hoped that this study may also be able to explore the socio-economic and cultural characteristics of farmers.
-) It is hoped that this study was be provided some understanding as to the factors contributing to the climate change
-) The findings may also reveal target group perceptions, desires and problems, the knowledge of which could enable officials concerned to modify the activities accordingly.

1.6 Limitations of the Study

Following are some limitations of the study:

- a) The study will be conducted in a selected VDC i.e. Dattu VDC- 2 of Darchula District.

- b) The study does not measure the whole country's climate change impact.
- c) This study will be limited in 30 respondents.
- d) The study will be conducted within the given time period and financial constraints.

1.8 Organization of the Study

This study consists of five chapters. The chapter one will be provided the introduction, statement of problem, objectives, rational of the study, conceptual framework, theoretical framework. The second chapter will be described with the review of literature and provides ideas about the previous researcher and studies being done on the sources. The third chapter will be summarized the methods and approaches applied by the researcher. The fourth chapter will be outlined the information about the study area and data presentation and analysis. Finally Summary, conclusion and recommendations will be include in chapter five.

These major chapters will be followed by references, appendices, acronyms and annexes related to the study.

Chapter- II

Review of the Literature

In this chapter, brief analysis is presented about the theoretical review and review of related documents of the study. This chapter is basically divided into three parts. The literature review presented below describe about the climate change and agriculture, second part deals with the global scenario of the climate change and agriculture in the context of Nepal and finally last section deal with the anthropological engagement in the climate change.

2.1 Theoretical Review

Climate change is defined as the variability in average weather and ultimately state of the climate system over a specified timeframe (Crate and Nuttall, 2009). This variability is normally evidenced by changes in the mean temperature, precipitation and rainfall levels among others. Changes in climate can be caused by natural factors such as sunlight intensity, and volcanic activity among others or anthropogenic factors such as burning fossil fuel, deforestation and other human activities (Crate and Nuttall, 2009).

Climate is always associate with particular place and region which is normally reflect through climatic and non climatic indicator. People are always aware about the local event of their surrounding either that is climate or not but achieving it by an idea. Perception of climate change is informed and structured by the dynamic nature of human environment relationship, farmers made sense of local climate through the use of categories that were not to or determined by traditional weather cycle (Vedwan and Rhoades, 2001).

The awareness of the extent to which change of climate can affect the environment, society, and economy is increasing. Long-term climate change has been observed at continental, regional, and ocean basin scales, due to increasing concentration of greenhouse gases particularly carbon dioxide. These include changes in precipitation amounts and timings, arctic temperatures, wind patterns, and aspects of extreme weather like heavy precipitation, drought, and heat waves (IPCC, 2007).

The pattern of precipitation is not distributed evenly across the world and is governed by atmospheric circulation patterns and moisture availability. These two factors are impacted by temperature so the pattern of precipitation is expected to change due to changing temperature. The changes include the type of precipitation, the amount, the intensity and the frequency. Precipitation has increased in eastern North America, southern South America, and northern Europe and decreased in the Mediterranean, most of Africa, and southern Asia (Trenberth, K.E et al., 2007).

Increasing global average air and ocean temperature can change the type of precipitation during the winter season (IPCC, 2007). The pattern of precipitation is changing from snow to rain in Northern regions and mountainous area so that heavy precipitation events have increased even in places where total rain amounts have decreased (Barnett, T.P., et al., 2008). All these changes are associated with increasing global temperature since warmer air can hold and carry 15 more water vapor (Santer, B.D., et al., 2008, Willett, K.M et al., 2007, and Santer, B.D., et al., 2007).

Seager, R. et al., 2007, Bates, B.C. et al., 2008, Kundzewicz, Z.W. et al., 2007, and Lettenmaier, D. et al., 2008 projected runoff using climate models. Based on their projection, California and other parts of the West will experience decreased runoff, while runoff will be increased in the East.

Bates, B.C. et al., 2008 and Mote, P. et al., 2008 studied the impacts of higher temperature on the snowpack. They found the production of runoff as streamflow in summer will be earlier in the East and some areas of the Northeast. They found the reduction of snowpack is widespread particularly in lower elevation mountains in California, the Northeast, and the Northwest.

There is evidence that precipitation is transitioning from snow to rain more in the West and Northwest over the last 50 years (Feng, S. and Q. Hu, 2007, Knowles, N. et al., 2006, and Huntington T.G. et al., 2004) and runoff is occurring up to 20 days earlier in the West and up to 14 days earlier in the Northwest due to earlier melting snow (Stewart, I.T. et al., 2004 and 2005). Other studies in snowmelt-dominated

basins in the West and East show earlier spring runoff by up to 60 days in the West and up to 14 days in the East (Stewart, I.T. et al. 2004 and Rauscher, S.A. et al., 2008, Hayhoe, K. et al., 2007). Earlier melting snowpack will produce earlier runoff, there will be less summer stream flow, and this will put more pressure on humans and the environment due to less available water and higher air and water temperatures.

During the past decade, various approaches have been used to assess the impact of climate change. The approaches, described comprehensively in the final report of Climate Change Characterization and Analysis in California Water Resources Planning Studies 2010, are as follows:

It is reported that the developing countries are more susceptible to climate change impacts as they have limited capacity to adapt. The least developed countries are among the most vulnerable to extreme weather events and the adverse effects of climate change. Also, these countries have a very least capacity to cope with and adapt to adverse effects of climate change. The major risk reduction approach is adaptation to global change (UNFCCC, 2006).

Agarawal, (2003) analyzed recent climatic trends that reveal a significant warming trend in recent decades, which has been even more pronounced at higher altitudes. Climate change scenarios for Nepal across multiple general circulation models meanwhile show considerable convergence on continued warming, with country averaged mean temperature increase of 1.2°C and 3°C projected by 2050 and 2100. Warming trends have already had significant impacts in the Nepal Himalayas. Although Nepal's contribution to the GHGs emissions is very less, it is among the countries where its impacts are very high (Chalise, 1994).

2.2 Empirical Review

Poudel (2011) in his article "*Eyewitness Accounts on Climate Variability and the Responses: Perspectives from Farmers*" studied at Khatri-chhap of Kirtipur located at the Kathmandu valley. In this article he explored that people with different socio-cultural arrangements have different experiences and responses to climatic variability. In this paper, he argued that local experiences of climatic variability, which have been

monitoring by locals in their lifetime. He explored their responses or coping mechanisms, which they have been practicing to mitigate with climatic risks. By using eyewitness accounts and hearsays, he explored and documented the experiences about climatic variability of local people. His article suggests that farmers of Kirtipur also have felt more threaten in their livelihood during drought years. The farmers have several experiences about the effects of climate change in local level. In this context, farmers, in rural community, develop alternative way to cope with the uncertainty based on their indigenous environmental knowledge as well as strong social fabric that help the local community to mitigate with the climate risks and uncertainty in the local context.

Rai (2010) studied among Mustang people attempts to analyze on how a micro socio-economic dynamics and discourses occurring in a local setting is interrelated with national and international political dynamics of global climate change. He explored the local experiences of climate change, causes of climate change and its perception and impacts of climate change in local context of Mustang. In this study he concluded that there are lot of knowledge, perception and experiences with the local people. So, the attempts to advance for the adaptation to climate change highly requires the insights developed and enriched from vary local to the global societies. Thus, there is need to look and understand the climate change with the links of discourses developing from micro-macro phenomenon.

Poudel (2010) studied about perception of local people on climate change and impact of such change on agricultural and livestock management practices among the people of two different ecological and social setting from local people's perspective. In this study he used cultural model for the emic understanding of people about the effects of climate change. His study attempted to understand the perception of the people on climate change through the change in climate related parameters. His study clearly explored difference in the perception among local people about climate change, climate related risk and disaster, their impacts on agriculture and livestock and present coping and adaptive strategies followed by the people in their surroundings.

Those researchers like Sapkota (2013) and Chapagain (2013) who have conducted their research on the issue of climate change have focused on the issues how climate change is occurring in the rural area and its effects on local people. Sapkota has focused his research on people perception that how people forecast weather and rainfall however, Chapagain has focused about effects of climate change on livestock and its directly impact on the local people. Here to some extent, my research issues is similar to that of Sapkota and Chapagain but my research has basically focused on the farming and agricultural system and how due to the effects of climate change farmers should have to change their traditional farming system and how they have been shifting their farming system and how they have been adopting to brick factory, poultry farm, and cash crops as well.

The Climate Change budget code has enabled the integration of climate change into development planning. The GoN has secured multilateral and bilateral funding to implement climate change programs. In the fiscal year 2013-14, 11 out of Nepal's 27 Ministries have a budget allocated for climate related programs. The total climate change budget amounts to 3.1 per cent of the total GDP (NPC, 2013). Localization of climate planning and coordination. The National LAPA Framework has been approved. 70 LAPA's have been prepared in 69 village development committees and 1 municipality across 14 districts. Efforts are being made to support national roll out of the Framework. Approximately 11.4 per cent of the total national climate change budget has been allocated to local programs (compared to a target of 80%) (NPC, 2013).

Chapter - III

Research Methodology

This chapter includes the research Design, Nature and sources of data, universe and sampling, techniques and tools of data collection, data presentation and analysis.

3.1 Research Design

This study will be carried out on the basis of descriptive and exploratory research design. Qualitative data is generated from directly talking with the respondent and documenting their experiences whose narrative account about climatic fluctuation agriculture pattern and coping mechanism contributes to this research for making valid.

3.2 Nature and Sources of Data

Both primary and secondary data will be used in the study to make the study more qualitative rather than the quantitative. The required primary data will be generated through the field study. Both qualitative and quantitative data will be used, but major concern is paid on the qualitative information, as of the research is to explore and document the local perspective and adaptive strategies followed by the community to reduce the impacts of climate change on agricultural production.

3.3 Universe and Sampling

I will be used purposive sampling for completing my research. According to my research needs to collect and generate data I will used purposive sampling. The study area Dattu VDC consists of 9 wards. The ward no. 2 was purposively selected for the purpose of study because in the ward no 2, there is huge agricultural production and mostly farmers are lives there.. It was evidenced during field visit. In the ward around 45 households are farmer households which is universe of the study. Out of 45 households 30 households will be selected randomly as a sample unit. I will be selected the elder members of the community, assuming that they are the witness of

the ongoing change and have gained valuable information and experience about changing pattern of the climatic regime of their locality during their lifespan. Unstructured interview will take with local herders and farmers who will be purposively selected.

3.4. Techniques and Tools of Data Collection

3.4.1 Household Survey

To get the primary data, the structured questionnaire covered all objectives of the study will be developed, then the questionnaire will be filled up by the researcher. The researcher will be visited all selected sampled households.

3.4.2 Field Observation

To get the primary data and relevant information traditionally applied the observation method. Despite the fact achieved from respondents' reply, the researcher himself observed the agricultural practices adopted by the villagers. Moreover, researcher also will be observed the small irrigation system, which is constructed villagers by use of traditional knowledge, socio-cultural setting, and Parma (labor work reciprocity) system of the area. The aim of this research will be examined the changing practices in agriculture as well as farmer's other exercises which are directly affected by climate change, so the researcher also observed traditional farming processes to paddy and wheat and recent farming processes, i.e. cash crop vegetable plantation, leasehold field for brick factory, poultry farms which are key coping strategy for them. . Mainly the researcher will be observed the techniques and practices of agriculture farming in the sites.

3.4.3 Key Informant Interview

The key informant interview is a standard method that is widely used in agricultural related and other rural development inquiry. This is one method used in rapid assessment for gathering information from the affected community. The term "key informant" refers to anyone who can provide detailed information and opinion based on his or her knowledge of a particular issue.

3.4.4 Focus Group Discussion

The focus group discussion will be held at selected study area. To complete the group discussion the checklist will be prepared to collect the information from local farmer and to get appropriate information on inclusive basis. Research will be discussed on various activities of local people.

3.5 Data Presentation and Analysis

Analysis is necessary for the data interpreting and analyzing data. Analysis is a continuous process of reviewing the information as it is collected, classifying it, formulating additional questions, verifying information and drawing conclusions. Analysis is the process of making sense of the collected information's are two kinds of the data (qualitative and quantitative) will be collected through the use various methods and techniques All the collected quantitative data are presented in tabular form. These included population structure, age-sex composition of the households, size and structure of the household, household is income, and so on. The next important data is qualitative data. For the meaningful generalization of the unorganized qualitative data,

-) Business organizations are the product of their environment. To adapt in changing environmental forces these banks are recommended to study and predict the business environment continuously as well as should make SWOT analysis so that the activities can be adjusted accordingly in the changing environment.
-) Past trend in different headings of cash flow should be analyzed to make future plans to handle cash in effective way.
-) Time value of cash should also consider for effective cash management. Future contingencies and selective cash need should be estimated properly.
-) No business can run without cash and making default on its obligations. Even being a few days late in meeting payrolls, or paying suppliers or creditors can severely damage important business relationships.
-) In addition to cash flows statement, cash budget should also be included in the directives issued by NRB for financial institution. Cash flows reports the cash activities of the past period. It reflects the actual result of past cash transaction. To know the expected cash amount for future period, cash budget should be prepared.
-) The marketing strategies should be innovative that would attract and retain the customers. It is recommended for both the banks to develop an innovative approach to bank marketing for its well- being and for sustainability in the market.
-) An emphasis should be given on planning, research and development for the mobilization of low cost savings as well as to open new branch and to introduce qualitative products and services according with the demand of existing and potential customers

) Both these banks should invest excess cash in short term liquid assets that can be converted into cash as per the requirements and these banks follow the strict investment policy to avoid the non performing assets.

) One of the management basic responsibilities is to ensure that the business has enough cash to meet its obligation as they become due. Therefore, in order to improve cash flows, both these banks are recommended to take several strategies like deferring income, taxes, peak pricing and developing an effective product mix in both the short and long terms.

Further it can be drawn that in Nepalese market liquidity crisis was exist for the short term period due to the declining rate of interest of the banks and the lack of better alternative investment opportunities within the countries. In addition, the government had framed liberal policy towards licensing banks. Consequent of this no of new commercial banks emerged in the given scenario with increase in paid up capital tightening the cash flow position of the banks. However, under the given scenario, in order to sustain and increase the deposit position of the banks the management of the banks are very cautioned and they effectively tackle the problem by introduction of the policy of retaining the existing depositors and further brings different deposit product in order to lure and compete the market, which make them (banks) able to maintain the adequate level of cash flow in such un-favorable situation.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Profile of the Study Area

This chapter present about the basic features of the study area, location, demographic feature and village economy and agriculture. This chapter deals with the geography and people of the study site. It begins with the general information about Darchula District.

4.2 Socio economic Status of Farmers

4.2.1 Distribution of Respondents by Caste/Ethnicity

Nepal has a constitutional monarchy with a multiparty system. There are different cast / ethnic group such as Dalit, Cheetri, and others etc.

Table 4.1 : Distribution of Respondents by Caste/ Ethnicity

S.N.	Cast / Ethnicity	No. of. Member	Percent
1	Bramin	20	70
2.	Chherti	7	
3	Dalit	2	
4	Others	1	
	Total	30	100

Source: Field Survey, 2016

According to field survey, 70 % Brahmin, Chherti 21.66%, Dalit 8.33%, others 1.66%. The principal climatic factors affecting crop production are the same as those influencing all vegetation- temperature, length of growing season, moisture conditions, sunlight, and wind- but they must be considered in a different light with respect to crops. Natural vegetation is, axiomatically, adapted to the climatic conditions with which it is associated. For economic reasons, we have domesticated crop plants and cultivated them in environments where they could not survive without our help. The above tables proved that maximum member are Bramin and minimum member are lama were selected for my study.

4.2.2 Distribution of Respondents by Family Types

The empowerment of rural women depends upon the family types. In the joint family, the woman has less authority and responsibility due to male dominant society and it is very difficult to enhance skill because less opportunity has provided to her for career development.

Table No: 4.2 : Distribution of Respondents by Family Size

Family Type	Number of HHS	Percent
Joint Family	21	
Nuclear family	9	
Total	30	100

Source: Field Survey, 2016

According to field Survey, among 30 respondents survey 71.66 percent of total sample live in joint family and 28.33 percent live in Nuclear family. The

principal climatic factors affecting crop production are the same as those influencing all vegetation- temperature, length of growing season, moisture conditions, sunlight, and wind- but they must be considered in a different light with respect to crops. Natural vegetation is, axiomatically, adapted to the climatic conditions with which it is associated. For economic reasons, we have domesticated crop plants and cultivated them in environments where they could not survive without our help. The above table has proved that maximum member line in joint family.

4.2.3 Distribution of Respondent by Education Status

Education is the key of development. Darchula is among the top of the education index in the country. This VDC has better education status. Among the total respondent in this area 12 percent are illiterate, 26 percent respondents are literate, they can read and write easily, although, they had never attended school.

Similarly of the total, 30% respondents fall under grade 1-10 of formal education; only 32 percent women completed SLC above.

Table No. 4.3 : Education Status of the Respondent

S.N.	Education	No. of women	Percentage
1	Illiterate	3	
2	Literature	6	
3	1-10	7	
4	Above S.L.C	13	
	Total	30	100

Source: Field Survey, 2016

According to my field Survey, large numbers of the members are still literate (21.66) percentage. This result shows that only 6 women (10%) are illiterate. Only 10% out of total illiterate women.

Therefore, the education status of the farmer is satisfactory.

4.2.4 Distribution of Respondents by Occupation

Agricultural is still the single largest sector of the economy and the main source of live hood for the bulk of the population. Thus it is known as agricultural country. Where near about 80 percent people hold the agriculture occupation. In the study area, the table show the majority of respondents were involved in agriculture occupation and that followed by service which is presented in the table 4.5 as below.

Table No. 4.4 Occupation of Households

Type of Occupation	No. of family	Percent
Agriculture	15	
Service	7	
Business	5	
Labor	2	
Total	30	100

Source: Field Survey, 2016

Table no. 4.4 display that agriculture was the major source of live hood in the study area where 51.66 percent respondent out of total respondents were adopted the agriculture. While 23.33 percent respondents were involved in service. 18.33 percent respondents were business and only 6.66 percent respondents were labor. Agriculture is essentially a combination of processes designed to promote a favorable environment for growth. With few expectations, the goal is improved yield and quality. Early farmers assesses yield in terms of return per unit of planted seed and stock; in modern times the dominant criterion has been production per unit of cultivated area; the trend is toward consideration of yield per unit of water, photosynthetic energy, fertilizer and pesticides, or the energy expended in cultivating, harvesting and processing. Agricultural practices are so diverse as to include drainage and irrigation to control the moisture factor, artificial sheltering to control temperature, and shading or the use of electric lights to control light.

Through proportionally agriculture occupation was seen highest among other occupation in the study area, majority of respondent around 51.66 percent were adopted non – agriculture occupation.

4.2.5 Age Structure

Table 4.5 : Age Structure of the Total Sample Respondents

Age group	No. of Respondents	Percentage
20-30	2	8.33
31-40	13	43.33
41-50	9	30
51 above	5	18.33
Total Respondents	30	100

Source: Field Survey, 2016

According to my field Survey, 8.33% respondents are of 21 to 30 age group, 43.33% respondents are 31 to 40 age group. 30% respondents are 41 to 50 are group and 18.33% respondents are 51 above age group. It proved that maximum respondents are 41- 50 age group.

4.2.6 Landholding Patterns

Land is the most importance source of wealth of a Nation. Without abundant land, it is very difficult for the development of any country. It is argued that landholding is considered as the major indicator for the identification of poor in Nepal. In study area, Researcher found all most all respondents have landholding as compared to average national size. The following table given the average landholding size of the study area.

Table 4.6 : Distribution of Respondents by Size of Landholding

Landholding in Ropani	No. of Respondents	Percentage
Without land	1	
Below 1 Ropani	3	
1-5 Ropani	9	
6-15 Ropani	11	
Above 15 Ropani	10	
Total	30	100

Source: Field Survey, 2016

According to field survey, 3.33% member of total sample member have no land, 11.66% member have only below ropani, 31.66% member have 1-5 ropani, 36.66% members have 6-15 ropani and in last 16.66% member have above 15 ropani. The actual distribution of crop plants is determined by the combined influences of physiological, economic, social, technological and historic forces; but no crop can attain importance in an agricultural system unless it is adapted to prevailing environmental conditions.

4.2.7 Annual Household Income of Respondents

Usually, income in poor households is contributed by several of its members. Gauging a member's socio-economic status using income as a variable, the

annual income from main occupation, her other sources of income and annual income from all other income earners of the household. Per capita household and family income is an important economic variable. To extract economic characteristics, it is important. When the total family income is divided by the total number of family members, per capita family income is obtained. World development report stated that people struggling below. Yearly per capita income US\$ 365 are poor. The exchange US\$ into NRs is unstable, it varies from 64 to 72.5. So, average exchange rate NRs 68.49 has been used to calculate yearly peer capita income in Nepalese currency, which becomes NRs25000. Those farmers whose yearly per capita income is given below table:

Table 4.7 : Annual Household Income of Respondents

Income in Thousand	No. of Respondents	Percentage
Less then 50 thousand	4	
51- 80 Thousand	12	
81- lakh	9	
Above 1 lakh	5	
Total	30	100

Source: Field Survey, 2016

The tables 4.7 show the annual income of the cooperative members. According to the survey, out 30 respondents, there are 13.33 percent household who have less than 50 thousand, at the same time 38.33% households who have 51-80

thousand annual income respectively, the annual income of 30% household have 81-100 thousand annual income. In last only 18.33% respondents household have more than 1 lakhs annual income.

4.2 Adaptation and Coping Strategies to Climate Change In Dattu

One of the main objectives of the study is to seek rural people's adaptation strategies to cope with climatic change and climate change induced disasters. In the case of Nepal, poor and marginalized communities are more vulnerable to climate threats. Poor farmers are unable to afford irrigation systems and are prone to delay in rainfall or extended drought compare to rich farmers who can afford to irrigate their field (Manandhar, et. al 2010; cited in shrestha). Societal and cultural aspects of risk rather than the physical aspects (Morcer, et.al; cited in Shrestha, 2010). Farmers action are not entirely in response to changing climate but also wider social change and adapting to technological innovation at their disposal (Shrestha,2010). Thus, this chapter describes the existing coping and adaptation strategies followed at community level which help to increase the adaptive capacity and resilience in response to risks and hazards related to climate. Some local intervention and initiatives in resilient path are explored as following:

4.2.1. Adaptation to Climate Change in Dattu : Strategies and Options

Farmers are exposed to recurring droughts; they need to adapt their farming systems from year to year to the differing conditions caused by droughts. For most, however, agricultural adjustment is a costly option, as investment is need in re-sowing, crop replacement, intercropping or irrigation. Now I will discuss here the adaptations strategies, which the villagers have applied to cope with the changes they are facing due to climatic variability and options they have to develop for the better adaptation to this variability.

a) Application of Genetically Adaptive Varieties

Farmers here are trying to adapt through applying new variety of rice for the erratic rainfall. Some farmers have tried new variety of rice in last two years in place of the seed they were traditionally using. Khumal-4 was the main rice breed for them for last several years but some farmers tried Taichung (new rice breed) for last two years because of delay in rainfall. Local people of Dattu , Taichung is more adaptive for the late rainfall condition. Khumal-4 was planted June 15 to July 15 in monsoon but the Taichung can planted late July to first week of Aug too. The production of Taichung was satisfactory enough for them whereas the production of **Aljja** was least when there was delay in rain.

b) Full Scale Production System of Hybrid Maize

Traditionally the farmers here plant maize in their upland (bari) as maize doesn't need more water for its improvement. According to them large amount of water in soil is harmful for the maize. So, maize production is not affected more by climate change. However, when they tried maize in their low land field (khet) the result was very negative. In 2006 when the rainfall here was very much least and delayed, farmers broadcasted maize in their *khet* but they could not produce maize as they expected. There is problem in the land of Dattu because land does not dry up soon when it got heavy rainfall. What happened here in words of a woman, According to Sanu Kaji Hada :

In the year 2012, rain did not fall till the last of Asar (June/July). At last, we had sowed maize in our khet. But the rainfall happened in first week of Shrawan (July/August). Because of this heavy rainfall, all plants died because of the wetness in soil, which remained for longer period than needed. It is because of the type of soil here, we could not grow maize in our khet. Rice is the only option for us in rainy season and it

is suitable here but it also could not farm in last two years because of low rainfall.

The impact of climate change was varied according to geographical location. Therefore, the use of maize as alternative to rice in rainy season on their *khet* is not a viable option for them. Untimely rainfalls have become the problem for farming maize in rainy season because the farming fields wet for long time. As a result farmers of Dattu are primarily engaged in the field for paddy crops in rainy seasons July/August due to heavy rainfall.

c) Management of the Livestock Population

Livestock keeping is the secondary occupation of the villagers even though they are not keeping livestock as profession. Every household keep livestock for manure and fulfill cash needs, as it is the only source of cash for rural farmers. However, they are not keeping livestock as the option to adapt with changing condition. They have their own problem in doing so. They argue that without good farming livestock keeping is not possible. Moreover, it becomes impossible to do it professionally when there is scarcity of water for irrigation and household use. Rice straw is becoming more and more expensive and scarce in the area because of declining rice farming, which is the main food for the cattle. Due to the scarcity of grass and hay, the local villagers could not feed their domestic animals. During my fieldwork, the respondent told me that livestock husbandry is very difficult now a day. The informant told me:

Livestock husbandry is very difficult now a days due to the less production of hay in the field. Wheat farming was totally replaced. We should also buy maize for feeding to cattle then how can we keep livestock. We should also buy Feed for animal and a bundle cost was five Rs before some years ago but now, its cost is 15 to 20 Rs per bundle by which we keep

livestock only for economies of our cost in daily livelihood but not as a family occupation.

I also observed that the villagers could not get hay and grass even they want to buy fodders for their livestock. Other food supply like maize and wheat is also decreasing which they used to feed their cattle. Therefore, they could not keep more livestock by which its effects occur for supplying manure to their field. They are not in a condition to apply it as profession. While there were easily, access to fodders and green grasses from forest resources and the production of hay was high. Farmers of Dattu used to pet livestock for example, cows, buffalos, goats, hens for the intention of selling and home use however, the changing climate and weather fluctuation local area causes lack of fodder and grasses from forest and decreasing production of hay from produced paddy. so that now a days local farmers started keeping more or less three or four livestock at home which the intention of their daily subsistence livelihood.

d) Change in Crop-cycle and Pattern

Farmers from Dattu have been practicing crop cycle system to make their life standard easier and normal which is different than traditional farming practices. Among the farmers from Ghampati, Indra Bahadur Dahal (52) expressed his experiences in his way to my question why are you using crop cycle system.

Most of the elderly people and our father, grand-father used to say that just as we can easily lift the newborn buffalo's calf everyday till 5/6 months so as use of urea in the field everyday and increasing amount of it spontaneously decreases the fertilizing power of the land and it gives very low production of the crops which is gradually affects to the traditional farming system. I memorize that last year paddy production had been

highly decreased and produced paddy provided only half of the rice so that we have started to use crop cycle system by which a disease which is occurred in a single plants does not transmit to the other plants. Particularly after starting crop cycle system it reduces the use of urea in the land and pure organic farming can be done. I have also done organic farming in which constantly radish, carrot, apple which is produced under the land are farmed. But we have a problem of soil, if there is fertilizing soil crop cycle system is very beneficial for us.

The **Piplabot** farmers are able to predict quite well, when the rain will come and plan their planting season to coincide with the rains. This has, however, become difficult in recent years due to changing rainfall pattern. To this, the farmers are adapting by changing types of crop, they used to grow. A key informant informed me about a case in point is shifting from wheat cultivation to drought resistant crop such as Peas.

4.4.2 Diversification of the Economic Strategies

Diversification of available opportunities for livelihood income source has important role to cope with changing climate. Once the impact of climate change narrows down the scope of traditional livelihood people seeks alternatives. They give first priority to make the existing livelihood source more resilient. The second priority is to seek alternatives livelihood like income generation from the available resource and opportunities (Gurung and Bhandari 2009; cited in Parajuli, 2012). From the field study, the impact of climate change was severe on livelihoods of communities in the study area. Many

diversification strategies that communities practice earn minimal incomes, rarely strengthen the livelihood.

The local people of study area is attracting towards cash crops from subsistence farming. They have commercialized local product such as cauliflower, cabbage, potatoes, peas, local chickens etc. Now village people trying to farm tomato in winter season, which need less water than wheat and potato product. People are commercialized in recent time due to the climate change which process has diversified rural income source and people have become more resilient. Instead of paddy and wheat farming people are attracting towards above mentioned cash crops after the changing condition of environment in past 5-10 years. Now local persons of Dattu established a seed bank to collect and sale good category seed like paddy wheat maize and other vegetable seeds too. Some people take lease other people's land and starting tomato farming in winter season. Beginning 2006, they organized in 15 users group and demand hybrid vegetable seed from District Agriculture Office (DAO). Now the DAO providing hybrid vegetable seeds to them.

4.2.3 Arrangement of Rain Making Rituals

The local inhabitants celebrate different rituals in order to cope with the changing climate. These rituals are especially performed with the parsing of lord Shiva, Indra, Bhairaba, and other goddesses. These gods and goddesses were considered as the symbols in order to make rainfall. In addition to make rainfalls, they also perform such rituals so as to make their tradition continue. This fact is also proven by the environment of youths in such rituals. In order to protect their traditional norms, values, and traditions, they celebrate some rituals regularly and some occasionally. Badri Prasad Khanal (38), who also participated in such rituals exclaims;

We believe in the religions and spiritual power of god. Because our fathers and forefathers have done so and in order to make continuation at such traditions, the youths are also taught by the older ones about the process of making god happy so that no crisis falls upon us. For that we usually praise the defending goddesses, with enchantress some hymns. By making praise of such gods and goddesses, we are indirectly benefitted which also increased our trust upon god.

About statement explicitly clarify that even young generation talk about modern age, they are ready to cope with changing climatic circumstances by assimilating divine power, traditional rituals and they also celebrate rain making rituals.

a) In praise of Defense Goddess

There are religious organizations, which function to accomplish the expected task during the ritual ceremonies. In such rituals the priest of such organization, one who is guiding character, stays for a whole day fasting before the day of ritual. Not only that, he is hells to blade his head and beard. In the day of performs ritual, all the villagers gathering the house of priest. The main feature of this ritual is that a goat is sacrificed. These people are guided by the saying that their god is factors because his thrust is not quenched so he decides to make drought. In order to make him happy, he is to be pleased by giving sacrifice of blood.

The villagers pay the cost amount of sacrificed goat. In addition, other materials used in that ritual by dividing the total cost, For all the involved members. Then after the leader of that ritual (Bramhin priest) rules ahead towards the place

where they make sacrifice and other members strictly follow him with the proposed goat for sacrifice behind him. However, Bhramayani and defense goddesses rituals are performed in different days but the process, method and involvement are the same. **Bhramayani** ritual is performed in a lawn nearby the village where as defense Goddesses ritual is performed in **Phurke** pone forest. When the priest and other devote reach in the pone forest, the priest charts some hymns with strong determination to please the goddess by making sacrifice of goat. When the goat is sacrificed in front of the sculpture of goddess (made of stone), the blood is pared in it thinking that goddess will drink it when they make sacrifice and has been pleased.

The significance of such scarifies is that people of the village, believe that the defense goddesses please with blood; she will definitely make the prosperous, happy and cheerful by making rain. After enchainment are over the devotes of scarified goat and take it as a “Prasad.”After all the scarified rituals ends and the devotes, once again praise for rain as they say, “Saune Bhramayani gives us water as rain” “defense goddess makes rain”.

These rituals have become the coping strategy for the villagers of Dattu . They celebrate these rituals on the month of Chaitra, Baishak and Jestha at once in three months if rain does not fall as per their expectation and traditional time.

4.2.4 Social Network

Social networks in the study area play crucial role to climate change adaptation. According to Ensor and Berger, social networks are the glue between many of the elements of adaptation. They drew attention to the relationship between actors and can be visualized as a web either of connection that link diverse individuals and institutions directly or via other actor.

Adaptation is associated with planned action. People of Dattu, they have also updated use of high yielding varieties, multiple cropping and change of local seeds to improved seeds of vegetables. Similarly there is trend of replacing local varieties of crops with hybrid, which in long run can threaten to be the agrobiodiversity. Now the people of Dattu have formed many groups such as mother's group, community forest user group (CFUG), vegetable farmer's group for community level. Now they are organized 15 farmers groups in two VDCs (such as Khanaltho and Daraunepokhai). The District Agriculture Office sends to them hybrid vegetable seeds, and now in village, there is hybrid seed centre established by local farmers. In this center, not only sale hybrid seeds but also buys the local good seeds production such as paddy wheat maize etc. In 2011, maize crop was damaged by leaf-burn disease. People informed that hybrid maize was high drought tolerance; as a result, leaves of hybrid maize were not burned in 2012. Farmers said that disease and pests did not affect it. Farmers have actively involved in agricultural group and these groups are creating platform to unite local productions.

4.4.5 Use of Alternate Sources of Water

Adaptation to climate variability and change is not only a matter of individual and household decisions. It also requires institutional and policy measures that support agricultural production, food security, water resource management, and infrastructural development. So for developing better adaptation options for the studied area and any other parts of the country, the interdisciplinary research about the area is necessary. The first option they have identified is making deep tube well in their field side for irrigation. They have not yet made any tube well in their field as it is not affordable for individual farmers. They have made two tube wells in their field for the purpose of drinking water, and it is satisfactory for them. The use of ground water is viable and necessary option for adaptation

with changing condition. They delay it as it is the new condition they are in. further delay in this may cause further problem.

The effects of global climate change can be seen in the local level and local people because the impacts of climate change has been occurred in different things for example paddy, maize and wheat so that on behalf of government have applied many policy i.e. tube-well as an alternative source of drinking water, donation for seeds and chemical fertilizer to mitigate the effects of climate change.

Another major problem in Dattu, Most of the land are used for Chimneys Eta-vhatts where cultivated land are degrading for agricultural. Which shows the negative impacts on both environment and agricultural pattern. These trend of increasing the number of chimneys and eta-vhatts produces more Carbon which is one of the major cause of global warming. Whereas now local people are facing the problems on agricultural systems such as : damage on irrigation system, low fertile land, degradation of various water resources etc.

Chapter Five

Summary , Conclusions and Recommendations

5.1 Summary

Climate change is defined as a variation in climatic parameters and is attributed directly or indirectly to human activities. Most of the researches have been carried out about the biophysical aspects by neglecting the local people or their perception, but how the physical manifestation of change are perceived, experienced, interpreted, and negotiated at community level. This study has conducted in Dattu village of Darchula to address the research objective and research problem of the subject matter, which is conducted through Anthropological perspective. It explores the climate change and its consequences in the ongoing period and local people and culture were primary concern of the study. The main study of this study was to explore and document the local perception on climate change in the study area by focusing on agriculture and analyzed the local adaptive or coping mechanism developed by local people with changing weather/climatic fluctuation over the last a few decade or more.

Therefore, this study clearly indicates that the climate is changing in the study area and local communities are already experiencing unusual rainfall and increasing temperature pattern in 10-15 years. Which are indicated by frequent occurrence of long drought, increased temperature, intensity and duration of rainfall uncertain, drying up streams/ponds, and disappearing some local crops (eg. millet). Due to climate change, seasonal calendar also been changed. This has caused significant impact on livelihood assets, particularly on traditional agricultural practices, production and likely that in to come in future. The impact of climate change on water resources has directly experienced by local people in their agriculture and livestock management. In the study site, the

majority of farmers primarily depend on monsoon rainfall for cultivation of major crops like maize, wheat and paddy.

Farmers would use multiple indicators to examine the climate change in their surroundings. Local rural people interact and understand the local climatic phenomena according to the significance of landscape. They are aware about climatic fluctuation while doing subsistence practices in their living world. People have varied perception on local level based on their observation. They observed climate event from the courtyard in one hand and another hand they used to do their agricultural activity based on time boundary. People perceive the local change in their life ways either in the local resources or in agricultural production too. Local practices has changed cultivate as well as harvesting period. After shifting time of agricultural practices local people felt that, their perceptions of climatic forecasting have been declining gradually.

Dattu is one of the area encountering climatic uncertainties around village. People are most aware about the absurdity of climate in their local level. In this study, in order to examine the impact of climate change on agricultural sector and investigation the current coping and adaptive strategies employed by local people, this will ultimately increase their adaptive capacity and resilience in changing scenario. Local calendar of people was more systematic in the past and all over, they followed their culture. Based on their knowledge they understood the local climate from their cultural interpretation. They categorize the year based on climatic events. Due to climate change, seasonal calendar also been changed because the timing is uncertain with changing calendar.

Based on research finding in order to examine the local perception on climate change and coping/adaptive strategies, which is applied by local people, which they have been monitoring and practices in a lifetime in their local ecological setting. The rainfall, storms, temperature and other climatic indicators are changing in amount and intensity over a year. Local people are expecting the climatic events untimely in their lifetime. Climatic indicators and the local culture of their community are shifting together in rural area. People perceive

knowledge and experience in local system by their own culture. The day-to-day observation and interaction of people reflects the characteristics of climate calamities with agricultural activities. They act and prepare the forthcoming event according to the seasonality. People have adopted spontaneous (without effort) ways to respond with ongoing climate change. They are diversified in terms of income sources. some people are trying to adapt to the changing condition by applying some new tools and like they they have tried to new variety of rice, full scale production system of hybrid maize, management of livestock population, crop cycle system and being social networks, establishing the brick factory and use of alternative source of drinking water. Which are central ways of adopting and coping with climatic uncertainties adapted by the local communities especially Dattu people in the context of my study.

5.2 Conclusions

The adaptation of crops and livestock to certain climatic optima is of great significance in connection with the introduction of a particular variety or breed into a new era. To the extent that climate influence the productiveness of crops or livestock, transfer of plants or animals to another region with a similar climate is likely to be successful. There is huge list of crop which originated in Europe, and which has been successfully carried into other mid-latitude climates by European emigrants. Nowhere is there a more striking example of wholesale transfer of plants and animals into a similar climate than the establishment of British agriculture in New Zealand. Breeding and selection play an important part in plant and animal introduction, as do economic and cultural factors. But the suitability of a climate for a particular crop or animal is a primary consideration which is not altered by the fact that many crops and animals have a wide range of adaptability to climate.

Finally, to sum up the study I have drawn my conclusion based on the empirical data found in the field. The study shows that the causes of climate

change and weather fluctuation in the Dattu is prolonged issues and its effects have been seen on the life of local people and local pattern of farming system including the changing crops patterns, changing in their weather forecasting system, fluctuation of temperature and drying up of the river and stream as well. In my fieldwork, I have found some specific adaptation tool applied by the farmers to better fight with the challenges posed by climate change. I have seen smallholder and subsistence farmers are suffering from the impacts of climate change that is locally specific and hard to predict. They perceived climate change as disturbances of their close relationship with nature and it disturbed the daily/seasonal activities, and ethno biodiversity.

Due to climate change, local traditional farming practices have been changed. Local farmers have started farming of Taichin paddy instead of their traditional Khumal-4 paddy and leaving their wheat farming those crops eg. Vegetable and organic farming. Climate change has shifted local perception and weather-crops interaction as well as it has also changed their seasonal calendar of farming. It can be said that the local farmers' perception and meteorological record shows the similarity in changing climate scenario and weather fluctuation. Even the effect of global climate change can be measured in the local level but also local farmers constantly follow their traditional norms/values and believe on super natural rituals which have become coping mechanism to them. Most of the land are used for Chimneys Eta-vhattas where cultivated land are degrading for agricultural. Which shows the negative impacts on both environment and agricultural pattern. These trend of increasing the number of chimneys and eta-vhattas produces more Carbon which is one of the major cause of global warming. Whereas now local people are facing the problems on agricultural systems such as : damage on irrigation system, low fertile land, degradation of various water resources etc.

The local people of the Dattu are practicing various means to cope with the impacts created by climate change but these are not enough to accommodate all those consequences. If scientific predictions are to be believed, environmental changes are going to be extreme, more frequent and more widespread than previously experiences in human history. The discourses of climate change with its scientific, economic, political and moral dimensions is a relatively recent arrival in the global arena and it is changing the way local event are framed and understood. So public policy should address socio-cultural resilience and vulnerability. Implementation of public policy is necessary to climate change adaptation.

5.3 Recommendations

After the analysis of data and studying the findings, it is recommended that:

- i. Those who are willing to production high, has skill trainings before doing occupation.
- ii. Information should be provided to them about the climate.
- iii. There should be further research about the impact of climate change. The study results suggest that the proper use of water and air helps in rural development by creating new opportunities.
- iv. Suitable environment as well as policies should be created to motivated the young generation.
- v. They should made act and prepare the forthcoming event according to the seasonality.

2.	2000-5000	
3.	5000-8000	
4.	8000-11000	
5.	11000-14000	
6.	14000-17000	

9) What are the most risks and hazards in your area?

.....

10) What are you experiences on change in temperature and rainfall in your area?

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11) What is the duration and events of rainfall?

.....

12) Do you think, temperature decreased or increased now than before some years ago?

.....

13) How do you know about rainfall pattern in different seasons?

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14) What is the situation of water resources of last few decades?

.....

15) What are the indicators to know about climatic events?

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16) What are the climatic indicators?

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17) What are the non-climatic indicators?

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18) Are there animals and birds now a days as early or before some years ago?

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19) Have you noticed any appear or disappear of new species (plants, crops, birds and insects)?

.....

20) What kinds of animal behavior do you watch to identify the season?

.....

21. In your opinion what kind of impacts of climate changes occurring on agricultural land management over the last few years?

.....
.....

25)

ANNEX II
KEY INFORMATION INTERVIEW

- 1) What is the importance of climate change in this VDC?
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- 2) Have you changed types of crops in your surrounding during the last 10-15 years?
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- 3) What would be the possible causes for changing rainfall and drought pattern? And what is it's impacts on land (khet)?
- 4)
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- 5) What is the timing of plantation and harvest of major crops (paddy, maize, wheat)?
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- 6) How people exercising agricultural activities?
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- 7) In your community what are the things mostly affected by climate change?
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- 8) How new climatic condition affect to the livelihood?
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.....
- 9) What kinds of activities do you follow to be prevented from the impact of climate change?
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.....
- 10) More effective?
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