Livelihood Adaptability and It's Sustainability in the Mountain Ecosystem: Lachung Valley, Sikkim Himalaya

A Thesis Submitted

To

Sikkim University

In Partial Fulfilment of the Requirement for the

Degree of Doctor of Philosophy

By

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I, Bipul Chhetri do hereby declare that the subject matter of the thesis entitled **"Livelihood Adaptability and It's Sustainability in the Mountain Ecosystem: Lachung Valley, Sikkim Himalaya"** is the record of work done by me, that the contents of this did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and this thesis has not been submitted by me to any other University or Institute.

This is being submitted in the partial fulfilment of the requirement of the degree of **Doctor of Philosophy** to the Department of Geography, School of Human Sciences, Sikkim University

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CONTENTS

List of Tables

Page

List of Figures

List of Maps

List of Plates

Acronyms

DEM : Digital Elevation modelling

SL : Sustainable Livelihood

HHs : Households

GPS : Global Positioning System

SHGs : Self Help Group

FAO : Food and Agriculture Organization

IPCC : Intergovernmental Panel on Climate Change

DFID : The Department for International Development

UNDP: The United Nations Development Programme

IRDP : Integrated Rural Development Programme

NTFPs: Non-timber Forest Products

FGD : Focus Group Discussion

ICAR : Indian Council for Agricultural Research

Chapter I

Introduction

I.1 Background

People living on hillsides and mountain slopes are literally dwelling 'at the margin' of society, of the national economy and of the wider biophysical environment (Stocking, 2005). The characteristics of society and economy in the mountains are largely governed by the natural environment. The livelihoods of the people to large extent are shaped by the nature of existing environment. Multiple factors determine people's livelihood. These factors can be categorized as Natural and Human induced. Natural factors include the existing climatic conditions like temperature, rainfall, snowfall etc. On the other hand, human induced factor arises out of people's choice in making decision and make a living out of it. The former seems to play a dominant role in the isolated mountains where the decisions in making the living are determined by the external environment.

The choices ranging from crops to be grown, the period of harvesting and the animals to be reared and clothes to be worn are entirely dependent on the natural factors. Based on the available options, the people inhabiting different landscape make choice of living. The idea of adaptability is therefore ability in making a decision out of the range of choices available for living. People in the mountainous landscape can be well understood in terms of their ability to adapt to the changing environment. The process of making a living out of prevailing environmental limitations need careful understanding of the natural system and the way people fit themselves in the system.

Besides, the other characteristics of societies in the hillsides are their inaccessibility. Inaccessibility sets limitations to livelihood in terms of creating a distance between the zone of habitation and the zone of availability of goods and services. Because communities are poor, their strategies for coping have to be more complex and diverse in order to withstand a dynamic and unpredictable environment (Chamber, 1997). The population inhabiting such biophysical conditions needs to be well prepared with different strategies to cope up with different forms of external threats. The calamities may range from floods, landslides, earthquakes and even from famines. Community must have the knowledge of adapting themselves from the harshness of the unfavorable climatic conditions. The adaptations in terms of meeting their livelihood, adaptations with regard to changing climatic conditions and adaptations to manage the resources for its sustainability. The other issue of concern by which the mountain society gets affected is the problem of land degradation whereby the population gets affected to large extent. Rates of degradation and environmental change are maximum in the steep terrain of the hillside (Messerli and Ives, 1997). Sikkim Himalaya has also been witnessing rapid changes in the nature of biophysical condition. Besides these, the processes of adaptations of the mountain communities have undergone large scale changes in terms of nature of livelihood practices. Over the years the process of globalization has also posed a grave threat to the agrodiversity of the Sikkim Himalaya (Sharma G, 2016)

In addition to different forms of problems, the societies in the hills have their distinctive culture which forms their identity. The lifestyle, culture, norms and values of these societies have their close link with the mode of life they live which are usually isolated from urban life. The people in isolation have their own way of dealing with their physical

environment and their lifestyle that gets embedded in their culture. The role of community seems to be very vital in preserving the biodiversity and the livelihood of the society despite of fragile environment. Socially, Hillside provide home for societies that have been able to preserve spiritual and cultural values which have been lost elsewhere. This value act to protect the environment (Bernbaum, 1999). Mountain environment presents overwhelmingly structured restriction and opportunities to the human adaptation and these are largely determined by the vertical zonation of micro environment (Thomas, 1989).

The study aims at setting the case of Lachungpas of North Sikkim. Lachungpas are the community that have been living in the North eastern part of North Sikkim with their traditional practice of Yak herding, animal rearing and maintaining their hereditary pastureland. The study analyzes their livelihood system and how it has changed over the years due to socio political changes. The work emphasizes the nature of livelihood changes brought about by the tourism. It analyzes the socio economic conditions of the people with the framework of Sustainable livelihood approach taking livelihood capitals into account.

Thus the study tries to locate livelihood of the communities in isolated mountain landscape and its changes over the period of time. The work investigates the role of institution, society and economy keeping environment to understand the nature if livelihood adaptability at the centre of the study.

I.1.a Adaptability

Adaptation refers to adjustment in ecological, social or economic system in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change (Smit, 2007). It refers to the response to the changing environment that is perceived risk or the opportunity. Climate plays a role in migration of some crops to higher altitude, shifts in sowing and harvesting times of local crops and pests in crops and fodder species, and losses in crop productivity (Sharma G, 2016). Therefore, the human adaptations to such rapid change need greater understanding of climatic variability and decisions to adapt needs to be well monitored taking agricultural community into account.

The IPCC defines adaptation as 'adjustments in the natural or human system in response to actual or expected climatic stimuli or their effects or human systems which moderates harm or exploits beneficial opportunities' (IPCC, 2008). The response to the external processes has formed the way of living for the population to live and grow. Uncertainty in the ways through which climate change will be felt set against its speed and scale of impact of impact, combined with the invisibility of causal linkages in everyday life, bring new challenges for sustainability of socio-ecological system (Pelling, 2011). Adaptation is a process that is not static but a dynamic and runs parallel to the changing external environment.

Adaptation requires a closer look at social relations and practices, even values, as sites for adaptation, and suggests that it is necessary, but not sufficient, to control the impacts of

climate change through technological innovations like environmental engineering and crop selection. There cannot be a clear cut ways of adaptation and it can neither be observed directly through which the population can avoid risk or make use of opportunities.

Adaptive capacity of the society determines its ability to cope with the changing state of environment. Adaptation varies according to the system in which they occur, who undertakes them, the climatic stimuli that prompts them, and their timing, function, forms and effects. In unmanaged natural system, adaptation is autonomous and reactive. It is the process by which species and ecosystem respond to changed condition. The capacity to adapt varies considerably among regions, countries and socioeconomic groups and will vary over time. The most vulnerable regions and communities are those that are highly exposed to hazardous climate change effect and have limited adaptive capacity (Smit, 2007).

Adaptability is therefore the ability of the communities to fit them in the changing nature of system. The ability of the community to fit themselves in any system is in turn governed by the external processes as well as the processes that operate within the system. Livelihood adaptability for instance is the process that are governed by the external processes in the form of institutions and governance as well as the internal processes that operates within the system i.e., the household decision in making the choice of living.

Adaptability is therefore important component of research that has been taken for the study. It basically tries to draw the ability of the community to adapt them in the

changing natural, social, economic and political conditions. The word adaptability in the work has therefore been justified by focusing on the way the people of the valley have changed their means of sustenance over the period of time. Apart from climatic element being the forces of livelihood adaptability, the work takes into account of social dimension as an agent of livelihood change.

I.1.b Livelihood Sustainability

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. Conway and Chamber, 1992 explains livelihood as the means of gaining a living, including livelihood capabilities, tangible assets, such as stores and resources, and intangible assets such as claims and access. Livelihood is multi-dimensional, covering not only economic but also political, cultural, social and ecological aspects.

Sustainable livelihood (SL) is environmentally sustainable when it maintains or enhances the local and global asset in which livelihoods depend, and has net beneficial effect on other livelihoods. A livelihood is socially sustainable when it can cope with and recover from stress and shocks and provide for future generation (Chamber and Conway, 1992)

The SL approach aims to identify and develop assets, strategies and strength of poor groups across all sectors in order to meet the livelihood goals of the community users (Ferrington, 2001). The framework views people as operating in context of vulnerability. Within this context they have access to certain assets or poverty reducing factors. These gain their meaning and value through the prevailing social, institutional, and organizational environment. This environment also influences livelihood strategies and

using assets that are open to people in pursuit of beneficial livelihood outcomes that meet their own livelihood objectives (DFID, 2001). The aim of sustainable livelihood approach is to enhance capability in facing change and unpredictability, improve equity and increase social sustainability by reducing external stress and shocks by providing safety net (Solesbury, 2003). The key concepts of Sustainable livelihood approach are:

a) Holistic development describing all geographical and social groups, external influences, livelihood strategies, outcomes and players;

b) Dynamic, flexible development to allow for continual feedback, learning and adaptation of the model

c) Development building on strengths rather than needs;

d) Investigation on micro-macro links, emphasizing the importance of the interaction between macro level policy and institution and the option of communities and livelihoods

e) Sustainability in environmental, institutional, social and economic system; and

f) People-centered development rather than resource or government centered

The Sustainable Livelihood (SL) approach uses a strong community focus and builds on the strength of the community to ensure the goals within the capacity of each household and community. The use of household skills, assets and priorities to ensure this realization provides a richer basis for the success and sustainability of interventions appropriate to each household, culture and ethnic group (Hann, 2001).

There are many policy issues of direct importance to sustainable livelihood that do not involve participatory development at all, such as land tenure reform, fiscal and taxation

policy and issues of good governance among others. However the sustainable livelihoods approach has often been linked to a participatory style of development in variety of different ways (for example, through decentralization of decision making, devolution of fiscal responsibilities and local institution building (Sosan J, 1996)

The management and conservation of the resources base and the orientation of technological and institutional changes in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development is environmentally non-degrading, technically appropriate, economically viable and socially acceptable (FAO, 1991). Conway in 1987 classifies the objectives of sustainable agriculture into four main types:

1) Agro economic systems (productivity) in terms of yield/ income
2) Stability (measures of co efficient of variation in the field or net income
3) Sustainability (for long run)
4) Equitability (in terms of income distribution)

The whole idea of sustainability therefore centers on the need to develop technologies and practices of production system and can be visualized a system that:

- do not have adverse impact on environment,
- are accessible and effective for the farmers,
- lead to improvement in food productive services.

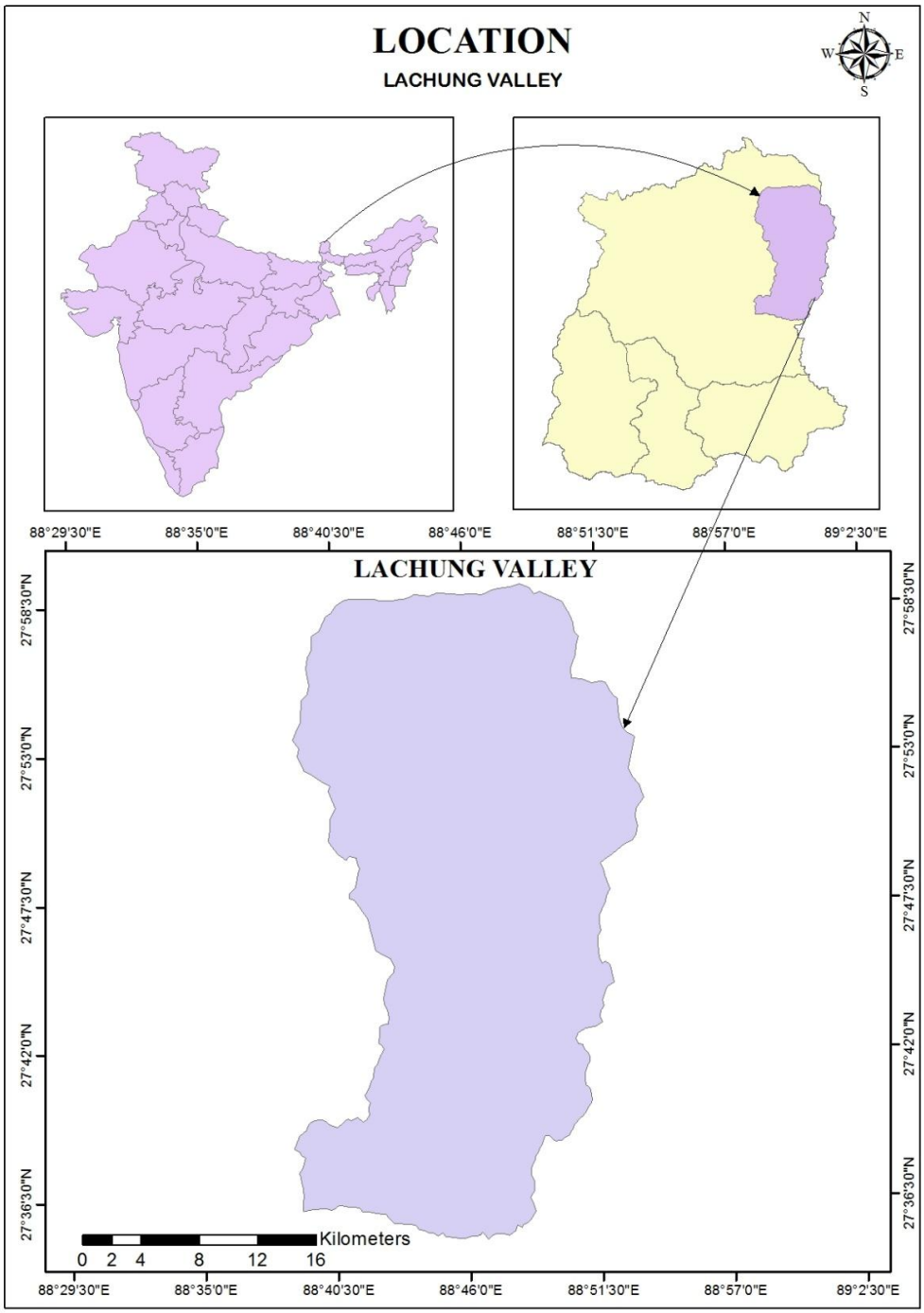
The idea of agricultural sustainability does not mean ruling out technologies or practices on ideological grounds. If technology works to improve the productivity for farmers and does not cause harm to the environment then it is likely to have sustainable benefits.

Farmers in Sikkim Himalaya have observed temperature rise and untimely rainfall, as well as the impacts on their agriculture (Sharma G, 2016). Livelihood sustainability is therefore the process of positive interaction of human with that of physical environment that shapes social, economic and cultural way of life. The changes brought about by the human actions determine the sustainability of the system.

Livelihood sustainability is therefore the ability to understand the nature and the way humans fit themselves in particular setting. Hence understanding the sustainability of livelihood requires knowing the nature of social changes brought about by the human action and the way the resource gets channelized in the natural environment.

Hence to understand the issues of sustainability of livelihood, one needs to first understand the social system and its processes operating at different levels. Adaptability of a system is indeed intertwined with the social processes that bring about major changes in households decision making processes. The forces of nature that tries to control the human, sets enough of limitations and out of these limitations livelihood is derived. Mountain livelihood is not an exception when it comes to the process of interaction. However the degree of vulnerability and the level of limitation are relatively more owing to its geographical locations and climatic variability. It therefore needs different level of enquiry and understanding for which the approach needs to be relatively different.

I.1. Location Map of the Study Area:



Sikkim is a small mountain state in the Eastern Himalaya with rich biodiversity. It is the landlocked hilly state surrounded by neighboring nations like Bhutan and Chumbi valley in the East, Nepal in the West, and Darjeeling District of West Bengal in the south. The state has been divided into four districts the largest being the North Sikkim. Though largest in terms of area, the North district has the least population density in comparison to the other districts. The factors like inaccessibility, difficult terrain, fragile mountain system and poor connectivity with road networks, the region is isolated with less density of population concentration.

North Sikkim occupies the area about 4266 square kilometers i.e., about one third of the total area of the state. It has the total population of about 43709 (as per 2011 Census) i.e., about 8%of the state's population. The majority of the population in the region belongs to the Bhutia community. North Districts has two sub divisions namely Chungthang and Mangan.

Lachung valley lies in the northwest direction at about 50km away from the Chungthang at an elevation of about 8160 ft. The original inhabitants of the Lachung are known as Lachungpas whose population is about 2495. The region has a very steep slope and has a dense forest cover with high peaks covered with snow. The region has a strategic location with respect to Indo China border; there are restriction on the movement and settlement for the security purpose.

Considering the three major components of agro system i.e., landscape, bio climatic and growing period, the region falls under sub alpine zones. Their primary means of livelihood comprises of population in Lachung valley is primarily dependent on

pastoralism (Chakraborty, 2011). Border trade had contributed to very large extent in supporting the livelihood of the Lachungpas prior to 1962, but after restriction imposed on border trade, the livelihood of the Lachungpas have changed to great extent both in terms of exchange of goods and services as well as in terms of land available for pastoralism.

I.2. Overview of Literature

The need of understanding human environment relationship and environmental transformation that takes place in mountains was the major focus of study among the research that took place in mountain. When the deteriorating living condition of the mountain people become the object of research, both natural and human factor involved must be taken into account. Combining knowledge of environmental condition with the survival strategies of individual and local communities that aim at better, sustainable future presents a challenge to everyone involved in the research, policymaking and developmental practices (Hermaan, 2006)

The major challenges that the mountain society is facing is the problems associated with changing environment which often is termed as climate change. The changing climatic phenomenon has direct linkages with the livelihood of the society. Rural livelihoods are subjected to multiple shocks and stresses that can increase household vulnerability. Climate variability is one of the pervasive stresses that individual and communities in rural areas have to cope with (Ziervogel, 2003).

The changing climate acts as a stress with which the society needs to comprehend and the necessary steps must be taken with the changing climate to meet the need. The need of

adapting to the changing climatic phenomena must run parallel. The growing evidences of global environmental change and increase climate variability demands that the adaptation options, adaptive capacity and ways to reduce the risk should be prioritized (Smit, 2007).

The IPCC defines climate change adaptation as adjustment in natural or human system in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2008). Hence in wider sense the adaptation to any system is the adjustment to the existing environment. For example the livelihood practices among the mountain herders are just the adjustment of the community on the basis of existing environmental condition.

Adaptation includes both adaptive capacity and adaptive action as sub categories. Capacity drives scope for action, which in turn can foster or hinder future capacity to act. This is keenly seen when adaptation requires selling of productive assets (tools, cattle, property) thus limiting the capacity for adaptive action and recovery (Pelling, 2011). For some adaptation went beyond human responses to environmental change or natural hazard to incorporate all the processes of environmental transformation and interaction with the natural world for wealth creation. Thus adaptation does not necessarily mean adapting to natural environment but the process of changes in social, economic and cultural way of life.

Smit et al., 2000 argue that adaptation depends greatly on adaptive capacity or adaptability of an affected system, region or community to cope with the impacts and risks of climate change. The adaptive capacity of communities is determined by their

socio economic characteristics. Enhancement of adaptive capacity represents a practical means of coping with changes and uncertainties in climate including variability and extremes.

Adaptation is purposeful when directed towards a recognized hazard or opportunity and incidental when response to some other pressure that has consequences for exposure susceptibility or adaptive capacity. The adaptation thus is mainly linked with the external forces that influences or has the potential to influence the normal existing processes. The adaptive strategies can be led by the community as a whole on the basis of community's participation or can be based upon the self-organization of the society. Social learning is a property of social collectives. It describes the capacity and process through which new values, ideas and practices are disseminated, popularized and become dominant in society or a sub-set such as an organization or local community.

Adaptability of livelihood in Sikkim Himalaya needs greater attention towards making best use of agricultural resources among the farming communities. Agriculture being the main source of livelihood for more than 75 percent of the population of Sikkim and contributes around 17 percent of the Gross State Domestic product (Kumar, 2012). Hence greater attention must be made towards adapting to agrodiversity by the farming communities in Sikkim Himalaya and Resource management to be made for the specific objectives.

I.2.a Sustainability and Livelihood

The interest in sustainability of agriculture and food system can be traced to environmental concern that began to appear in 1960's. The key issues that have

contributed to the loss of agro biodiversity in Sikkim Himalaya include current investment priorities of the government, lower per capita landholdings (i.e., less than 0.1 ha per person) as per 2011 Census, poor marketing mechanism, inadequate financial resources, lack of appropriate farmer centric strategies for the conservation of genetic resources and associated traditional knowledge, and lack of a common mechanism and supportive policies for agro diversity conservation (Sharma G et al ., 2016).

The idea of sustainability today incorporates some fundamental issues like environmental management, farm productivity, equitability and distributive approach into concern. Sustainability in livelihood includes all the ways and means in which the society can meet their daily needs, and generate income for their sustenance keeping concern for the natural environment for long term development.

Sustainability in agricultural system include biodynamic, community based, eco agriculture, ecological, environmentally sensitive, extensive, farm fresh, free range, low input, organic, sustainable and wise use (Preety, 2002). The idea of sustainability differs across different economy based on geographical location. For instance the agricultural system that may be best sustainable for hill farmer may not be too sustaining for the farmers of the plains where the land size is comparatively larger.

If a technology works to improve productivity for the farmers and does not cause undue harm to the environment, then it is likely to have some sustainable benefits. And for the hill farmers' traditional knowledge seems to be more sustainable when it comes to the method and techniques of production for their own geographical and biophysical

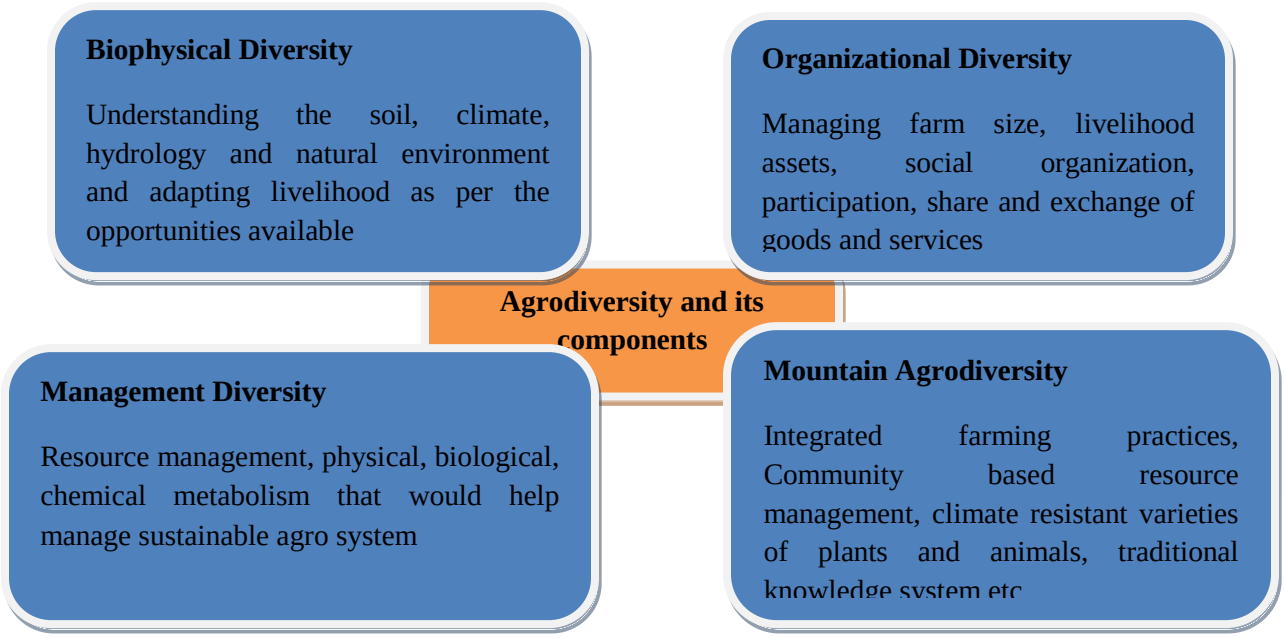
conditions. It is therefore very important for the researchers to have clear understanding of community's traditional knowledge system when it comes to livelihood research.

FAO, 1991 defines sustainable agriculture in much larger aspects and defines sustainable agriculture as "the management and conservation of the resource base and orientation of technological and institutional changes in such a manner as to ensure e attainment and continued satisfaction of human needs for the present and future generation. Such sustainable development is environmentally non-degrading, economically viable and socially acceptable".

Thus the definition of sustainable agriculture includes productivity, income generated, sustainability, equitability and environment friendly means of agricultural system. Hence a common techniques or uniform approach of resource management may not be very positive for the mountain livelihoods. It therefore needs approaches that are more holistic in nature and would be able to identify different elements of sustainability in it.

In hilly region of the world, the problem of soil erosion has been the major issue of concern. Soil erosion in mountainous region is caused by both environmental as the by the process of adjustment with socio economic factor. The socio economic factors include the land use system, the over population in the hills and the developmental activities in the region while the environmental causes may include rainfall variability, cloud burst and other climatic variability. However, the impacts though generated by different factors, can be minimized and monitored following sustainable livelihood practices.

Agrodiversity in Sikkim Himalaya with different components need to take into account the following diversity into account:



Adapted from Stocking, 2002

The risk involved in livelihood and the nature of unforeseen impacts can be minimized following livelihood practices that suits particular geographical region. The role of community participation, institutions as a unit of governance, access to resource use by the user groups etc come into play when studies on livelihood are taken into account. Livelihood is therefore more people centric that emphasize the process of interaction between the human in relation to their environment. The major phase of development of livelihood and the concept of sustainability can be traced from the following flow diagram:

Table 1.1 Chronological orders of Livelihood Studies

Time	Organization	Objectives
1970's	Integrated Rural Development Programme (IRDP)	Approach focused on developing the farmers strength and to provide equitable distribution of income.
1980's	Food Security Initiatives	Developing farming system and rural development. Emphasized research on Agrarian reforms
1990's	Chamber and Conway Framework	Talked about livelihood in terms of capabilities, assets and activities. *"Livelihood comprises the capabilities, assets,(stores, resources, claims and access) and activities required for a means of living*"
1998	Policy Guidelines for integrating Environmental Planning (PGIEP)	Talked about the importance of linkages between different sectors. Role of community, NGO, Institution and Municipalities.
1999	DFID	Defined sustainability in context of vulnerability, range of institutions and processes and developing asset base.
1999	CARE	Discussed livelihood in terms of possession of human capabilities, access to tangible intangible resources, and existence of economic activities.
1999	OXFAM	talked about livelihood in context of livelihood Capital (Natural, Financial, Human, Social, Physical)
1999	Learning About Livelihood (LAL)	Livelihood as people centred, Holistic approach, Household participation
2001	UNDP	Talked about livelihood in terms of means, activities, entitlements, assets. Focused on peoples strength rather than their needs Development of Micro Macro Links in achieving sustainable livelihood

I.2.b Livelihood Diversification among the Mountain Communities:

Livelihood diversification is the means of adopting different means of living by the households i.e., involvement of the households in multiple economic activities. Such involvement results in greater degree of stability especially among the rural households by generating multiple sources of income. It is in fact the mechanism of reducing the stress or vulnerability that a particular household may face due to dependency on single activity. When diversification is discussed in the rural development context, it is usually posed in terms of either the need for on farm changes in the mix of agricultural activities or of the changes in the mix of agricultural activities or of the desirability of developing rural based non-farm industries (Ellis, 2000).

Diversification may occur both as a deliberate household strategy and as an involuntary response to crisis. It therefore becomes difficult to identify the phase of diversification. The cause and consequences of diversification are differentiated in practice by location, assets, income level, opportunity, institutions and social relations; and it is therefore surprising that these manifest themselves in different ways under differing circumstances**.**

I.2.b.i Tourism as a means of Livelihood Diversification

Among the different land use pattern in mountain economy, the most important remains to be the tourism. The introduction of tourism has its own history in India. The colonial government initiated it for various purposes like sanatorium and rest houses for the soldiers. The reason behind it was the scenic beauty of the region and the favorable condition that the hill station possessed. However, the present mountain society has also

seen this sector as a lucrative activity. Most of the mountain economy today has shown a shift from their traditional practices of agriculture to other non farm sector.

In recent decade, tourism has developed rapidly in the mountain regions throughout the world. This growth has led to substantial economic and social change with resulting environmental consequences, frequently unseen (Price, 1992). The flourishing tourism in mountain economy is no doubt a good source of livelihood for the community; however the major concern that remains unsolved is the level of its sustainability. It may be possible that the present market of this sector may be good enough at present but may be non-sustaining in nature owing to several factors intertwined with it.

Besides this the tourism depends mostly on the climatic condition and the landscape of the region. However with the changing climatic condition and other socio political influences, the dependency in this sector as sustainable source of income needs to be more evaluated. The seasonality of climate is one of the most marked characteristics of the mountain regions. As a result, attractions for tourist vary at different times of the year. Thus, very few communities can rely on tourism as a reliable source of year round income and employment (Price, 1992).

The growth of tourism besides having positive outcome among the rural communities has several negative consequences. The transformation of livelihood brought about by the tourism may have series of impacts on farm based economies. The rate of growth of tourism critically affects the community's ability to adapt to the many direct and indirect changes which results. The traditional practices and cultural values get transformed and the modern practices, symbols, culture etc. gets introduced in the society. Another area of

visible change in most mountain communities influenced by tourism is the concern in building and settlement pattern (Schwabe, 1984).

Thus, one can see that the tourism in hills suffer a series of drawbacks ranging from environmental to economic and socio cultural drawbacks. Pelling remarks " as real things comes into contact with tourist, it becomes a little less of the real thing as the mixing of cultures, values, economy serves inevitable to dilute the strength of the original culture". The transformation of originality takes place when there is influence from the external sources and slowly its value gets diminished. Tourists are like so many cattle, representing highly mobile, productive, and prestigious, but perishable form of wealth. Like cattle, tourist give good milk, but only if they are well fed (Fischer, 1990). Hence high dependency on tourism may affect the community's economic structure and mode of sustenance in larger scale.

The impact of tourism can also be felt in the agricultural sector in one way or the other. The seasonal activity of tourism reduces the number of laborers in the peak season of the cultivation thereby reducing the productivity in the farm sector. Tourism activity often leads to inadequate maintenance of agricultural land and forest land, which may be implicated in decreased crop yields and the increasing instability of slopes (Price, 1992). Changes in the production of food may come about because tourist work comes to take precedence over agricultural work (Messerli, 1989). Thus, the sustainability of tourism in the mountain community seems to be the problem that needs serious attention. The nature of transformation in the economy and the changes in climatic phenomena operating on them may pose great threat to the population. The peoples' perception on changing climate needs to be well articulated and the problem needs to be seen from various ways.

The solution derived from them to be needs to be well informed among the rural poor of the society.

I.2.c Mountains as a Social Space.

On an average about 20 percent of the global population reside in the mountains or at the edge of the mountains (Martson, 2004). These high hills are the homes for the people to live, it provides land for different economic activities and the space for social processes. Though difficult to inhabit for all in terms of its geographical setting and rough terrain, it still forms the geographical space for the people to survive.

The forces of nature act upon the society and to certain extent limit their ability to act freely, however the people love their place, they find more comfort in their own location than anywhere else in the world. They construct houses, grow crops, and nurture their families over generations despite several limiting factors. In due course, they get attached to their land and environment and acquire identity out of it. Thus, humanity is sustained by the mountain.

The culture that develops among the society forms their identity. Their belongingness to the landscape makes them adapt to the different forms of livelihood practices. Despite numerous risks involved people love to reside in their own ancestral land. They get emotionally linked with the landscape that the risk involved does not have any effect on their decision to change their residence. Mountain does sustain humanity; they are also recognized as one of most rugged and challenging places on earth to pursue a sustainable livelihood (Zurich and Karan, 1999).

The linkages can be drawn between the physical and the social environment that binds the society and their activities with the livelihood strategies they adopt on the other side. Thus, within the limits of geographical settings, people derive their livelihood. The communities practice their own economic, social and cultural way of living.

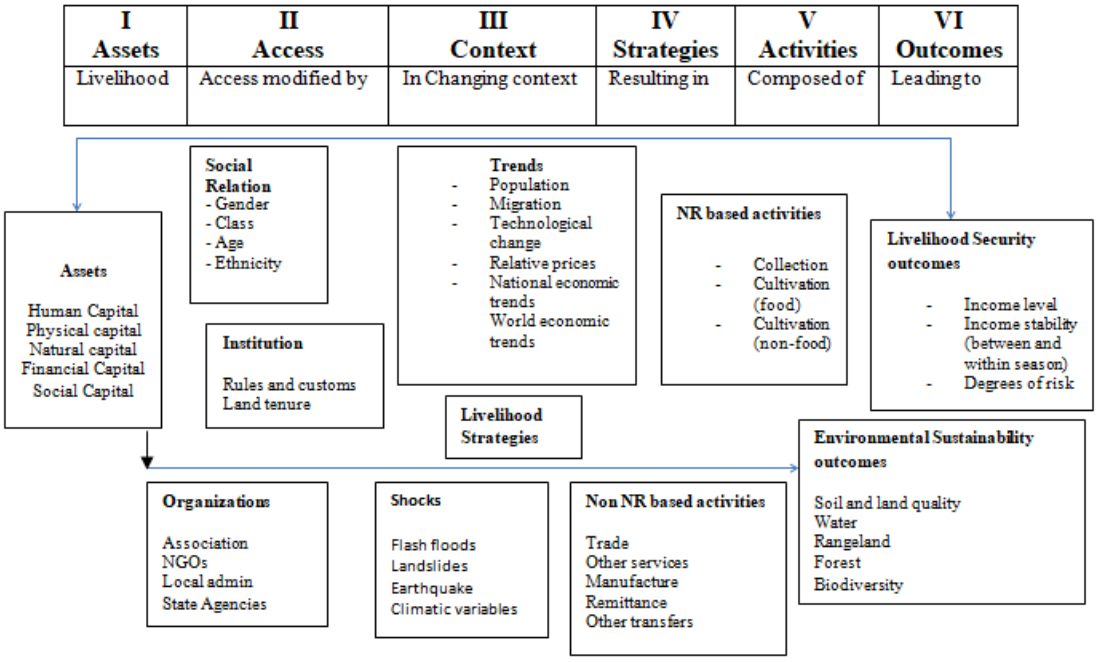
The level of prosperity in the system depends on several factors which are associated with the process of development that follows in the system. Livelihood of the mountain community in a similar way depends on the process of social interaction and the level overall development that takes place in the system.

I.2.d The Livelihood Framework

The livelihood framework is a way of looking at the complexity of people's livelihood, especially the livelihood, whether the livelihood the poor or the rich, whether it be rural or urban. The framework links different elements and level of interactions which includes access to resources to the community, strategies adopted, activities that are carried out and most importantly the outcome. Keeping all strategies into account it tries to link the process of interaction which itself forms a complex web like structure and relates it with the outcome that is generated.

It tries to understand the livelihood strategies of the people and the associated constraints and opportunities. The way of conceptualizing the livelihood and the influences upon it can be adapted from Ellis (2000) which can be represented in the following schematic representation.

Figure 1.I Framework for Rural Livelihood



Source: Ellis (2000) Pp.30 referenced from: (www.cefims.ac.uk/cedepapp/116_web_unit_/page_13html) accessed on 12/6/2015

I.3 Rationale of the study

Environment has always been the central focus of the study whenever the livelihood issues have been discussed. It shapes and reshapes the peoples choices out of which the make the living. The advancement of technology slowly transformed the level of dependency of population on environment. With the other level of development and increased literacy, there were shifts on the mode of dependency as it provided options for diversification.

However there has been difference in the nature of dependency on environmental products based on the nature of landscape inhabited by community. For instance

population inhabiting mountains remain more inclined towards their physical environment.

Livelihood practices among the population especially in the remote rural mountains needs proper management of the resources available. The limitations posed by climatic factors like temperature, rainfall, and other seasonal variation in weather conditions needs to be taken care as the dependency of rural population to their environment is very high. Farm management and practices has to be modified accordingly.

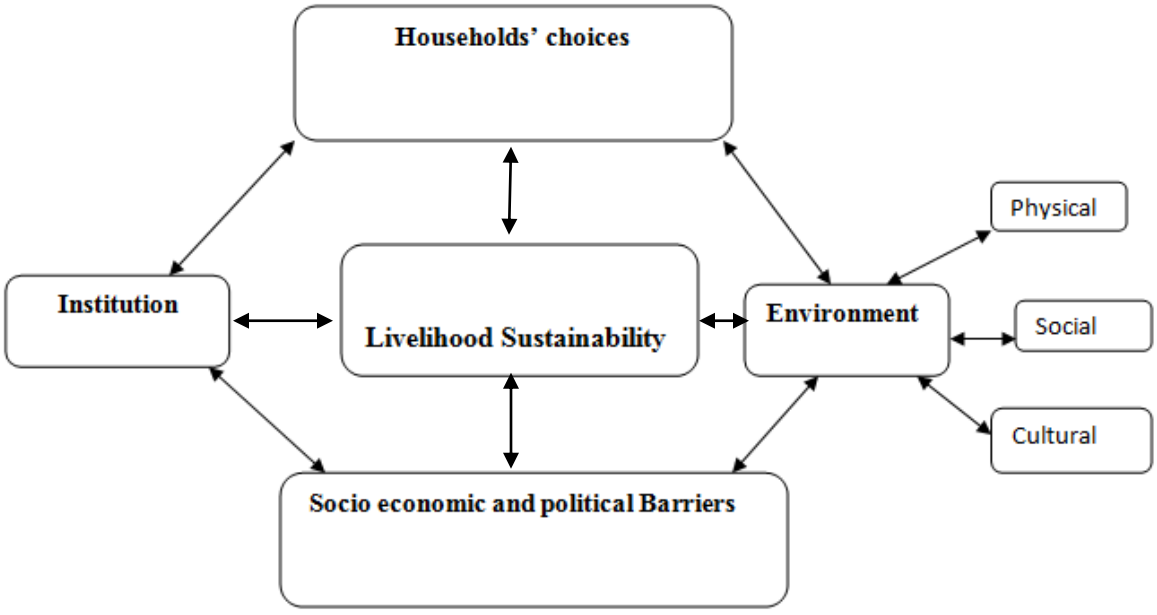
The mechanism to adapt to the changing environment has to be well organized in order to minimize the level of stress that it would provide in the long run. Livelihood adaptive ability has to be more planned and organized. The Sustainability of livelihood is the outcome of the nature of resources management and use of the environmental resources by the user groups.

Thus, monitoring the changes in livelihood forms the important aspects of livelihood sustainability. The role of institutions, community participation and effective decisions are key to achieve sustainability of livelihood among the rural households. Understanding the nature of environmental resources and making use of it adds more strength to the issue of sustainability. Tracing all the livelihood assets and working on the weakness of individual assets are the ways to generate sustainability in the long run. The weaknesses that are identified can be figured out and can be slowly modified as per the need of the community and can be strengthened for favorable outcome in the long run. Households' decision to large extent does not easily change when it comes to livelihood. However the changes brought about at the policy level would definitely bring the changes.

1.4 Conceptual Framework

Livelihood sustainability is an outcome of interaction among the human, social and environmental system. The existence of dialectical relationship between the two factors and itself part of larger system has been the base for understanding the livelihood sustainability. The framework analyses the agencies that adds sustainability to the livelihood where the household's decision, institutions, environment and socio cultural factors are intertwined within the livelihood system.

Figure I.2 **Conceptual Framework**



Taking note of the role of environment in one, changing level of technology and increased pressure on the natural landscape on the other, the decision made by the community and its functioning has been closely analyzed in this work. Livelihood as a

whole as a process of interaction that operates between human nature relationship taking account the level of participation among different actors like institution, household, community etc has been closely analyzed to understand the nature of livelihood sustainability of the community.

To establish and understand the links, the work investigates the following objectives:

I.5 Objectives of the Study

- To analyze the physical setting of the area and issues dependent on it.
- To establish the link between the environment, livelihood and institution.
- To measure the issues of adaptability for livelihood sustainability.

I.6 Research Question

- What are the characteristics of physical environment and how has these shaped people's responses in terms of institutions and livelihood?
- What have been the major changes in the environmental condition in the valley?
- How has the changing environmental condition influenced population parameters and livelihood which encompasses agriculture and animal rearing?

I.7 Methodology

The issues of adaptability and livelihood sustainability are directly linked with the community's perception. The adaptation to the changing environment is the decision of collectiveness. The researcher interested in knowing the human nature relationship therefore needs diverse methodology in understanding the phenomena from both people's perception as well the sources available in various other secondary sources like

government reports, Census data since 1981, Statistical reports etc. Hence the research is based on mixed methodology to understand the phenomena of adaptability and livelihood sustainability.

I.7.a Methodology for Data Analysis

The data analysis would be the important component of the study where the data obtained from different sources would be analyzed independently and conclusion drawn out of it would be analyzed as a whole for depth understanding of the issues of adaptability for livelihood sustenance by the people in the Lachung valley. The methodology for quantitative data analysis will make use of different statistical techniques whereas the information on qualitative would be articulated through different approaches and perspectives.

The secondary data collected from different sources has been analyzed through application various statistical techniques. The data on population obtained from Census report since four decade would be represented through trend line, bar diagrams, pie chart etc. to show the change of population over the years and understand the pattern of migration. Population composition would be shown through bar and pie diagrams and analyze gender based occupational structure over the period of time and understand man environment relationship.

The data on relational value like changing temperature and rainfall would be related with the agricultural productivity and changing sources of livelihood like income to find the degree of relation between these variables. The relation between different components of livelihood would be correlated to trace its sustainability

Besides this the study has made use of quantitative techniques for identifying the livelihood capital by assigning the varying weights to the different livelihood indicators and the comparison of different livelihood capital has been made to analyze the role of each capital asset to understand the nature of sustainability. The study also has made use of GIS techniques for mapping the region and to draw the pattern of land use changes that have taken place over the period of time and relate it with the changing economic activities of the population.

The quantitative data generated from the field survey (i.e. the household data) obtained from simple random sampling in different villages of Lachung has been analyzed to see the economic condition of the people, their ownership on different assets like cultivable land, livestock and income generated from other forms of secondary activities. Besides this the primary data obtained from in-depth interviews has been used to trace the changes that have taken place in the society and the occupational changes that have taken place has been analyzed to see the adaptability of the population in the region.

Thus the objective of highlighting the livelihood sustainability and adaptability of the mountain community has been met by implementing the mixed method of data collection and data analysis and the efforts has been made to draw every aspects of society that would not be possible by relying on one particular approach.

The following table shows different variables taken to analyze the study which ranges from physical, social and economic with different indicators and their aspects are as shown below.

Table 1.2 Parameters used in the study

Variables	Indicators	Aspects Shown
Physical	• Precipitation • Temperature • Relief, slope and Aspect • Drainage	Physical environment influencing the livelihood
Social	• Population • No. of Households • Social participation • Migration	Population composition and the functioning of the society
Economic	• Occupational Structure • Income • Livestock Ownership • Landholdings • Household Size	Livelihood options of adaptability

I.8 Database

The study is an attempt to understand man environment relationship and to understand the issues of livelihood sustainability. The nature of data itself is varied. The availability of secondary data has not been enough to fulfill the study, for which the primary data has been implemented to meet some of the objectives. The household schedule has been prepared to analyze the issues of livelihood sustainability. The study is therefore based on mixed approach to understand both qualitative and quantitative aspects of the phenomena.

I.8.a Secondary sources of data

In order to make the study more reliable different sources of data have been used. The data available on different official records and institutions have been used as a secondary source and analyzed to meet the requirement of the study in different possible ways.

- The data on Census of India has been used to see the demographic changes over the period of time. The Census data since 1981 to 2011 has been used to trace the growth of population, population composition in the region, economic characteristics of the population and other issues related to man-land ratio.
- The study has made use of data available in Annual reports; Government of Sikkim and village development action plan have been used to understand the nature of change on sources of livelihood over the years. The nature of livelihood changes has been analyzed from the change observed in terms of farm productivity and the composition of agriculture outputs over the years. The data on land use has been analyzed based on the observed changes in farm outputs and have been supplemented by field observation and interviews with the households.
- Lastly the land use data of the year 1991 and 2011 obtained from Department of Forest, Environment and Wildlife has been used to trace the nature of dependency on land based activities and highlight the nature of transformation on land areas to understand the pressure on the existing farmland and traditional activities like herding which forms the essential component of livelihood in the study area.
- The work makes use of imageries obtained from LANDSAT in order to analyze the nature of physical environment of the region namely slope, aspects and elevation. Besides this the toposheet of the region have used to analyze the

drainage, elevation and settlement of the region. Lastly the GPS has been used to verify the location accurately and mark the changes that have taken place over the years.

Table 1.3 Secondary data used for the study can be tabulated as follows:

Sl. No.	Type of Data Used	Sources	Objective
1.	Population and Household Data	Census 1991, 2001 and 2011	To show the changes in Demographic characteristics of the population
2.	Nature of agricultural Practices	Annual Reports and Village Development action plans.	To understand the composition of crops raised and farm productivity.
3.	Land use and Land cover	Department of Forest, Environment and Wildlife 1991 and 2011	To analyze the land cover use and land cover changes that have been observed over the years
4.	Imageries	LANDSAT with 30m resolution	To analyze natural topography of the study area.
5.	Topographical Maps	78A/9, 78A/10, 78A/13, 78A/14	To understand the location and mapping the boundary of the valley.
6.	Google Earth	10m, with zoom	To verify the location obtained from GPS with the actual ground location.

I.8.b Primary Sources of Data

The study makes use of primary data obtained through the household interviews. The information on socio economic status of the population was collected from the sampled households. Proportionate random sampling techniques were used to select the household for the survey. Altogether 200 households were surveyed based on the size of the household. The number of sampled households in individual hamlets varied with the proportions of sample. The Schedules comprised of both open ended and close ended questions to capture the qualitative information from the respondents.

The primary data were collected in different phases so as to add validity to it. The schedules were modified in different stage as per the need of the research and compositions of the respondents were also thoroughly revised to get the data required by the research.

Besides this the Primary data was also obtained through the interviews Focus group discussion with the Pipon (*Headman*) of the valley along with the local residents of the valley. The data on nature of governance and resource use in the valley were obtained through the headman. All these data obtained from the headman was analyzed while interviewing the respondents.

Lastly In-depth interviews were conducted with the herders and farm caretakers (*gothwalas*) to understand the reality of livelihood change over the years. The nature of dependency on herds and farming practices in the valley were captured through in depth interviews. The composition of respondents for the primary data has been shown in the following table below:

Table 1.4 **Research Methodology**

Method of Primary Data Collection	**Nature of population interviewed**	**Number of Sample surveyed/household**
Focused Group Discussion (FGD)	Senior Citizens of the village	One FGD in each village has been done. Total of five FGD's has been carried out in this research.
In- Depth Interviews	Village Headman(Pipon), and Gothwalas	Present and Ex- Headman were interviewed. Gothwalas were interviewed at their work place.
Household Schedule	Households	200 households based on proportionate random sampling technique.
Narratives	Farmers, migrant labourers, hotel owners etc	Collected from population involved in different economic activities.

I.9 Organization of Materials

The first chapter introduces the topic with the general background of the study area. It tries to introduce the research with theoretical backgrounds, objective of the study and also the review of literature. Besides this it introduces the study area, materials and methods used to achieve the desired objectives. The chapter also highlights the data collection techniques, sampled households and composition of respondents. The introductory chapter thus generalizes the concepts and ways to fit the concepts and techniques to carry out the research.

The second chapter analyzes the physical setting of the valley. It highlights the natural setting in relation to livelihood adaptability. Second chapter analyzes the geographical environment that shapes livelihood outcomes. Slope, elevation, aspects, drainage, precipitation and climate of the region has been analyzed in order to understand the nature of physical environment that governs the livelihood practices of the valley population. It thus makes the sense for need of livelihood adaptability for the population bounded by physical parameters.

The third chapter tries to understand the theoretical issues related to livelihood research. It tries to understand the methodology implemented in understanding the livelihood research across the globe. It then links the nature of livelihood studies that have been carried out in this research with that of livelihood studies that have been done elsewhere. Thus the chapter conceptualizes the theoretical frameworks on which the livelihood research has been carried out.

This chapter examines the nature of livelihood change that has been observed in the valley. The chapter analyzes the past scenario that governed the livelihood choices of the valley population. The system of land utilization, resource distribution and livelihood practices that existed in the past has been analyzed. Besides analyzing the past livelihood histories of the valley, it reflects the present livelihood practices and the changes that have been observed over the years. It reflects the influence of tourism in people's livelihood and its impact on the livelihood and landscape in the valley.

This chapter analyzes the entire livelihood process in relation to different livelihood capital assets (namely physical, social, natural, financial and human capital) possessed by

the valley population based on certain indicators and measures its sustainability. The strength of capital assets of individual hamlets has been analyzed based on the score of the valley on the basis of assets availability.

Finally a summary and conclusion of the study along with the limitation of the exercise has been included in the last chapter. The chapter concludes with the limitations of the study with recommendations that are important for further research on mountain livelihood.

Chapter II

Physical Setting of Lachung Valley

Sikkim is a name derived from the Sanskrit word sikhim 'crested'. In all of Sikkim there is absence of flat surface even for a kilometer distance. It has a total geographical area of about 7096sq. km. with north –south extension of 113km and 64 km west to east. Most of Sikkim is in the Lesser Himalayan Zone with the variation in altitude from 250 m to 8595m (Pradhan, 2004). It is bounded by Nepal in the West, Bhutan in the East and Tibet in the south. The state is divided into four main districts the North District being the largest in terms of geographical area and has the least population concentration among the other districts of Sikkim.

In Sikkim-Darjeeling Himalaya the Lesser Himalaya starts from Kalijhora and continues up to Singhing (In Sikkim). The outcrops of gneiss and granitic intrusion exhibit sharp rugged show bound mountains in steep accessible scrap face. Extending in the form of east-west trending ridge, it forms a barrier between Trans Himalayan zone and the Lesser Himalayas with Kanchenjunga as its western limit and a series of high peaks, deep gorges and numerous glaciers in between.

Different geomorphic forms can be seen all around the state. The Higher regions of the mountains have different forms of glaciated landforms. There are large number of valleys with different forms of flora and fauna depending on the different altitudinal variation. The fluvial landforms formed by river Teesta and other rivers at different

stages of its flow have been quite interesting. Besides this the Northern part of the state has different geomorphologic process which is the region covered by numerous glaciers and snow fields.

The location of steep mountains with numerous streams originating from glaciers in the high altitude and mighty flowing rivers along the forest and valleys of the state adds interesting characteristics in understanding the different geomorphic processes and shaping the lives of different species of organisms in the mountain ecosystem.

II.1 Locating Lachung Valley in the Sikkim Himalaya

Lachung valley in North Sikkim lies at an altitude of 3500m above the mean sea level and exhibits the different type of climate that is experienced by the region at lower altitude in Sikkim Himalaya. The latitudinal extent of the valley is 27 degree 41 min and 30 sec while that of longitudinal extent is 88degree 44 min and 50 sec.

The valley stretches for about 60 km from Chungthang[1] till it reaches Yumthang[2] which lies further north from Lachung valley. The river Yumthang Chu which flows South Easterly direction from Yumthang valley and Sebozung Chu that flows South westerly direction meets giving birth to new river Lachung Chu. River Lachung Chu passes through the valley of Lachung where it drains through several hamlets namely Singring, Phaka, Bichhu, Sarchok and Thomchi. The river on its southerly flow even drains through the hamlets and agricultural village of Lema and Khedum[3] and finally reaches

[1] The lower most portion of Lachung valley. It is the zone of confluence of Lachung Chu and Lachen Chu.
[2] Valley that lies further north to Lachung valley which attracts tourists during the seasons.
[3] These are hamlets that lies below the Lachung Valley with large agricultural fields. In fact the people from the valley descends down during the off seasons and winter months and cultivated these fields.

Chungthang where it meets Lachen Chu[4] and flows as Teesta in the lower region of Dikchu[5].

The present study focuses the Lachung valley on its entirety. The entire region from Chungthang towards the North of river Lachung Chu covering the valley of Yumthang has been taken for the study. There are other sub-valleys adjoining to Lachung valley namely (Yumthang and Sebozung) have also been used while mapping the study area. All three valleys have similarities in terms of movement of population seasonally as well as permanently for different purpose of sustaining their livelihood. The Valley presently comprises of two divisions. One comprises of settlements and the other comprises of agricultural fields. The number of households in each hamlets of Lachung Valley has been shown in the in following table below:

Name	**Total Number of Households**	**Sample Size Drawn for the study**
Phaka	110	55
Sarchok	75	38
Singring	90	45
Bitchu	103	51
Thomchi	21	11
Total	**399**	**200**

Source: Sarva Shiksha Abhiya (SSA) Report, 2015

[4] Lachen Chu is the River flows through the Lachen valley. It is one of the most important tributary of river Teesta in North Sikkim

[5] Small settlement in the lower region through which river Teesta flows.

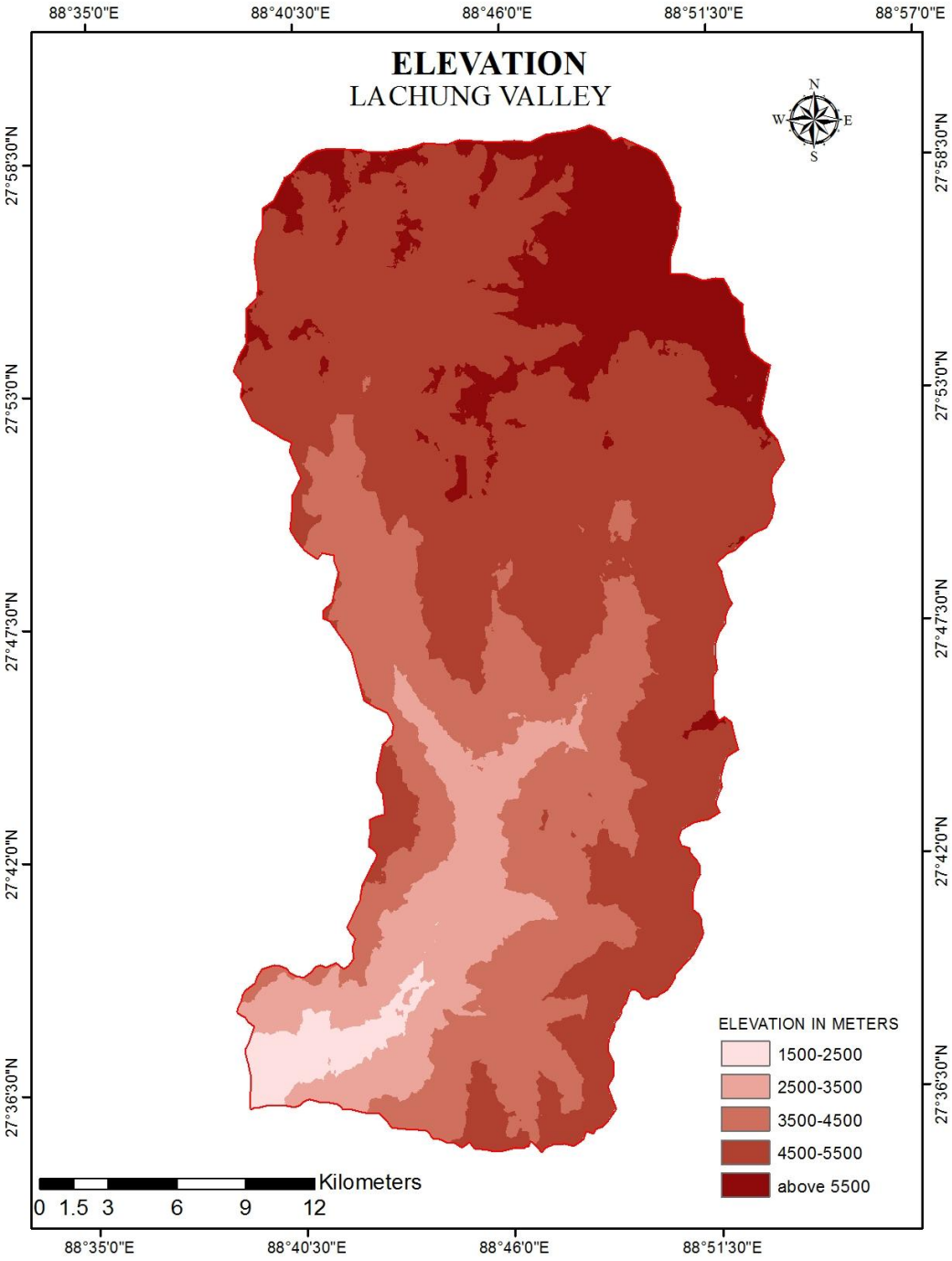
The present study has been taken based on the different forms and pattern of movements made by the pastoral communities. The study is thus based on the region that once used to be the habitat of the communities which sustained their livelihood by rearing their herds in the entire valley. However in due course of time and prevailing circumstances the population have adapted accordingly with marked change in their nature of livelihood sustenance.

The valley that has been taken for the study comprises of about 401 households and 2495 population in total as per 2011 Census. The location of the valley has the central location in the map that has been prepared for the study. It has agricultural fields along with the settlements. The East to west extension of the valley does not exceed 10 km on average; however the North South extension of the valley from Chungthang to Yumthang exceeds 60km on an average.

Thus the division of the valley from its base i.e. Chungthang to Yumthang in North can be divided as follows:

1. Chungthang region: the lower portion of the valley that serves the market place for the population of the upper valley.
2. Khedum and Lema region as the second belt which is in fact the agricultural villages of the communities living in the Central part of the valley
3. The third belt i.e. Central most part of the valley that comprises of villages and agricultural fields. At present this belt has emerged as a tourist based region.
4. The fourth belt in the valley in the North i.e. Yumthang valley which lies at an altitude of about 4200 meters from the mean sea level.

Map II.I.



Source: Obtained from DEM

II.2 General Elevation:

The lowest elevation of the valley is about 1550 meters above the mean sea level. The elevation of about 1500-1800 meter is seen above Chungthang and Khedum in the valley. However the steepness constantly increases as one move towards the north of Chungthang. Most of the habitable regions of the valley are found around the elevation that ranges between 2600 to 2900 meters above the mean sea level. The region being suitable for the growth of crops and the valley being flat, settlement are seen around this part of the valley.

However the eastern side of valley within the habitable zone of valley is seen to have the elevation ranging from 2900- 3500 meters. Towards the Northern part where the river Yumthang Chu and Sebozung Chu meet, the elevation ranges between 2900-3500 meters. The difference in the elevation between the lower and the upper range of the valley ranges between 1500 meters to 6500 meters. The differences in elevation have largely influenced the micro climate of the region thereby allowing the population with set of barriers and opportunities in terms of meeting the requirements for their everyday needs.

The breadth of the valley slowly decreases towards the northern part. Hence the most of activities takes place in the lower and the central part of the valley. The central part being relatively broad in terms of area coverage has the settlement and agricultural fields. Besides this the river that drains the valley serves the source of water for all forms of economic activities that take place in the valley.

The change in the elevation within the short range of distances has greatly influenced the nature and characteristics of the ecosystem. Within the short distances of kilometers there remains variation in the type of rainfall, temperature pattern and characteristics of the soil in high altitudes. These forms of variation in elevation from the upper and the lower region of the valley have largely shaped the nature and characteristics of livelihood strategies adopted by the population.

Table II.1 Elevation and area of the valley

Elevation in Meters	Area in Sq. km	Area in Percentage
1500-2500	60.70	8.08
2500- 3500	159.43	21.23
3500-4500	144.86	19.28
4500-5500	243.02	32.36
Above 5500	142.99	19.03

Source: Tabulated from the DEM

The Map II.1 has been tabulated in to show the range of elevation of the valley. There are altogether six class of range of elevation that has been identified. The value ranging between 1500 to 2000 meters has been categorized as lowest elevated zone owing to the steepness of the region while the higher elevation ranges above 5500 meters as shown in table II.1.

The table besides showing the range of elevation also shows the amount of geographical space that falls within the particular range of elevation. Though the area appears to be large in terms of its geographical coverage however the actual physical area that are suitable for human occupation and habitation remains low owing to ruggedness of topography.

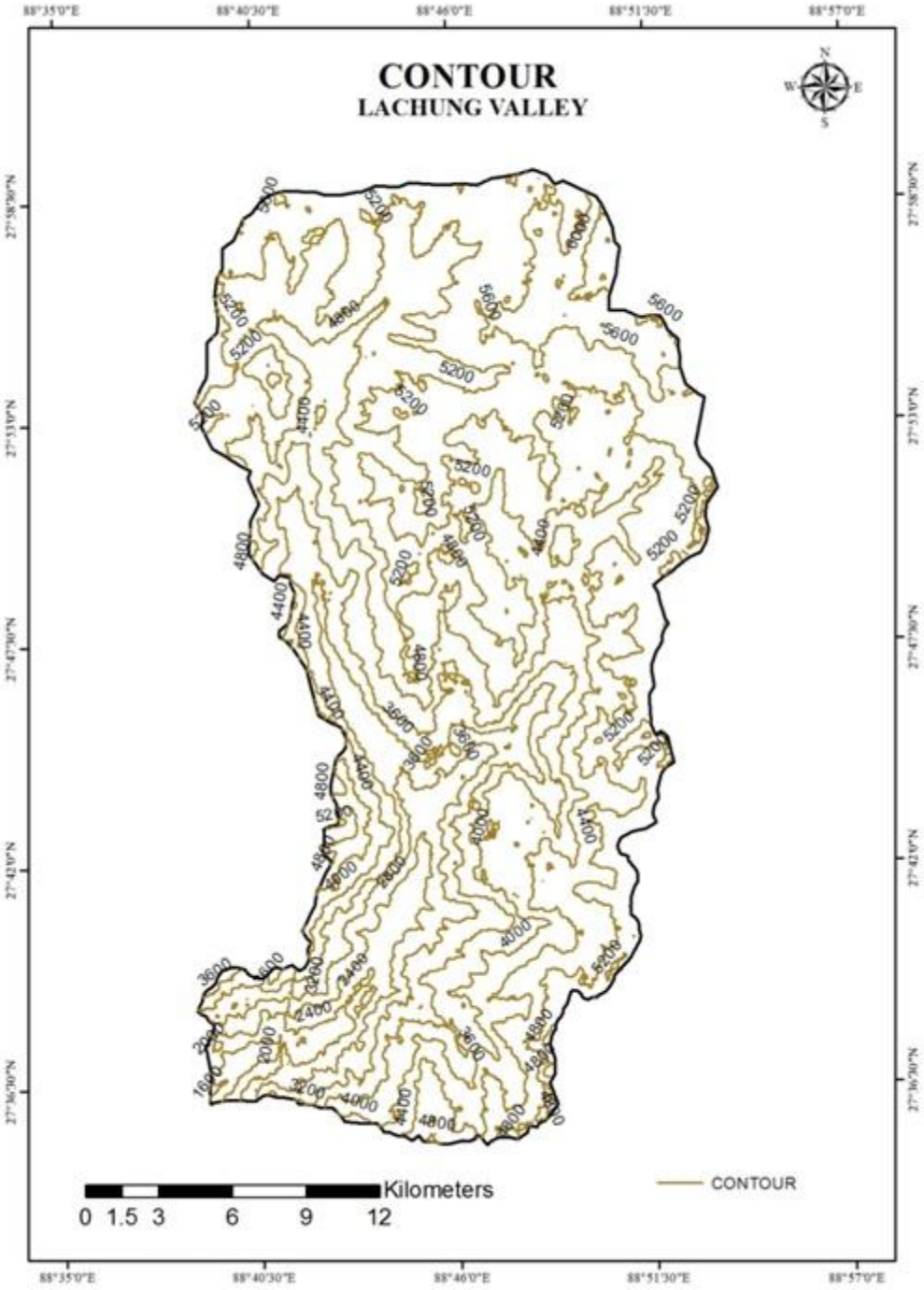
The table II.1 shows the distribution of area under different categories of elevation in the valley. The area under the elevation ranging between 1500 to 2500 meters is the lowest which is about 60.75 sq. km of the valley. This signifies that the population and settlements are located relatively at higher altitude of the valley.

The second category of elevation that ranges between 2500 -3500 meters has relatively higher percentage of land area i.e. 21.23 percent of the total geographical area of the valleys. Most of the settlement and agricultural practices are found in this belt. The elevation ranging between 1500 to 3500 meters having relatively gentler slope have been used for different forms of economic activities in the valley.

However the area above 3500 meters covering around 69 percent of the valley area have higher elevation making it relatively difficult for the population to sustain in terms of their steepness and natural environment.

Thus from the table above it can be said that only 31 percent of the total valley area falls in the category of human habitation zone. Thus understanding the opportunities in terms of access to natural resources available to the communities in the valley can be well understood from the fact that it has very less geographical area that is suitable for human habitation. Hence the altitude, and the topographic and climatic factors associated with altitude has been one of the most important factors that have been responsible for the population in determining their livelihood choices. Lachung valley is therefore limited to large extent by the type of micro climatic factors when it comes to understanding the household and their economic characteristics.

Map II.2



Source: Obtained from DEM

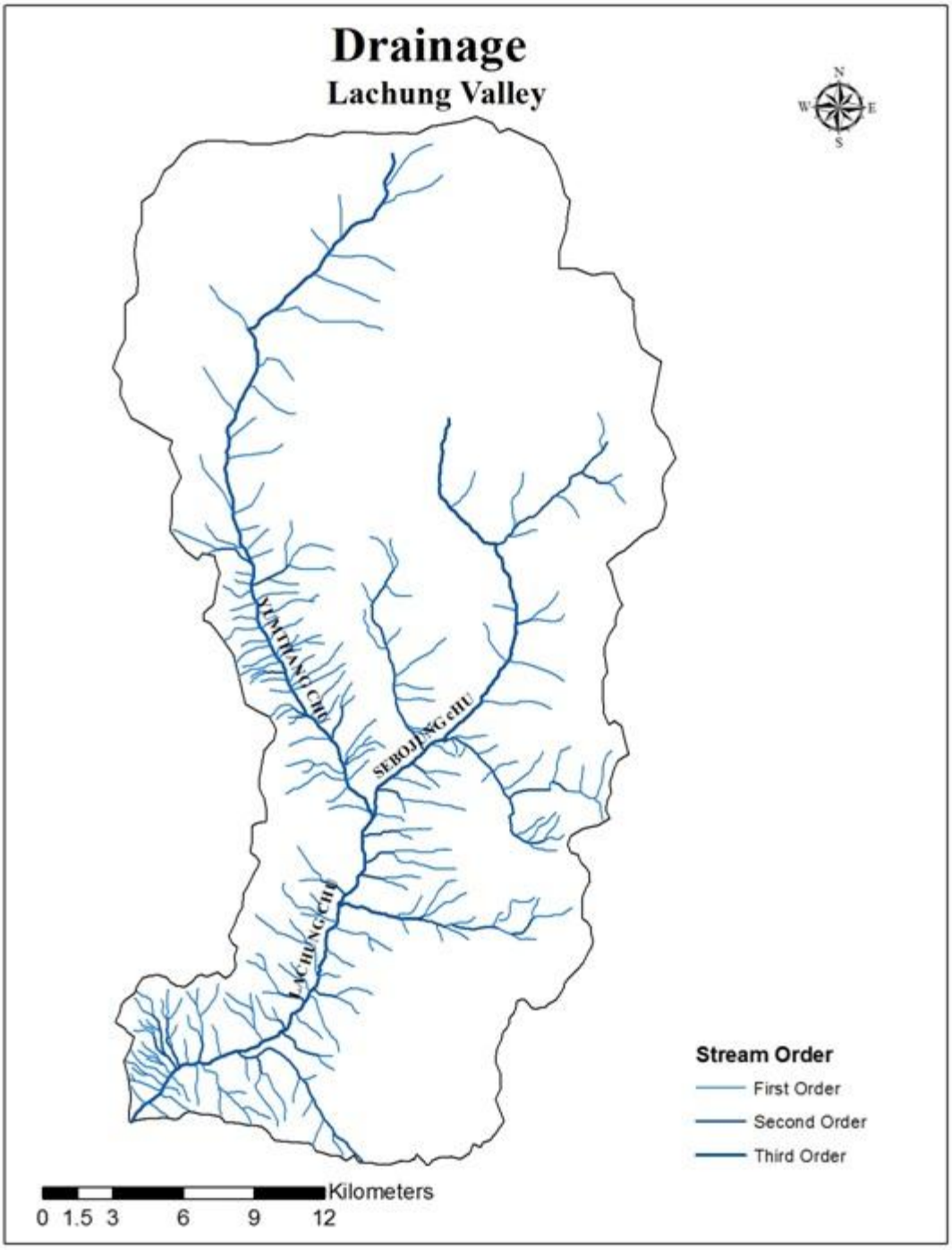
II.3 Contour Lines and Physical Setting

The contour line clearly depicts the location of the valley. The spacing of the contour line shows the gentleness and the steepness of the slope. Closer is the contour line greater is the steepness of the valley. Thus towards the west, the valley seems to be much steeper. However the western part of the valley has the wider spacing of the contour which shows relatively flat slopes. The central most part of the valley where the settlements are found in an around the altitude of about 2300 meters to 3200 meters lie the middle zone of the valley.

The spacing of the contour clearly shows that the valley appears to be moderately flat in the central part from North to South. These flat parts of the valley have been used for human settlement and are often used for different economic purposes to sustain the living. Though the elevation of these valley ranges from 2400 to around 3000 in the central region however these being relatively flat have greatly been responsible for sustaining the population of the valley. The central region being flat with not much of steepness has even let to the use of land for farming activities.

The northern part of the map has the wide spacing of the contours which shows the gentleness of the slope being relatively flatter; however the elevation of the region is more than 5000 meters which makes it unsuitable for human habitation. Thus the contour lines help in understanding the nature of slope with respect to the elevation and also has clearly shown the nature of terrain and steepness of slope that is present in the study area.

Map II.3



Source: Obtained from DEM

II.4 Drainage System

Teesta is the important river system that originates in Sikkim and flows for a long distance in Sikkim thereby there by supporting the state economically as well as by providing water for various uses. Unlike the entire river in the Himalaya Teesta is an antecedent river. It starts form Tso- Lhamu lake in Trans Himalaya region of North Sikkim.

Teesta right from its origin flows through different gradient. The gradient is high towards the North while its gradient constantly becomes low towards the South. Gradient of Longitudinal profile of the river Teesta is very less in the south and increases towards the North. The change of gradient is very sharp near Dickchu, near Main Central Thtust (MCT) and highest gradient was observed near Zemu.

The drainage pattern of Teesta Basin is mostly a mixture of sub-dendritic and sub-parallel. However, in the northern part directional trellis type drainage pattern is observed. Drainage density is high in the lower reaches but in the higher reaches the density is moderately high. The Teesta basin show symmetry sub basin up to the confluence of Lachen Chu and Zemu. The Dik Chhu, a left bank tributary of the Tista, has two main feeders, namely, the Bakcha Chhu and the Ratey Chhu, both originating from the Indo- Tibetan border ranges in the east. The Dik Chhu flows towards west and marks the boundry between the north and the east district of Sikkim.

The Dik Chhu meets the Tista at Dikchu Village. The Rongli Chhu, also known as the Rani khola, meets Tista at Singtam. The Rongpo Chu, the last left bank tributaries of Tista , originates from a lake very close to Indo China border. Its feeders include Byu

Chhu, the Lunze Chhu, the Rongli Khola and the Rishi Khola .The Rangpo Chhu meets the Tista at Rangpo, the gateway of Sikkim.

II.5 Major river System in Lachung Valley

II.5.aYumthang Chu:

Yumthang Chu flows down slope along the Yumthang valley in South easterly where it is fed by several smaller streams throughout its flow down the valley. The river has wide breadth in the Yumthang (a tourist hotspot). It flows for a distance of about 18 km till it joins the other river Sebozung Chu.

II.5.b Sebozung Chu:

The other tributary of Lachung Chu is the Sebozung Chu that flow almost south westerly direction. It is joined by several minor tributaries that have its origin in the glaciated valley in the North. It flows for a distance of about 12 km and then finally meets Yumthang Chu and flows as Lachung Chu in the South.

II.5.c Lachung Chu:

Lachung Chu is the main river that flows along the valley of Lachung for Several Kilometers. The river then with the increased volume due to confluence of Yumthang Chu from the left and the Sebozung from the right flows along the villages in Lachung. It flows for distance of about 28 kms till it reaches Chungthang. The Lachung Chu meets the river Teesta at Chungthang. The two rivers namely Lachen Chu and Lachung Chu meet at Chungthang and finally flow down as river Teesta.

The drainage pattern in the valley of Lachung appears to be Y-shaped. The confluence of Yumthang Chu and Sebozung Chu from two different directions meeting at a point and its southerly flow as Lachung Chu gives it a shape of Y shaped. The overall drainage pattern appears to be of Dentritic pattern. All three rivers in the valley namely Yumthang Chu, Sebozung Chu and the Lachung Chu are fed by several smaller streams giving rise to the dendritic pattern as a whole. The smaller streams of the higher elevation show that the flow of the stream is of trellised pattern.

Table II.2: Calculation of Drainage System in Lachung Valley

Stream Order (O)	Stream Number (N)	Bifurcation Ratio (bf)	Mean Bifurcation Ratio (mbf)	Stream Length (km) (L)	Mean stream Length(km) (ML)	Drainage Density (Dd)
1st order	580	4.75		270.4		
2nd order	122	4.06		144.5		
3rd order	30	4.28	3.09	92.2	608.1	0.809
4th order	7	3.5		42		
5th order	2	2		31		
6th order	1			28		

Source: Calculated from the Drainage map.

Here,

Stream Number (N) = Number of stream in particular order

Bifurcation Ratio (bf) = Stream Number in particular order/ Stream number of the next order

Mean Bifurcation Ratio (mbf) = Sum of total bifurcation ratio/ 2

Stream Length (L) = Length of the stream calculated as per the given scale of a map

Mean Length (ML) = Total length of the stream (L) / total number of stream order (o)

Drainage Density (Dd) = Stream Length (L) / Total Area of the valley (A)

R.E Horton (1945) defines drainage density as the ratio between total length of all stream and the total area of the drainage basin. The table above shows the characteristics of stream in Lachung valley. The stream numbers orders vary from 580 in first order, 122 in second order, 30 in third order, 7 in fourth order, 2 in the fifth order and 1 in 6^{th} order. The three main rivers of the valley are Yumthang Chu, Sebozung Chu and Lachung Chu. The total length of the streams in the valley is 608.1km.

The densities of the streams are higher in the lower valley where numerous streams join the river Lachung Chu making it more sustainable in terms of water availability in the valley. The availability of water from different minor streams in different villages makes the region surplus in terms of water availability for different activities from agriculture to animal rearing and presently for the tourism in the region.

II.6 Major Climatic Zones

In order to understand the physical environment of the region the climate forms an important determinant. The climatic condition of the region has close relationship with the existing flora and fauna thereby helping to understand the ecosystem of the region in inter-relationship with its natural setting.

Lachung valley also being located in the high altitudinal zone, experiences the climatic pattern that are predominated by cool temperate type and cold zone with short duration of frigid zone especially in the month of December and January.

The five major climatic Zones according to its succession from lower to higher altitude are:

a) Subtropical zone (Up to about 1000 meters characterized by fluvial process at lower altitude)

b) Warm temperate zone (between 1000 meters to 2000 meters with fluvial process)

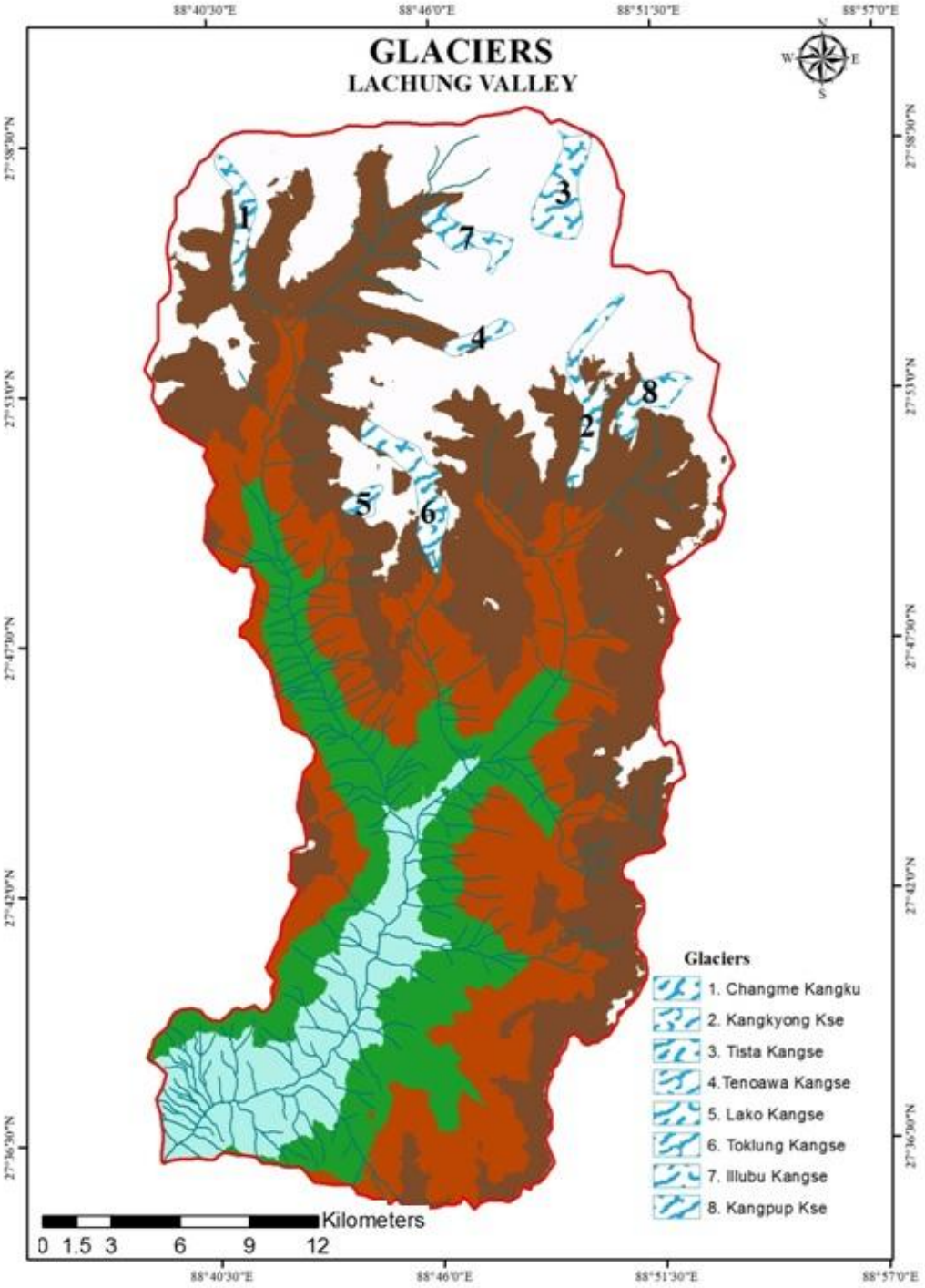
c) Cool temperate zone (Between 2000 to 2500 meters characterized by fluvio-glacial and fluvial process at higher and medium altitude)

d) Cold Zone (Between 2500 to 4000 meters characterized by periglacial, fluvio glacial and fluvial processes at higher altitudes)

e) Frigid zone (4,000 meters and above characterized by glacial, periglacial, and fluvio glacial processes)

Major portion of the Northern part of upper Teesta basin experiences the Frigid Zone, cold zone, and the cool temperate type of climate. The three geomorphic units –zone in combination have formed a major portion of the northern part coinciding with the Upper Teesta Basin. This upper section stretching about 100 km west to east signifies the presence of glacial, peri glacial and fluvio glacial evidences indicating the occurrences of related fluctuations in climate, timber line, and other associated effects in the context of mountain ecology and environment. Despite having small geographical area of the Valley, it experiences different types of climatic conditions within short ranges. The presence of lofty mountains immediate to the settlement makes it more different in regard to the type of climate the valley which therefore provides both opportunities and threats in terms of livelihood adpatability of the population.

Map II.4



Source: Obtained from DEM

II.7 Galceirs

The North Sikkim has been well endowed with the glaciers of different types and sizes. The northern part of the valley has numerous glaciers. The altitude being higher in the Northern part and the temperature of the region being low has favored the northern part of landscape with permanent glaciers. The main glaciers of the valley are Changme Kangkhu which is located in the North western part of the valley.

Changme Kangku has its location in the Northern Eastern part of the Yume Samdong which lies at an altitude of about 5000 metres above the mean sea level. The other major glaciers are Kangkyong kse, Tista Khangse, Tenoawa Khangse, Lako Kangse, Toklung Kangse, Illubu Kangse, Kangpup Kse. Besides this there are number of smaller glaciers in the upper region of the valley.

The melt water of the glaciers Changme Kangku, Illubu Kangse, Lako Kangse, Tenoawa Kangse flows through the western Channel of river Yumthang Chu where as the other glaciers Kangkyong Kse, Toklung Kangse, Tista Kangse, Kangkup Kse drains through the eastern channel of river Sebozung Chu. All these glaciers in the northern part of the valley with the lakes of varying sizes and volume of water content in them makes the valley water surplus in terms of different uses.

The northern part of the glaciated valley with their cold climatic condition and vegetation cover in terms of grasses and bushes makes the livelihood of the herding to sustain. The seasonal movement of this community in different time period makes them and their herds to make best use of the fodder at different altitude.

The landscape and existing climatic condition of the upper part of the valley has largely been responsible for less concentration of population.

The northern part of the valley experiences precipitation mostly in the form of snow which has its high accumulation during the winter months thereby affecting the yak herding communities in the valley adversely in terms of availability of fodder for their herds. Thus the altitude of the northern part of the valley has greatly the population inhabiting the upper region which at times makes them vulnerable in terms of meeting their livelihoods.

II.8 Climate

Climate is a synthesis of day- to- day values of parameters like precipitation, temperature, humidity, sunshine and wind velocity which is affected by the factors like altitude, latitude, location of the place etc. besides, the presence of vegetation, relative distance of the place from the continents and oceans are also responsible for shaping the climate of the region. Climatic variation in mountainous region occurs in short distances owing to altitudinal variation.

Though the region lies within subtropical climatic belt however the presence of high mountains and due to altitudinal variation one can experience temperate, alpine and even arctic type of climate within Sikkim Himalaya. The nature of altitudinal variations and resultant climatic variations makes the livelihood of the mountain populations different from those inhabiting tropical type of climate. The climate of Sikkim can broadly be classified in the following types as classified by (Choudhary, 1998)

II.8.a Sub- tropical humid type

The area lying below 1500 m experience this form of climate. The day temperature in summer in this belt may reach as high as 35°C while the winter minimum may fall up to 6°C. The average annual rainfall is high but varies from place to place due to variation in aspect. The average annual rainfall varies between (150 cm to 350 cm). In this belt, the humid period is very long, extending for almost six months from April to September. Night time showers are common in the summer months, thus rendering cool nights even in the hottest summer days. Winters are usually cold and dry. The region below the lower portion of the valley i.e. the area around Mangan experiences this form of climate in general.

II.8.b Semi-temperate type

The area lying between 1500m to 2000m experiences semi- temperate type of climate. Mean annual range of temperature in this region ranges from 26° C in summer to 8° C in winter. Rainfall is usually heavy; with a mean annual of 240 cm. Rainfall is exceptionally heavy in June, July and August when the south-west monsoon breaks in. Winters are generally dry except for some occasional drizzle. The lower portion of the valley i.e., the region around Chungthang and parts of Khedum experiences this type of climate in general.

II.8.c Temperate type

The hill slope lying between 2000m to 3000m falls under temperate type of climate. The annual range of temperature during summer and winter months vary between 15°C and 0°C respectively. Precipitation ranges from medium to high which are seen in the form of

rain and snow. Lachen and Lachung valleys of North Sikkim receive average annual precipitation of 170 cm. The summer months are moderate and the winter months are generally very cold in this belt. Winter snow is common. Frost is also common at nights almost round the year.

Thus the Central part of the Lachung valley which at present has been largely dominated by the Lachungpas experiences the temperate type of climate. The presence of cool weather condition in the valley has made it a tourist hotspot during the dry season of the year.

II.8.d Alpine Snow Forest Type

The region lying between 3000m to 4000m experience this form of climate. The temperature remains very low in this belt for more than five months i.e. (November – March). Rainfall begins from the end of May and continues till the end of September. The precipitation occurs in the form of snow in the winter months. The major part of this area is uninhabited due to harsh climate. The Yumthang valley in the North exhibits this form of climatic condition.

II.8.e Alpine Meadow

This region lies in the peripheries of snow-capped areas in the extreme northern, western and eastern part of Sikkim. The temperature is always very low in this region and the night temperature falls below the freezing point. Precipitation usually occurs in the form of snow-fall, except for the summer months. The ground remains snow covered and the soil remains frozen for at least four months of the year.

No permanent settlements are seen in this belt. The region further North to the Yumthang valley i.e. the region around Yume Samdong which lies at an altitude of about 4500-5000 meters have similarities in Alpine meadow type of climate with almost absence of vegetation. The valley above 4500 metres almost remains inaccessible for 3 to 4 months from December as it would remain frozen even to the lower extent.

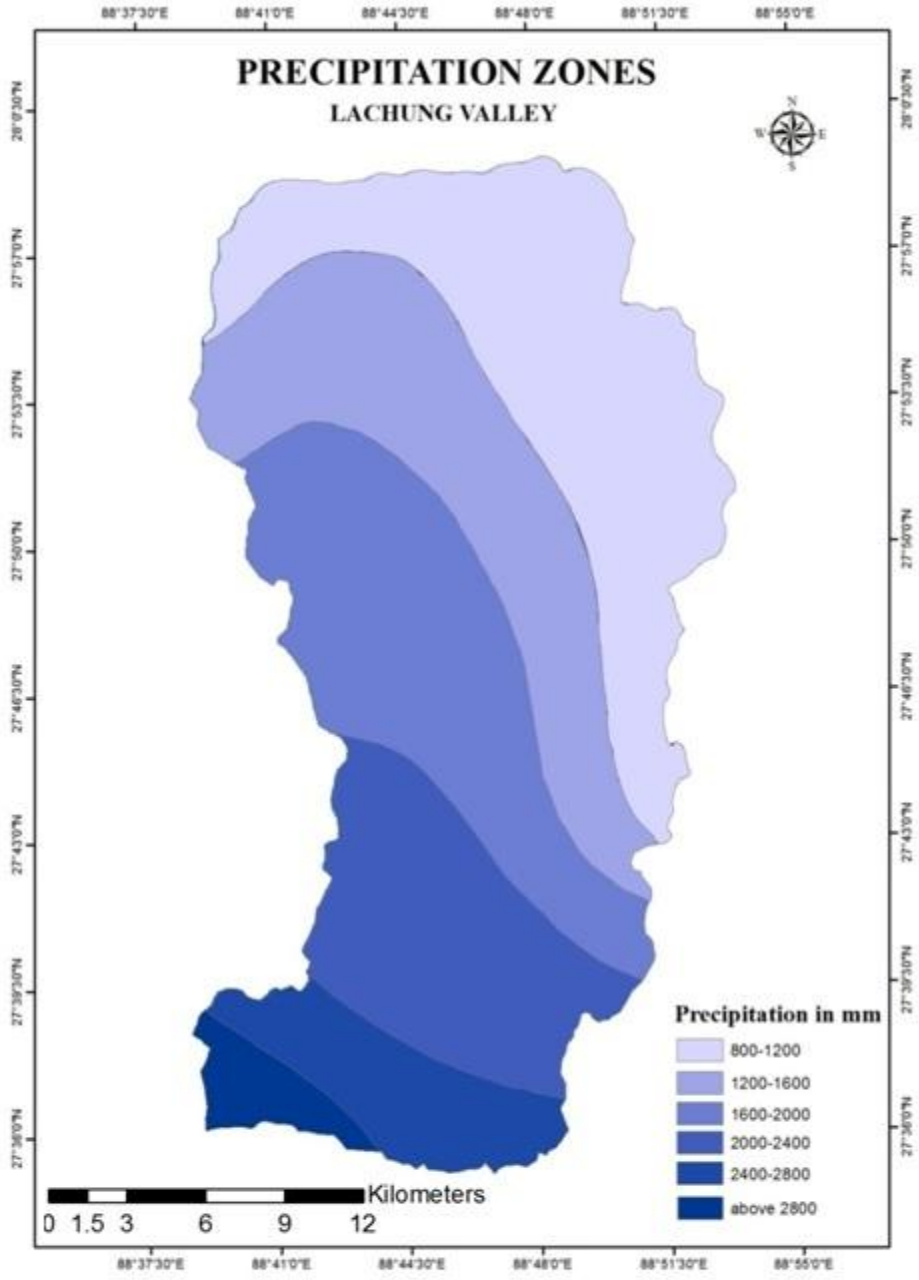
II.8.f Arctic type

This type of climate occurs in the extreme north western part of state where a number of snow peaks above 6000m are present. The snow peaks of Kangchendzonga, Kabru, Siniolchu and all the snow clad peaks are located in this climatic zone. The entire zone in this region is devoid of vegetation and animal life.

Thus the location of the valley has been as such that it experiences different forms of climate within the short distance of about 100 km. The differences in altitudinal variation within the shorter distance have made the ecosystem of the region more interesting in terms of understanding the issues of livelihood over the period of time. It provides opportunities as well as limits peoples' choices in different ways. Even the micro level variation of the valley affects the nature of vegetation, availability of rainfall and sunlight that are required for cultivation of crops.

The climatic variation that exists in the region makes it clear to understand the different forms and processes of human adaption and livelihood changes in the changing environmental condition of the valley. Hence it becomes essential to take all forms of natural environment into account while capturing the livelihood of the mountain community which to greater extent are influenced by environmental constraints.

Map II.5



Source: Adapted from the Department of Forest, Government of Sikkim.

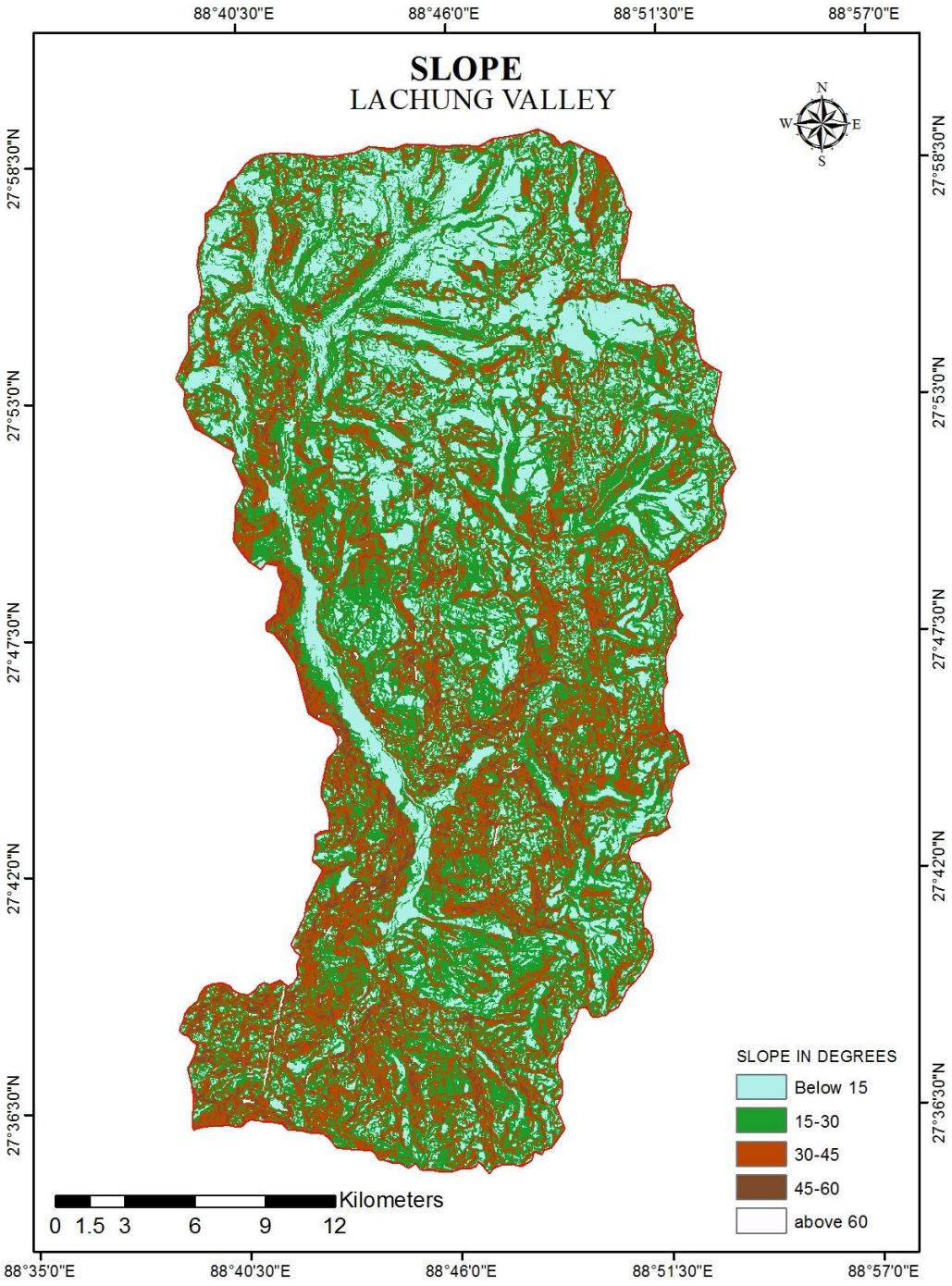
II.9 Precipitation

Precipitation has a major role to play when it comes to the issue of livelihood generation in terms of meeting the agricultural needs. The amount of rainfall that the region receives determines the nature of vegetation which indirectly links with the basic need of meeting the livelihood needs like firewood as fuel and other forest produce that are required for different purpose of construction and activities. Thus the scarcity of rainfall in any region indirectly has its impact on the livelihood needs of the population at large.

The variation of precipitation at different altitude can be clearly seen from the precipitation map. The entire valley can be divided into six precipitation zones in terms of different forms and amount of precipitation that the valley receives. The lower most part of the valley receives an annual rainfall of about 2800 mm and the mount of precipitation received by the region gradually decreases as one ascends towards the northern part of the valley.

Most of the human habitations are found till the region that receives the precipitation of about 1600mm in the valley. The precipitation in the form of rainfall can be seen till an altitude of about 3500 meters in the valley. The altitude higher than 3500 meters experiences the precipitation mostly in the form of snow during the winter months owing to cold climatic condition that exists in the region. The upper precipitation zone has very high ridges and permanent snow covered mountains and glaciated valley which experiences rainfall mostly in the form of snow. Thus, the variation in forms of precipitation has been observed from the lower to the higher region of the valley. Such variation in precipitation has largely shaped the nature and characteristics of livelihood adaptations and forms of livelihood generation mechanism by the community.

Map II.6



Source: Obtained from DEM

II.10 Slope

The general slope of the valley ranges from 15 degree to 71.3 degree. The slope ranging below 30 degrees have about 58 percent of geographical area in aggregate. The slope below 15 degree occupying the total geographical area of about 20.95 percent are seen to be covering the most of the settlement and the agricultural village in the lower elevation zone. Besides this the extension of slope below 15 degree are seen to have been occupying the region around Yumthang Valley.

The percentage of geographical area that lies in the slope ranging from 30 to 45 degree is 31.6 percent of the geographical area. Most of the human habitations are found in the slope ranging up to 30 degree. However few scattered houses are seen above 30 degree slope around the valley. Thus on an average it can be seen from the table that about 60% of the area that falls under the category of slope below 45 degree has been used by the population for various economic activities as well as for the settlement purpose.

The slope higher than 30 degree is found in the eastern and the western part of the valley. Though Northern most part of the valley has the slope below 30 degree, however due to harsh weather condition it becomes difficult for human habitation. Besides this most of the northern part of the valley has permanent snow field and bare rocky surfaces which limits the human settlement and other forms of economic activities to support the livelihood of the population.

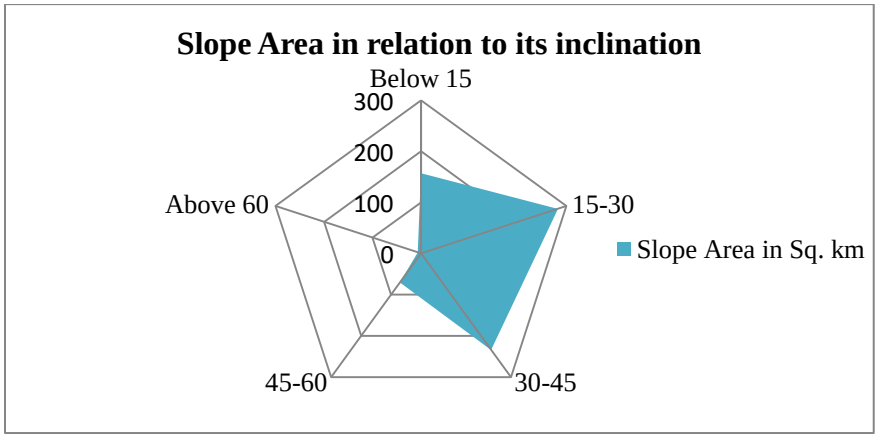
Hence the valley lies in geographically steep slopes and is surrounded by the mountain ranges with slop of more than 35 degrees with rocky surface which limits the actual land that is available for human habitations or any form of agriculture.

Table II.3 **Slope area of Lachung Valley.**

Slope in Degrees	Slope Area in Percentage
Below 15	20.95
15-30	37.63
30-45	31.16
45-60	9.36
Above 60	0.87

Source: Tabulated from the slope map and raster value of DEM.

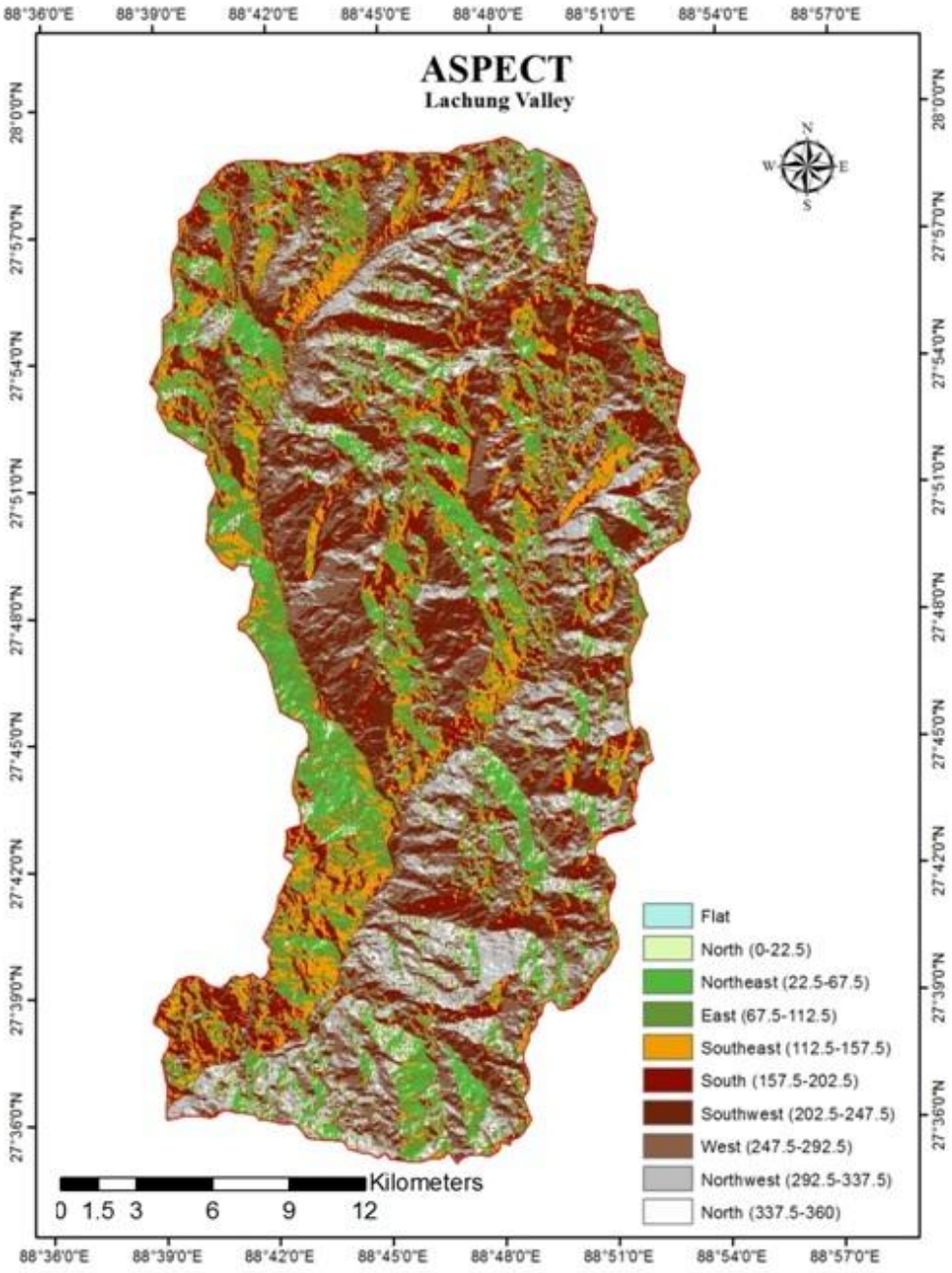
Figure II.1 Slope in relation to Valley Area.



Source: Computed from DEM Values

The above figure represents the surface area that falls under different categories of slope in the valley. It can clearly be said that most of the area of the valley falls within the slope below 45 degree. The total geographical area that falls below 45 degree slope is about 660 sq km of the total valley area which is about 87 percent of the total valley area. In general the valley occupies a good percentage of geographical area that is suitable for habitation however the actual area that are available has been fairly less due to differences in topography and micro environment.

Map II.7



Source: Obtained from DEM

Table II.4: **Aspect and Percentage of Geographical area in the Valley**

Aspect	% slope area
Flat	0.01
North	4.51
North East	9.42
East	11.88
South East	12.04
South	11.81
South West	15.13
West	17.16
North West	13.04
North	4.99

Source: Tabulated from the DEM data.

The table above shows the area of the valley with respect to the aspect. The aspect determines the face of the slope and the amount of sunlight that the particular face (direction) receives. For instance the west facing slope of the valley has the highest aspect value of 17.16 percent in the entire valley. Similarly South, East, South East facing slopes are considered to receive the maximum sunlight has the geographical area of about 35 percent of the valley area.

Thus the aspect shows the face of the particular slope with respect to its location. It is important to take slope and aspect into consideration while understanding the issues related to location and livelihood of a particular region.

Since the aspect determines the ability of a region to receive the amount of sunlight which indirectly relates different forms of economic activity like agriculture and animal rearing, hence it becomes important to consider the slope and aspect while understanding the physical setting o the region.

II.11 Aspect

Generally the East and the South East facing slope receives the maximum sunlight during the summer months due to which most of the habitat areas of the valley fall in this category. The hamlets of agricultural village (Lema and Khedum) are seen to have been its slope facing towards the south east direction. It is also apparent from the aspect map that the valley around Yumthang has its slope facing East and South easterly direction for which it receives good amount of light to support the vegetation of different forms.

Out of the 50 percent of the total area that falls under habitable category in the valley it can be seen from the aspect table that the east and the south east facing slopes cover about 24 percent of the total area of the valley. These categories of slope have well developed soil and receive maximum sunlight that is required for the growth of crops.

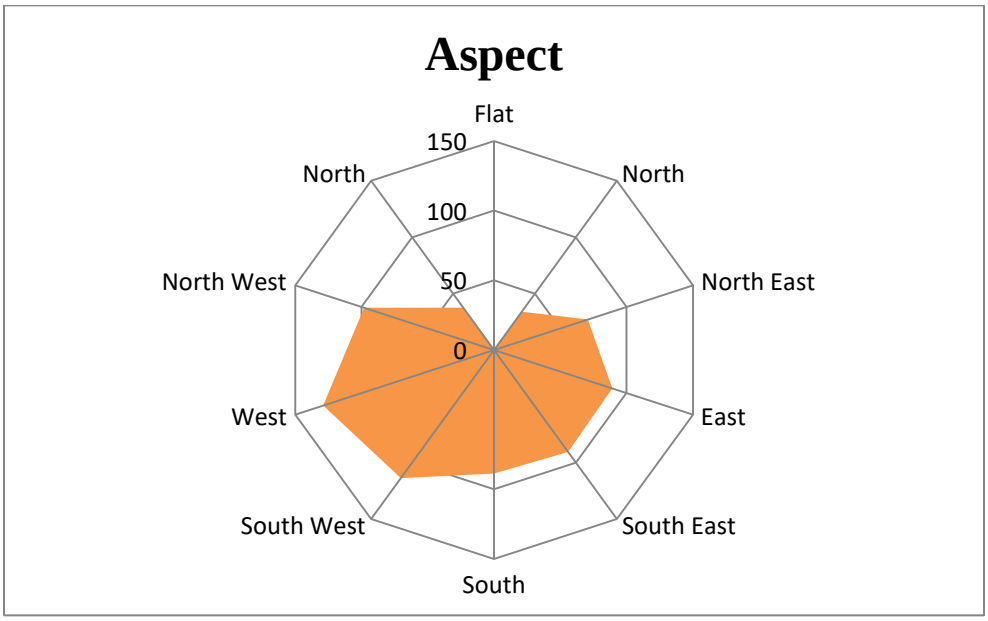
Hence the location of the valley has greatly helped the people to prefer agriculture as a means of sustenance during the past as well as at present. Besides this the region experiences the cool breeze throughout the year due the presence of glaciated valley within the distance of 100 kms from the valley. The valley slope that faces the east and south east direction receives the maximum light which blends the weather condition of the valley and makes it pleasant both for the population in the valley as well as the tourists from outside.

Thus from the table one can say that the maximum portion of the valley receives good amount of light owing to the fact that most of the habitable region falls in the category where the slope lies below 30 degree and the aspect in this zone has also been relatively good. Most of the higher elevated slope of the valley faces West, North and North West

and has the total geographical area of about 35% of the total valley area which is relatively cold both because of the aspect as well as the altitude of the region.

Thus as per the location of the Lachung valley is concerned, it has a favorable location in terms of steepness and its exposure to sunlight. The gradient being favorable in the valley has largely made the valley and the existing ecosystem suitable for the human habitation. The valley has today largely become the tourist hotspot mainly because of its favorable location and associated a physical factor that governs the local climate and other sets of physical parameters.

Figure II.2: **Aspect of Lachung valley**



Most of the valley area lies in the South west, west and North-west which receives relatively less amount of sunlight. However most of these slope lies in the higher altitude region above 4500 meters above mean sea level which is less preferred for habitation. Thus the idleness of the valley lies in the fact that it though lies at higher altitude of about

2500 meters but receives good amount of sunlight. All these factors support the growth of flora and fauna of different types which makes livelihood easier in terms of availability of basic goods required for meeting the need of sustainable livelihood.

Thus different factors act accordingly shaping the nature of livelihood adaptability of the population in isolation. The natural environment of the region largely affects the nature and pattern of livelihood strategies to be adopted which at times makes people in remote corners of the mountain environment make more vulnerable to different forms of catastrophes of different scale. The major causal factor and its various impacts on the population can be shown in the following table:

Table II.5: Factor Cause and Environmental impacts in the Mountainous region

Sl. No.	Factor Cause	Impacts
1	Altitude and Rugged Topography - Steep Slope - Loose material - Erosion and mass wasting	- Makes the population isolated - Restricts the mobility - Risk of environmental hazards - Restriction on land use pattern
2	Climate - Temperature - Rainfall - Snowfall	- Crop diseases and failure - Increases the risk of landslides and other forms of catastrophes - Limits the nature and type of cropping
3	Soil Condition -Poor Soil - Loss of soil by natural processes	- Mass wasting - Reduces the agricultural potential
4	Vegetation - Loss of vegetation for different use	- Accelerates soil erosion - Shortages of fuel wood
5	Natural Hazards - Landslides - Earthquake - Flash floods	- Loss of lives and property of the people - Damages the building structures, roads and other infrastructures

Thus the physical setting has important role to play in terms of meeting the livelihood needs. The natural environment of the region like altitude, slope and aspect, drainage, and other location factors largely determines the ability of the ecosystem to sustain the species of different types in it. When the location of the region is relatively far off from the markets and is isolated in terms of availability of market goods, the natural environment then has its role to play in terms of providing the goods required by the population. The way the population responds to the environment in terms of meeting the needs determines their ability to sustain. The level of technology implemented in the region determines its ability to produce thereby making the region more sustainable.

Lachung valley has its own locational advantage in terms of natural; environment. The soil condition, the micro climate of the valley, its scenic natural beauty has largely helped itself in maintaining the demands made by the population of the valley. It has supported the valley population by making the region suitable for the growth of different crops, horticultural products, livestock products and other forms of economic activity. However all these set of products that supports the valley need lies in the fact that it has suitable physical setting and natural environment.

Thus the issue of livelihood adaptability in the mountain ecosystem solely rests upon the nature of physical environment that the region has. In addition to it the ability of the population i.e. human capital also largely determines the ability of the population to make use of the resources. Hence understanding the livelihood issues in isolated region one must take note of the physical setting of the region which carves out the opportunity for the population to respond accordingly and meet their needs for sustenance.

Chapter III

Livelihood Dynamics: Insight into Theoretical and Methodological Issues

The complex process of interaction among the community and the resource user groups shapes their economic, social and cultural systems where the livelihood forms important element of it. Rural livelihood systems are the entry point to describe and understand change and responses to change in social- ecological systems. (Dekens, 2005)

The concept of livelihood is basically an approach of undermining the relationship between poverty and struggle for earning. The perspective of livelihood states how different people in different places live, and in recent times the approach has shifted its focus from rural to central development thinking (Scoones, 2009). The livelihood approach proposes to focus on peoples' strengths, abilities and capabilities. The idea is to build on people's strengths (i.e., existing assets) rather than to focus on peoples weaknesses (i.e., lack of assets) (Dekens, 2005)

Modeling of livelihood has a long history, with its roots in peasant studies by Chayanov, as well as other Soviet pioneers of development planning such as Bukharin. It later evolved through farming system studies of the 1960's farm management studies and wide range of micro-economic studies over the last thirty years. The linked notions of access to resources, income opportunities and access qualifications were developed in 1980s, and quantitatively modeled as an integrative decision making model (Scoones, 2000)

Until the mid 1980's and the early 1990's the livelihood approach, with its ground focus on studying the relation between the environment, poverty and rural development was poorly studies. It was after 1990 the international development agencies especially framed and refined the approaches in order to address the poverty issues that the livelihood studies gained importance.

(Chamber and Conway, 1991) focuses how resource management and sustainability are linked. Today the sustainable livelihood approach has become more of resource management and resource governance. The peoples' livelihoods are related with the external forces and threats which are then linked with its sustainability. The model developed by Chamber (1991) and Ellis (2000) focuses the role of different factors, agencies involved in making the decision of livelihood system. Sustainable livelihoods are those that can avoid or resist stress and shocks and/or that are resilient and able to bounce back.

The sustainability of livelihoods raises many questions. These fall into two groups: whether a livelihood is sustainable environmentally, in its effects on local and global resources and other assets; and whether it is sustainable socially, that is, able to cope with stress and shocks, and retain its ability to continue and improve. Sustainability is thus a function of how assets and capabilities are utilized, maintained and enhanced so as to preserve livelihoods (Chamber and Conway, 1991)

The livelihood approach makes it clear that livelihood system cannot be understood without taking into account the broader multi-level contexts and structure (i.e., cross scale linkages) (Dekens, 2005)

The notion of sustainable livelihood incorporates the idea of change and uncertainty and locates it analytically in the concept of socio-ecological systems. The latter can be defined as the space in which political, cultural, religious, social, economic, biological and geo- physical factors of an environment simultaneously interact with and in combination with each other to produce a variety of functions, processes and products, which shape the way a community makes its living in a given eco zone (Singh, 1996). At village or community level, a single livelihood strategy could not be applied, since different households will adopt different strategies according to their particular assets and access status (Ellis, 2000)

III.1 Methodological Issues on Livelihood studies

The livelihood studies itself have shifted to sustainable livelihood study over the past decade. The way the term has changed from livelihood to sustainable livelihood, there has been shift in the livelihood dimension. The involvements of different agencies, organization and institutions have been given more emphasis in the later stage. Most of the studies on livelihood have tried to link poverty with the peoples' capability with household survey predominantly dominating the methodological approach of livelihood. In so far as livelihood research is directed to the diagnosis of the cause of chronic poverty, the circumstances of poverty and the reasons for poverty should be understood through detailed analysis of social relations in particular historical context (Murray, 2001)

Livelihood research, has been carried out at the micro-level that of 'households' and 'communities' and has involved empirical investigation of combinations of modes of

livelihood and above all, of relationships between them (Murray, 2001). Most of the research on livelihood takes quantitative approach using the household survey as a unit of analysis. The household information on livelihood are quantitatively analyzed and modeled accordingly to trace the patterns of change over the years or to develop the policy for improving the peoples' livelihood. Quantitative methods were used to explain these patterns in terms of unequal power, exploitation and social discrimination (Bagchi, 1998). Thus the individual household forms the base for understanding the livelihood issues of any region that is shaped by the function of social and economic process at different period of time.

Core concept of livelihood research highlights the approach as 'people centered' in that the making of policy is based on understanding the realities of poor people themselves, on the principle of their participation in determining priorities for practical intervention, and on their need to influence the institutional structures and processes that govern their lives. Secondly, it is 'holistic' in that it is 'non-sectoral, and it recognizes multiple influences, multiple actors, multiple strategies and multiple outcomes. Livelihood strategies are competing among each other because livelihood objectives and priorities are diverse (e.g., short terms/ long, local /global, individual/household/community level (DFID, 1999).

Livelihood approach makes it clear that the ways of making a living are diverse; livelihoods cannot be confounded with jobs. A job constitutes a formal agreement where an activity or trade is undertaken in exchange for payment (cash), whereas a livelihood constitutes a broader concept (Dekens, 2005). Livelihood takes numerous micro elements

into account which therefore should studied emphasizing every element and household activities.

Thirdly, it is ‘dynamic’ in that it attempts to understand change, complex cause-and-effect relationship and ‘iterative chains of events’. Fourthly it starts with analysis of strengths rather than of needs, and seeks to build on everyone’s inherent potential. Fifthly, it attempts to bridge the gap between the macro and micro levels. Sixthly, it is committed explicitly to several dimension of sustainability.

(Elliis, 2000) have combined the survey and participatory methods in understanding the livelihood. The combination of these two techniques in livelihood research can help in providing the better insight into the critical issues of livelihoods of poor. Ellis carried out his research in Tanzania through FGD, Participatory wealth ranking exercise and through sample survey of household income from farms and non-farm activities. Quantifying different livelihood assets as a means of survival has also remained as one of the way of understanding the household level of sustainability.

Livelihood research takes into several elements of household assets into account thereby quantifying them in different measurable variables and analysis are drawn based on variables. However these are inappropriate without taking other social processes into account as the interaction of different social and cultural environment into account. Unless we understand the social structures and process through which sustainable livelihoods are achieved, a description of the relationship between the variables and outcomes are somewhat limiting (Scoones, 1998)

III.2 Institution and Livelihood outcomes.

Institutions are the social cement which link stakeholders to access to capital of different kinds to the means of exercising power and so define the gateways through which they pass on the route to positive or negative [Livelihood] adaptation (Davies, 1997) Understanding institutional process allows the identification of restriction/barriers and opportunities (or gateways) to sustainable livelihood (Scoones, 1998). By restricting and acting as barriers to various resources user groups the institution indirectly functions as the base for regulating the livelihood of the community.

Exercising the control over the resource, forming certain norms and regulations institutions keep the mechanism of livelihood generation stable both at the higher and the lower level based on the level of development of a particular region. An insight into social relationships, their institutional forms (both formal and informal) and the power dynamics embedded in these is therefore vital. Power relations are embedded within the institutional forms, making contestation over institutional practices, rules and norms which are always important. (Scoones, 1998)

Institutions are dynamic, continually being shaped and reshaped over time. This characteristic of institution and flexibility within it allows people and their resources to have balance thereby preventing disruption in the phase of instability. To capture change at interface between social and ecological systems, particular attention needs to be paid to the institutional dimension of livelihood change and cross scale linkages (Dekens, 2005)

III.3 Asset Based Livelihood

Assets may be described as stocks of capital that can be utilized directly, or indirectly, to generate the means of survival of the household or to sustain its material well- being at different levels above survival (Ellis, 2001).Within domestic cycles different combination of strategies may be pursued sequentially, depending on changes in dependency ratio, health condition and other factors (Scoones, 1998) These assets have been named differently in different works. For instance Maxwell and Smith (1992) in a food security context divide assets between productive capital, non productive capital, human capital, income and claims. Reardon and Vosti (1995) termed these assets as natural resource assets, human resource assets, on farm physical and financial resources and off-farm financial and physical resources.

The livelihood framework shows that resource access (e.g., land, water, forest) and access to assets in general alone does not always ensure sustainable livelihoods since resource access may not allow for access to the benefits obtained from the resources (Dekens, 2005). Thus, it the combinations of different factors like institution, social relation and organizations at different levels that makes livelihood sustainable. Livelihood resource may be combined creatively and innovatively often in complex ways, to create more livelihoods in a particular area (Sconnes, 1998). Hence making the livelihood sustainable to large extent depends on the peoples' choices and willingness. It therefore becomes very important to take note of household and community participation while understanding the basics of livelihood.

More assets any household has access to, the less vulnerable they will be to any forms of negative effects of the trends and shocks or to seasonality, and the more secure their livelihood will be. Households vary not only in the profile of assets that they hold, but also in their capability to substitute between assets when confronted by change. Assets that can freely be converted into cash that is then utilized to purchase other assets provide considerably more livelihood flexibility than assets that cannot be substituted (Ellis, 2000). Though the assets have been termed differently by different researchers in their work but the very idea of their work reflected on availability of different means of survival needed by humans.

III.3.a Natural Capital:

Natural capital refers to all those natural resources that are utilized as a means of living. For example land, water and biological resources fall under the category of natural Capital. Natural capital is enhanced or augmented when it is brought under human control that increases its productivity, as has occurred since the beginning of sedentary agriculture with the evolution of farming system. Some locations, for example , hilly and mountainous zones can represent rapid changes of gradient over short distances, allowing for high spatial diversity in livelihood niches: other locations for example, semi arid, flat terrain allow for less spatial diversity in the natural resource based component of human livelihood.

The valuation of natural resource is of prime importance in understanding the livelihood especially in the remote villages with majority of its population based on primary activities as their prime means of survival. Natural capital produces a significant portion

of the real goods and services of the ecological economic system, so failure to adequately account for it leads to major misperception about how well the economy is doing (Herman, 1992).

Natural capital is the spectrum of Physical assets within the natural environment that deliver economic value through the ecosystem services (Verma, 2008). The stability of livelihood system today mostly relies on the availability of natural capital. Access to natural capital of different types and at different level gives stability to the livelihood system.

III.3.b Physical Capital:

Physical assets comprise capital that is created by economic production processes. Buildings, irrigation canals, roads, tools, machines, and so on are physical assets (Ellis, 2000). Thus the physical capitals are part of those assets that helps in production of other economic goods. It is worth noting that physical capital can substitute for natural capital in many circumstances. Indeed, the entire long term process of technological change coupled with industrialization and urbanization is one in which physical capital cumulatively substitutes for natural capital over time. In economic terms the house in which the individual live may not necessarily be physical capital however if the house is used to generate income by various means such as renting out or other activities may be regarded as the physical capital.

The important characteristics of physical capital are that, it tries to improve the livelihood options available to the people. For instance the roads and other infrastructural facilities provide opportunities to the people to move and trade thereby making their means of

living. Thus the livelihood diversities are the indirect benefits that the people get out of making use of physical capital at their level.

Physical capital is therefore most important for the community which is remotely based such as the mountain and the hilly landscape of the world. Availability of physical assets such as good network of roads supports directly and indirectly the population and their resource thereby improving their livelihood standards.

III.3.c Human Capital:

Human capital as defined by Carney (1998) refers to the labour available to the household: its education, skill and health. Human capital is thus the ideas that the people in rural acquire in due course of their living. Human capital usually improves with the investment by the government in the sector of education, health and training. Public education and health services are macro policies designed to raise the level of human capital across the country as a whole (Ellis, 2000).

The importance of human capital in livelihood studies cannot be studied as a separate or distinct field. The knowledge possessed by the people which are important component of Human capital helps in building the other forms of capital thereby making the population less vulnerable to different forms of risk. Educated person not only acquire productive skills, but they learn how to learn which enables them to deal with a changing environment (Kass, 2007). The investment made in this sector enables the population in the long run to make wise use of other forms of capital thereby reducing the poverty and vulnerability of the population groups.

Thus human capital is also the essential capital which is often seen at the later stage of development and with the awareness of the population about the importance of education in human lives. Human capital raises the ability of the population to make wise decision in every sphere be it in formulating policy or making the household choices.

III.3.d Financial Capital:

The sustainable livelihood as (Hann, 2000) depends on five assets of capital namely Human, Natural, Physical, Financial and Social. These capital based asset influences the peoples' livelihood. These assets are linked to one another which indirectly shape the peoples' ability to meet the means of living. The researchers concerned with poverty reduction, sustainability, and livelihood strategies follow the version of 'assets-mediating processes-activities'

The livelihood can be best understood when its different components and elements are studied specifically under different categories. The classification of different assets will help in understanding the livelihood aspect more clearly and its shortcomings can easily be identified. Identifying the assets that are weak or lacking under each category of assets, as well as those that are deteriorating over time due to adverse processes, either in the livelihood strategies of households individually, or in the collective community-level management and utilization of natural resources can help in making the decision pertaining to livelihood sustainability.

Carney (1998) proposes a schematic approach in understanding the livelihood of social group categorizing them under different assets. The idea of understanding the livelihood of individual household or the community in fact revolved around these sets of assets

which later was quantified and understood based on indexing by different economists. Since the livelihood of the community revolves around the access to five main assets which basically was refereed as livelihood pentagon. Different assets were represented by five vertex of the pentagon where the centre of pentagon represented the zero level of wealth.

III.3.e Social Capital

The term Social capital attempts to capture community and wider social claims on which individuals and households can draw by virtue of their belonging to social groups of varying degrees of inclusiveness in society at large (Ellis, 2000). Social capital is the part of social relationship within which the individual household in a society builds up in course of their lives (Putnam, 1993) envisages social capital as consisting more of horizontal social groups such as association, clubs, and voluntary agencies that bring individuals together to pursue one or more objectives in which they have a common interest.

The shared identity plus the repeated interaction through participation in the network means actors get caught up in the set of rules that both assist certain sorts of action and limit others Social capital is embodiment of cumulative effect of human activity, it facilitates productive activity when combined with other forms of capital; it can be wielded as actors pursue their given objectives; and it can contribute to the creation of other types of capital. (Bebbington, 1999)

Moser (1998) defines social capital as reciprocity within communities and between households based on trust deriving from social ties. Swift (1998) explains social capital is

made up of both of networks of association and elective relationships between individuals, which may be vertical as authority relationship, or horizontal as in voluntary organization, and of the trust and expectations which flow within those networks. Thus the livelihood strategies adopted by the community is the part of the functioning of the social groups in any region. In due course of functioning the relationship that the household attains in the society acts as an asset for the livelihood generation at large. The reciprocity within the community helps strengthening the social relationship as well as maintaining the household livelihood generating ability.

Social capital is clearly the most difficult to described in any other broad qualitative terms (Bebbington, 1999). The nature of social capital is as such that it becomes difficult to categorize or understand easily however it is one of the most important element of the society and cannot be neglected while understanding the livelihood research. A community low in social capital as manifested by weak networks and associational activities, poorly performing or perfunctory organizations, and little reciprocity occurring between households, seems also likely to be one that offers little scope for negotiating access to assets, and experiences weak management of common property resources (Ellis, 2000).

Livelihood thus is the function of intertwined processes among natural, human, financial, physical and social capital. It is therefore difficult to rely on individual capital in understanding the livelihood processes. The different capital as mentioned are interrelated in such a fashion that the outcome of one capital at times results into the other forms of capital which directly or indirectly is related to livelihood of the community at large.

Carney in his approach tried to show the strength and weakness of every capital and tried to map the livelihood of the community and the individual households. Livelihood represent particular challenges for limiting the scope of empirical enquiry this is due to complex interrelationship between assets, access and activities, making it more difficult to decide what factors to include or exclude from the investigation. Livelihood framework may not directly solve the problems related to livelihood generation or adaptations however it may suggest a way of organizing and identifying the key components (assets, activities and processes).

The framework encourages direct attention to be directed at assets. Understanding these assets and their access to different population groups helps in making the policy and implementing the financial aid to different capital specifically based on their level of availability. The availability of any capital in surplus can help in utilization of such capital thereby focusing on the scarce resource to balance and reach the level of sustainability.

III.4 Processes involved in Livelihood Strategies

Livelihood processes and strategy is composed of number of social, economic, and political factors. Scoones (1998) divides these factors into two categories name condition and trends on one hand and institutions and organizations on the other. Condition and trend includes history, politics, economic trends, climate, macro ecology, demography, and social differentiation. Institution on the other hand as per North (1990) is the formal rules, conventions, and informal codes of behavior, that comprise constraints on human

interactions. Different livelihood pathways are evident over different time scales. Over seasons and between the years, variation in options emerge (Scoones, 2000).

The institution stabilizes the interaction of the community within set of frameworks and reduces uncertainty in the society. Institutions tend to change slowly and incrementally, rather than in discontinuous jumps, even during or following social upheavals. Social relations, institutions and organization are critical mediating factors for livelihoods because they encompass the agencies that inhibit or facilitate the exercise of capabilities and choices by individual or household (Ellis, 2000).

The inter relationship between the assets, livelihood processes and activities are influenced by several events and households circumstances. The trends can be population growth, changing density, migration, changes in agricultural technology, growth of non-farm activities, changes in prices of the commodity that has its impact in the economy. These trends may turn favorable or adverse. Researchers basically try to relate trends and patterns of development and link their work with sustainability by measuring it in different quantitative terms.

Livelihood strategies are dynamic; they respond to changing pressures and opportunities and they adapt accordingly. These activities are natural resource based and non natural resources based. Household based on natural resource activity differ from households based on non natural resources. Based on the nature of activity Scoones (1998) has classified livelihood strategies as agricultural intensification or extensification, livelihood diversification, and migration.

The concept of sustainable livelihood is a composite of many ideas and interest. At any scale, livelihood are composed in complex ways, with multiple and dynamic portfolios of different activities, often impoverished as part of an ongoing 'performance' (Richard 1989)

Scoones (1998) in his work identified five key elements in understanding the livelihood outcomes which emphasized on elements like creation of working days among the rural household as a livelihood strategy. Poverty reduction strategy measured in terms of income or consumption level of household both in qualitative and quantitative aspect can help in reducing the poverty. Besides this the well being and capabilities of the household should also be taken into consideration while understanding the livelihood. Lastly livelihood adaptation, vulnerability and resilience are to be taken into account for coping with livelihood stress and shocks. Natural resource base and sustainability are the important aspect of understanding the livelihood of the individual household and community at large.

It is the interaction among different livelihood asset that makes the livelihood more sustainable based on their uses at different levels of interaction among the population. Tracing the past history of events gives clear understanding of different process operating over the time. This makes historical approach central to any analysis (Scoones, 1998).

Thus a livelihood issue encompasses several activities into account. These activities are woven in social, cultural, economic and political dimensions. It therefore becomes complex in understanding the process that operates and brings changes in livelihood aspects. Researchers engaged in livelihood issues therefore needs to take the social

history, economic trends cultural aspects and political roles into account in order to understand the functioning of livelihood system.

The methodologies should be case specific. The nature of operating process and the outcome of such processes needs to be clearly identified in order to understand the issues of sustainability of livelihood. Multiple dimensions of livelihood that operates at different levels must be tracked and several methodologies must be implemented at different level in order to understand the complexity of livelihood processes. Hence the task of identifying the livelihood complexity needs careful understanding of the history and the nature of activity carried out in the past and tracing the changes and the process operating along with it.

It is therefore important to understand that research on livelihood does not necessarily depend on particular method. It needs multiple methodologies at different stages for drawing the clear picture of the phenomena. Different agencies, processes act simultaneously which needs careful attention and relying on particular set of method may not yield satisfactory outcome.

Chapter IV

Land Use and Economy

Livelihood primarily depends on the availability of resources in the region. The availability of the resource in the region depends on several factors which forms the base for livelihood adaptation among the population. Land use on the other hand is a synthesis of physical, chemical and biological system on one hand and human/societal on the other hand**.** In remote mountainous area where technology is generally of low level, land holding size acquires great importance. The changes in pattern of land use takes place to meet the demand of population which are observed in the form of growing settlement, conversion of wasteland into agricultural land, or changes that suit the purpose of the population at large.

The change in land-use has the direct relationship with the changing economy of the population. The changing land under different uses generates various source of living among the population thereby increasing their ability to meet their livelihood needs. The mountain environment itself represents a fragile environment with poor economic base for the population inhabiting in the region and the livelihood associated in such environment needs a proper attention. The weak resource base at times fails to meet the need of the population that results in various forms of poverty and inequality. Mountain livelihoods are therefore more vulnerable in terms of its resource base as the external environment limits households ability in different ways depending on which people adapt to them differently.

IV. 1 Historical overview of Land Distribution in Lachung

The valleys of Lachen and Lachung were also private estate of Queen at the time of Campbell's visit, but later it was reported by Das that these were assigned to Dewan (Bhasin). As the people of the Lachen were not happy with Dewan's administration the valleys were then returned under the rule of Maharaja Kumar of Sikkim.

The land in Lachung valley had strong community regulation with family ownership over it. They had communal pastures and forest with common ownership of grazing and land usage. The ownership of land belonged to the individual family but however its sell and purchase to outsiders were regulated by village council (Dzumsa)[6].

Even the specific time for sowing and harvesting of were fixed at the meetings of the Dzumsa to utilize the resources in organized way and maintain the equality in its distribution. The land distribution system of among the Bhutias in Lachung was known as (Sago)[7]. The members of the concerned ethnic group had the right to make use of land with the permission from the Pipon. In case of disputes over the land holdings, the Pipon possesed the right to solve the disputes among the land holdings among members of Dzumsa.

IV.2 Land holding among the Lachungpas

Bhutias of Lachung have no title to land. They cannot sell land, but have only the right to use the fields (Bhasin: 185). The animals were seen as the most important asset of the

[6] Dzumsa refers to the system of governance in Lachung where the head of it was elected annually. The headman of the village are elected by the members of the village who is generally referred as "pipon" who had the right to control over the administrative activities of the village.

[7] Refers to the system of land tenure among the Lachungpas with Pipon as its head and where the state has no power to control over the land possessed by the people in the village.

household. Every household were responsible for the payment of taxes to the Dzumsa. The tax to be paid by the people depends on the Pipon who fixes the amount to be paid by the individual household on the basis of the land they posses. There exists equal division of land among the son whereas the daughters are devoid of such possession. However, in cases of only daughter she can possess the land with the permission of Dzumsa. The eldest son has the right to possess the house of the father at the time of property division.

Even the household property's other than land i.e. animals and other form of property were divided equally among the sons. There are no landless labourers and tenancy as such was not allowed in Lachung. People do lease out some land to needy person but without any interest. Loans are also given without any interest.

The head of the state being the Raja had power over his territory over areas in Lachung. The taxes to the Raja was in fact not fixed but had to be paid by Lachungpas in the form of kind rather than cash. The payment of kind was yaks, blankets Toho[8] and salt. In addition to this, the people served Raja as porters whenever called upon to do so. Royal family of Sikkim until 19th century had a customary to visit Chumbi valley in the summer month. During the visit of the Royal family in Lachung, the people in Lachung had to provide with free transportation for the Royal couple. The people took them to Geree in Tibet. From there the people of Dobta carried them thence to Chumbi in six stages. The British stopped this practice when they took over control of the Sikkim administration in 1980. The yaks received in the form of kind from the people were left in village of Lachen and Lachung. These Yaks had to be reared by the people who were paid regular

[8] Tuber of a plant found in the higher altitudes that were used as food.

for their labor to graze them. The pasture of Tibet as well as Sikkim was used by the Bhutias as there was no restriction in the movement of Yaks in the border of Tibet and Sikkim. They paid dairy products like curds, ghee, ponies, yaks, and blankets to the Raja of Sikkim while on the other hand the taxes paid to Tibet by the herders were shingles, bamboos, dye, stuff and also in dairy products. After the introduction of money, the people paid the sum of Rs. 800 to Sikkim Raja as a revenue for the two valleys. However at present the taxes are paid according to the Government rules.

Thus, the nature of land holding among the Bhutias' of Lachung was based on the type of relationship that the people had with the Rajas of Sikkim. There existed the community participation in managing the land within the village level, where the Pipon was the head having the control over the land use and land holdings among the Lachungpas. On the other hand at higher order, the raja was the supreme head that had the control over the entire valley of Lachung.

Land distribution pattern among the Bhutias' of Lachung had influenced effective land use. Among Lachungpas, the land redistribution was done after every three years. This system of redistribution was done in order to avoid unequal distribution of good and bad land. Thus, there existed equality in the resource distribution among the Lachungpas which in other way favored the harmony among the population in the village.

One can thus say that the existence of the community in the valley had close association within the social system and the nature of economic prosperity largely depended on the type of relationship that the community had with their king who happened to be the highest authority of the Valley.

IV.3 Economy and Livelihood of Lachung

Lachung's economy was primarily based on agriculture and animal husbandry. Agriculture was grown in the valley while animal herding was the other source of livelihood. Animal formed the backbone of the households' economy and formed the economic security. Crops that were grown were buckwheat, wheat, turnip, peas and potatoes. In addition to this the products that they obtained by rearing Yaks i.e., Milk, Meat, Fats, and other dairy products provides enough income for the household to function. The number of Yaks that were reared in the valley was enough to supplement household economy along with agriculture.

These nineteenth- century accounts show that the valley was self-sufficient in terms of meeting their daily needs. The income from animal rearing, and agriculture provided them sufficient income to run the households need of food, clothing and shelter. The fodder from Sikkim as well as Tibet provided people to have the animal assets as much as they could. This provided huge opportunity for the people to have sufficiency in terms of meeting their daily requirements.

Thus, the region had numerous opportunities when it came to available options for livelihood. Lachungpas were well endowed with abundance of natural resources and land that were used for settlement and agricultural practices. In addition to this the trade that existed helped to strengthen the households' ability to meet the livelihood. The participation of both male and the female members of the households provided greater flow of cash in the households' thereby making the community self sufficient in their own isolated landscape with their own system of governance and administration.

IV.3.a Border issues and Setback to Livelihood of Lachungpas

With the closure of the border in 1962, the Bhutias of Lachen and Lachung suffered greatly. Many of their yak and sheep herds were seized by the Chinese, when the Bhutias were on their seasonal migration under the ancient trans-border pasture agreements. Their trading activities across the border also stopped (Bhasin V, 1989). With the closure of the border the limitation was imposed on the livelihood of the people.

The Chinese also prevented the Bhutias of Lachung from using pasture land in Tibet, causing heavy losses in their herds due to the lack of adequate alternative pasture areas. Military encampments, supply bases, and defense posts were set up in the Northern border area. With the closure of the border the very lifeline of the people was sealed.

The closure of border not only restricted the pasture but also seized the Yaks that were grazing in Tibet during border closure. Animals spent most of their grazing months in Tibet and few months in Lachung. Thus the people had to lose their huge assets which itself other way affected the household economy Lachung Valley. The closure of the border thus affected the people in the valley.

The grazing zone was limited in one hand, on the other hand cross border trade that helped people to trade their goods across the valley was restricted. Thus, the people in the valley had to change their lifestyle and livelihood strategies in many ways. The sudden changes that occurred in the valley restricted the people in terms of limiting their livelihood in many ways.

The restriction of trade across the border have reduced the livelihood opportunities and transformed these transhumance practitioners into a settled agriculturalist thereby

bringing marked changes among the socio-economic environment of the valley. The restriction of opportunity was as such that it even brought changes in the household level and even restricted the women participation in contributing the households' income.

IV.3.b Women Participation and Household's Economy

Women in Bhutia society has a great contribution in terms of managing the household as well as contributing to the family's income. The trade that existed between Tibet and Lachung had indirectly involved women in contributing the households' economy in Lachung valley. With the wool imported from Tibet, Lachungpas wove carpets, blankets, on their own.

The closure of border gave a setback to the traditional handicrafts in the valley. The unavailability of wool in the valley from Tibet affected the role of women in contributing to the household needs. The wool that was imported from mainland India was of poor quality which significantly discouraged women from weaving it as there was plenty of it available in the markets. Thus, the demand for Tibetan wool woven commodities significantly reduced due to unavailability of wool thereby affecting even the participation of women in contribution to households' economy.

The closure of border to great extent was a setback to the involvement of women workforce in economic contribution of the household. Lachungpas' had to suffer the losses in the form of shrinkages in the grazing land for their herds, in terms of size of land holdings, loss of trade across the borders, loss in terms of contribution made by women in terms of household's livelihood.

The impact of closure of border on Lachungpas Livelihood has been shown in the following table:

Table IV.1 Major Events that changed the Livelihood of Lachungpas.

Major Event	**Changes on Lachungpas Livelihood**
Closure of Border (1962)	• Loss of herds • Decrease in land available for pasture • Decrease in size of land available for agriculture • Restriction on trade across the border • Restricted women's Participation in households economy
Opening of North Sikkim for Tourism (After 2001)	• Easy flow of goods and Services in Lachung • Tourism as an alternative source of livelihood • Easy Marketing of farm crops to distant markets in Mangan and Gangtok • Improved access to transport and communication • Options for livelihood diversification available even among the poorer households • Greater flow of financial capital in the valley • Improvement in the functioning of *Dzumsa* through taxes. • Improvement in terms of availability of resources like firewood, water supply and other social activities through effective resource management.

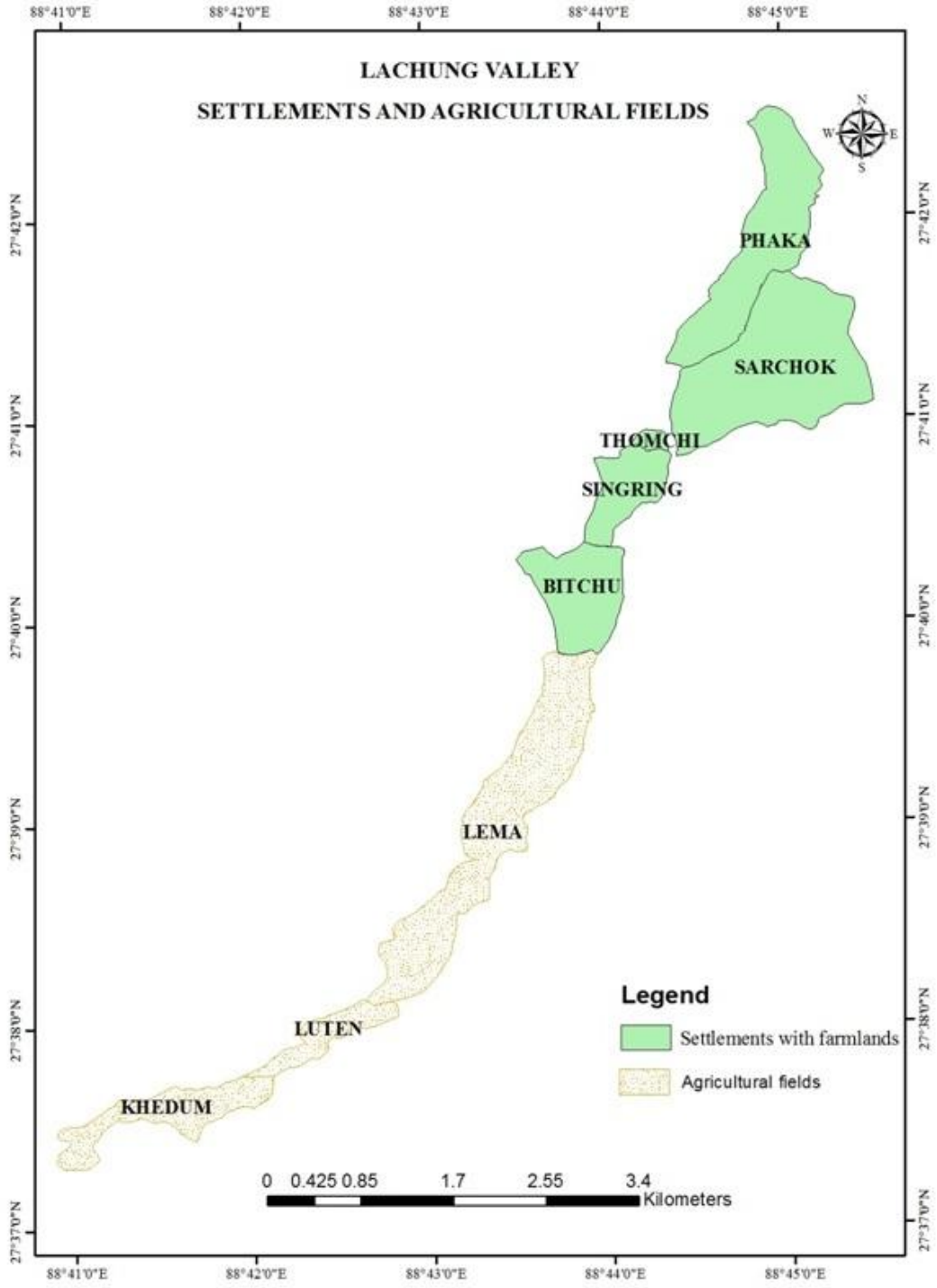
IV.4 Traditional Livelihood and issue of Governance

The traditional livelihood of the Lachungpas was more closely dependent on the natural resource base. They were self-sufficient as it had low population base which the available resource had the ability to provide them with the needs of the people. The functioning of the *Dzumsa* was as such that resource management and equity in resource distribution was well maintained at the village level. This functioning not only helped in maintaining the equity in resource distribution among the population but also helped in retaining the identity of Lachungpas in the isolated region of the state. The adaption to the natural environment of the community reflected their ability to cope with the any form of stress evolved out of natural calamity.

The literature available from the works of Bhasin and Campbell reflected that there existed close relationship of Lachungpas with their natural environment. Their livelihood dependencies were directly linked with the agricultural fields and pasture land. The size of herds reflected their status in the village. The closure of the border had severe impacts on the livelihood of the Lachungpas.

Most of the population had to depend on limited source of income generated from the agriculture and animal rearing. Agricultural products were mainly for the domestic consumption while the animals formed the households' economic security. Hence, the Lachungpas after the closure of the border had to sustain themselves with the limited resources available to them. The household had to adapt to the changing scenario in the village. Lachungpas therefore had to be managed their livelihood within the limited resource base and existing political scenario.

Map IV.1 Location of Settlement and Agriculture Land in Lachung Valley



Source: Obtained from google map and GPS locations.

IV.5 Livelihood Scenario in Lachung Valley

The entire valley can be divided into three major divisions i.e., The Upper valley, Middle valley and the Lower valley. Upper valley encompasses the region above (altitude). The middle valley encompasses the region extending from Bitchu to the region above Phaka (habitable zone of the valley). The lower valley comprises of the region below Bitchu and extends until Khedum. The lower region comprises of agricultural field of the people of Lachung. This division of land was done to make best use of agricultural fields.

The middle valley comprises the hamlets of the population residing in the valley. The habitable zone extends for the distance of about 5kms. It comprises of houses of Lachungpas with small garden sized field where vegetables and crops are grown. The crops grown in these small patches comprises of seasonal vegetables, pulses and food grains. The women are seen to be mostly engaged in cultivation of land. Besides making use of land the women take care of household chores. The organic fertilizer derived from the animals make the soil rich which yields higher productivity even in the small patches of land around the houses.

Plate IV.1 **Women making her agro product ready for Sale in the Market**

Source: Field Survey, June 2016

Every household has fenced field around their houses mostly made up of stones to prevent domestic animals from damaging the crops. The crops that are grown in this patch of land are mostly for the domestic consumption. Very few houses sell these crops in the distant market around Mangan and Gangtok. Mostly potatoes and other green leafy vegetables are sold in the market. The demand for these crops is high in the market as these are organic in nature. The women in the house thus have the important role in managing the field as well as the household activities.

The lower valley comprises of agricultural fields of the people residing in the middle valley. Lema, Luten and Khedum are the three farmlands of the people. Every household residing in the settlement zone posses the land in the lower valley. The fields here comprises of stone fenced wall with spiny bushes to prevent the animals from grazing the crops. Every fenced land has the small huts in one corner of the field where the *gothwalas* (caretaker of fields and herds) live.

The people from the middle valley come to their respective fields every morning and work in their fields and grow different crops and vegetables which itself contributes to households economy. The *gothwalas* look after the domestic herds and graze them rotationally to add the fertility to the soil. The *gothwalas* keep their animals in these three agricultural fields for four to five months (i.e. December to April) and move to the upper valley with their herds to make use of fodders after the passage of winter months. Thus the people from the middle valley walk to the lower agricultural fields to grow crops and vegetables early morning and move to their houses in the evening.

However, *Dzumsa* controls the systems of moving the herds from upper to the lower valley. This system of land distribution and division has made the people in the valley sufficient in terms of meeting the demand of every household. Sufficiency in food crops is achieved by making use of the land in the middle and the lower valley with lower valley contributing to greater share of the productivity. Hence the system of governance had the important role in generating the livelihood of the people in the valley.

IV.6 *Dzumsa* and its Functions

Dzumsa had been one of the most primitive institutions operating in Sikkim. Their origin existed since the origin of this community in the Valley. It had been able to win govern the valley since the past. The Pipon as the head of *Dzumsa* had a power to control the resources and govern the valley thereby keeping good relation with the *Chogyal*[9]. Pipon as the representative of the community was the intermediary between the people and the *Chogyal*. Apart from keeping the community together, the Pipon as the representative head of the community visited *Chogyal* and paid the taxes in the form of cash and kind thereby able to maintain good relation with *Chogyal*. *Dzumsa* had been performing various functions in terms of keeping good relation with *Chogyal* to resolving the disputes and making use of environmental resources keeping the community together.

However, the functioning of *Dzumsa* has undergone several minor changes over the years. Despite of the changes that have occurred over the years, it has been able to maintain its local ethos, which still distinguishes Lachung and Lachen in terms of its administration and resource governance. The local administrative system (Dzumsa) is

[9]The king or Raja of Sikkim was referred as Chogyal by the people.

strong enough to unite its people in the valley and govern and manage the resources and administer the village. The functions of *Dzumsa* in the valley can be listed as below:

IV.6.a Administrative Function

The village development action plans and schemes are controlled by *Dzumsa*. The *Dzumsa also* posses the right to administer the size of land holdings among the Lachungpas. It conducts meeting on regular basis and the problems arising in the villages are discussed. Besides this it administers the development activities that take place in the valley. Funds are raised and taxes collected by *Dzumsa* are used for productive activities in the village. Most of the developmental projects in the village come under *Dzumsa* and the Pipon along with the *Ghyapen* (Secretary) takes the initiative of working with the project based on the necessity of the particular village. Thus the function of *Dzumsa* is not only limited to administer the land holdings but also extends towards executing and monitoring the overall plans and projects that come to the village.

IV.6.b Resolving the Disputes and Conflicts

All disputes arising in the village are solved by the dzumsa. Very few cases in the village are handed over to the police. Most of the conflicts and disputes are solved within the *Dzumsa*. The dispute arising out of land distribution, disputes on property division and other conflicts are resolved by *Dzumsa*. The decision of *Dzumsa* on disputes cannot be challenged as it forms the collective decision of the community. *Dzumsa* at times holds the meeting twice based on the nature of disputes that emerges in the valley. The decision of the *Dzumsa* often remains fair as it is the highest authority in power in Lachung.

The function of *Dzumsa* in terms of solving the dispute has been captured from the narrative from the field as narrated below:

"We are happy that the Dzumsa exists in our valley. We solve our problems within the community and Pipon always gives the fair decision". **(Tshering Lachungpa, 42)**

The power vested on *Dzumsa* therefore has been very vital as the decision given cannot be challenged and the people are satisfied with the role of *Dzumsa* in terms of getting the justice. Hence there exist the trust to the institution and its role which therefore makes people contented with the role of *Dzumsa.*

IV.6.c Resource Management:

Dzumsa has the power to make use of resources available in their region. Even the seasonal grazing for the herds is managed by *Dzumsa*. Pipon sets the particular time period for allowing the herds to graze in the higher altitude and to bring back the herds to the lower valley during winters based on the seasonal calendar. The practice of transhumance is still visible in Lachung today.

This practice in fact existed in the traditional economic system whereby the pastoralists made use of pastures in different seasons with large size of herds comprising of Yaks. This system of governance was important in order to manage the large size of herds along with the pasture to graze. However, still today despite having smaller size of herds rotational grazing is still controlled by *Dzumsa*.

In addition to this *Dzumsa* has the power to distribute the land and collect Non Timber Forest Products (NTFP). The system of land distribution among the community was

maintained by *Dzumsa* since the past. Even today equity in terms of land distribution, size and quality of land to be allocated to the household is maintained by *Dzumsa.*

IV.6.e Fund Collection and Utilization in *Dzumsa*

The most important function of *Dzumsa* is the function related to collection of taxes from hotels and business services. *Dzumsa* collects the taxes every three years and these collected funds are utilized for the development activities in the village. Certain fraction of collected taxes are donated to Buddhist monastery, some part of share is utilized for emergency services and the amount that remains in hand are distributed among all the member households under *Dzumsa* in Lachung valley.

The meetings of *Dzumsa* are held once every month. At times these are held twice depending on the need of meeting. However one General Meeting is held every Year. All accounts and taxes that are collected and utilized by *Dzumsa* have to be submitted in the General meeting and the new *Pipon* is selected for the next one year tenure. The meetings of *Dzumsa* are headed by the *Pipon*. There are two *Pipon* in Lachung. They are Khedum *Pipon* and Lema *Pipon*. These *Pipon* have two assistants who are called *Ghyapen*. It's the role of *Ghyapen* to inform *Pipon* about the meetings and solve problems that exists in the village.

The *Ghyapen* assists the *Pipon* in different ways. It is the role of *Ghyapen* to remind the *Pipon* about the meetings and to enquire about the problem at the village level. The Pipon gives his decision in consultation with the *Ghyapen.* Hence the Ghyapen forms the mediator between the people and the *Pipon* to administer the social system and make it function smoothly in the Valley.

Plate IV.2 **Meeting conducted by *Dzumsa***

Source: Field Survey, June 2016

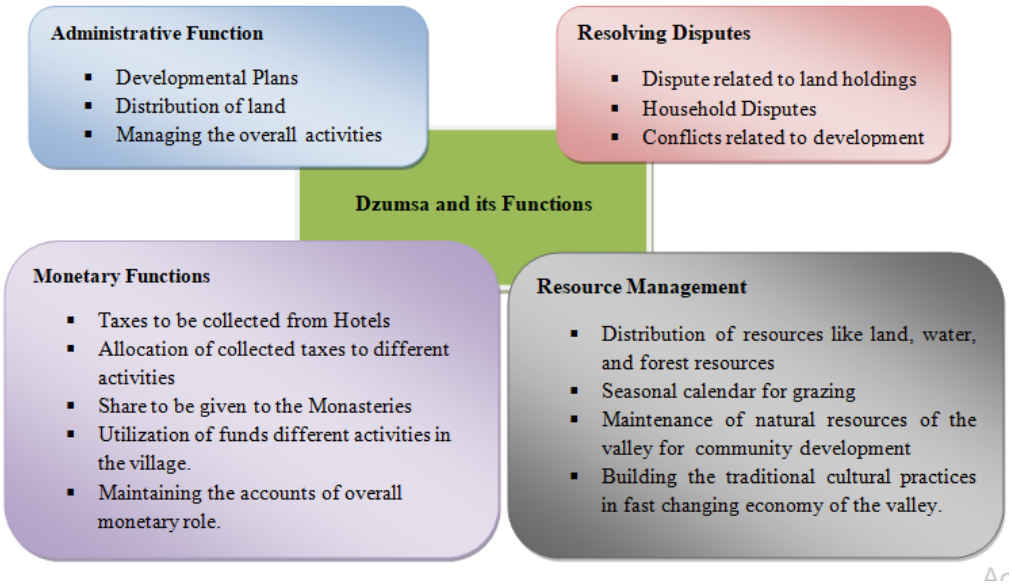
Dzumsa maintains the record of the number of hotels, business enterprises and other source of revenue generation that exists in Lachung. Tenders are raised in the meetings and the people bid these tenders based on their purchasing powers for three years terms only the Lachungpas are allowed to bid the tender. The tender holders in the village possess the right to run the hotels and business. Certificates are given to the tender holders for certain period of time. The purchasers of tender are then allowed to work accordingly. Similarly the construction of village roads, bridges and other developmental work has to be tendered in the meetings of *Dzumsa.* All these collected funds are further utilized in village development and community services.

Thus, the *Dzumsa* has key role in maintaining the livelihood needs of the people in the valley. The way the resources are managed and allocated, the way the conflicts are resolved in the village has important aspects in preserving the livelihood assets. This

characteristic of *Dzumsa* today has made Lachung different in terms of maintaining and managing the livelihood capital for the present and their future generations to come.

The role of *Pipon* in the village are numerous but his role becomes distinctive when solving the dispute arising in land holding, making use of land for different activities like grazing, sowing and harvesting etc. Besides these, the other important role Pipon is to maintain the decorum of the village in terms of maintaining the equality in terms of resource utilization by the community.

Figure IV.1 Dzumsa and its functions



Source: Field Survey, 2016

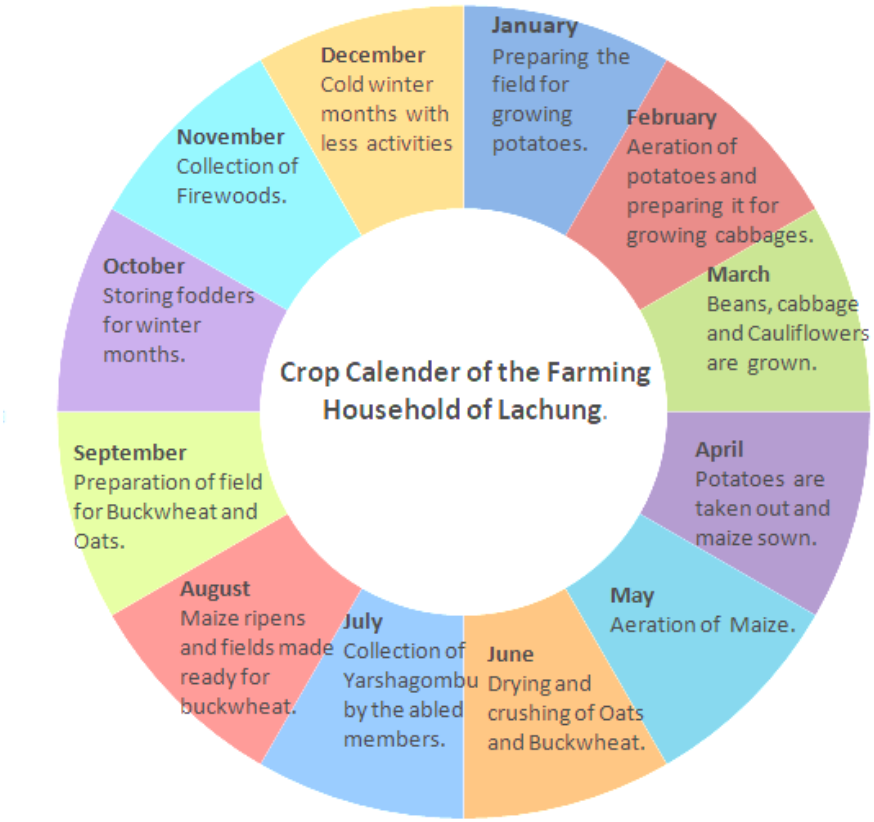
The various functions of *Dzumsa* in the valley have been shown in the chart above and it can be said that the function that it performs in the valley cannot be easily neglected. The sustenance of the economy in the fast environment due to flow of tourism has been well balanced by *Dzumsa*. It has been able to keep its traditional culture and have been able to

keep the ethos of the valley well adjusted to the nature of surroundings. Besides maintaining the economy it has been able to gain the trust of the people for so long and these reciprocity between the institutions and households itself is the indication of sustainability of a system.

Table IV.2 **Major Cropping Seasons in Lachung**

Months	Crops Grown
January- April	The month of January to April is generally used for the purpose of growing vegetable crops. Potatoes and Cauliflower are grown in the month of January and march respectively. The month of May is utilized for preparing the field for sowing of maize. Thus the first four months of the year is generally used for the vegetable crops owing to moderate temperature during these four months.
May-August	These four months are generally used for the purpose of growing food crops. Major crops raised in these months are Maize, Barley (Ooa) and Wheat. Maize is sown in the month of may which ripens in the month of August. In addition to this the month of August is used for crushing of Ooa (Barley). Thus, the dry summer temperature of these month helps in drying of food crops which is crushed and stored for the other months.
September- December	The month of September is generally used for sowing of wheat and Barley. October month is utilized in collection of fodders for the peak winter months. November and December being the coldest months of the year restricts the productive work.

Figure IV.2 **Seasonal calendar of the Farming households in Lachung**



Source: Field Survey, April 2016

Cropping calendar of the valley has been shown in the wheel diagram above. The activities of different months of the year of the farming households have been reflected in the diagram above. The diagram clearly depicts the nature of activities that are carried out and major crops that are raised in different time periods of the year. The wheel basically reflects the nature of livelihood practices that are carried out in the rural households. However the time of sowing and harvesting different crops vary owing to different climatic conditions in the valley.

The seasonal activity wheel reflects the nature of activities through which the farming households of Lachung are occupied in different months. Except for the month of December (period of snowfall), the agricultural activities are carried out in all the months of the year. The households get engaged in farming raising different crops both for the domestic consumption as well as for the sale in the markets. Gangtok forms the major market centre for the produce while the hotels around the valley form the other place to sale the vegetables grown. Cauliflowers, potatoes, beans, cabbage etc are sold in the markets. The tourist vehicles that ply every morning from the valley carry their produce to Gangtok, where the farmers fetch relatively higher price for their produce than the goods that are sold in the valley itself.

Plate IV.5 **Agricultural Field prepared for the growth of Horticultural Products**

Source: Field Survey, 2016

IV.7 Major Non Timber Forest Produce (NTFP) collected in Lachung Valley that contributes to the Household's income.

NTFP used to be the integral part of household livelihood in Lachung. The interview with the old farmers reveals the fact that these collected NTFP's supplemented the households' livelihood for number of months in the past. They were sold even in the

markets and some NTFPs were used as substitute of grains for the households. Following were the major NTFP that were collected by the Lachungpas and contributed in household livelihood:

a) ***Yartsagunbu***
b) ***Dhoop***
c) ***Toho***

IV.7.a Yartsagunbu:

Yartsagunbu is a Tibetan term used for the plant cum insect that changes its form depending on the season. It a fusion of words 'Yar'- Summer, 'Tsa'- Grass, 'Gun'- Winter, 'Bu'- Insect. Yartsagunbu is usually collected during the month June and July. This is one of the most prominent NTFP that is collected not only in Sikkim but also in the other parts of the Himalaya including Nepal. It is generally used for the medicinal purposes. It serves as the medicine that improves the immunity system and strengthens human body. It has high commercial value. Single stick of it can be sold for Rs. 100-150.

The household collecting Yartsagunbu move to the higher altitudes during the last week of June and collect it till the end of July depending on the availability. Only the able members of the family go for collecting Yartsagunbu. Since the collection of Yartsagunbu requires greater strength to withstand the harsh weather and good eye sight. Hence, the family at times takes their children along with them to collect it.

The availability of Yartsagunbu varies every year. Sometimes the collection becomes more than 300 sticks a week or at times it may fall to 50 sticks a week. The family that moves to collect this resource takes their food, tents and utensils to cook along with them.

However the collection of Yartsagunbu these days have rapidly gone down due to excessive extraction of this resource over the years. The increasing demand of this product outside the valley have made this resource precious due to which the people go for collecting it despite harsh environmental conditions prevailing in the higher altitude. The collection of Yartsagunbu provides additional sources of income for the people in the valley during their off seasons.

Table IV.3 Households that go for collecting Yartsagunbu

Hamlet	Total Household	Number of sticks collected	Price sold (per stick)	Total Value of Sale
Bitchu	14	155	110	17050
Singring	09	120		13200
Thomchi	02	61		6710
Phaka	07	125		13750
Sarchok	12	158		17380
Total	**34**	**619**		**68,090**

Source: **Computed from Field Survey, 2016**

The household participating in the collection of Yartsagunbu in Lachung has been different over the years. Factors like rough climatic condition in higher altitudes and other livelihood options available within the valley have reduced the households participating in collection of Yartsagunbu. Though its contribution to households income is meager, however it forms an important part of seasonal activity i.e., mostly in the month of July. One member or at times two members from the family go for collecting Yartsagunbu. The nature of hardship and risk involved in collecting Yartsagunbu and its lesser availability these days have reduced the household's number in collecting it.

Table IV.3 shows the contribution of Yartsagunbu in households' economy in Lachung Valley. It clearly reflects the participation of households and the return fetched by the

households in Lachung. The total sticks of Yartsagunbu collected in the Year 2016 was 619 by 34 households making it an average of 18 Yartsagunbu per household and when its monetary value was calculated per household, it was around Rs. 2000 per household on an average. Thus, the actual return when seen in comparison to the associated hardships falls very low. Hence it clearly reflects that the return fetched out of collecting Yartsagunbu to that of hardship and risk associated is really discouraging. However, the households' still go for collecting it as it forms some sorts of involvement in economic activities and supplementary source of income for the poor households.

The narrative of Rincehen Lachungpa reveal the nature of hardship that collecting Yarsagunbu involves and reason for their decreasing collection over the years:

*"It is very difficult to ascend higher altitude especially if it rains. Vehicles take us till Yume Samdong (base camp) but thereafter we need to walk for 4 to 5 hrs. Sometimes we get 70 to 100 sticks and sometimes not even a single stick are available to us" (**Rinchen Lachungpa, 27**)*

Hence the availability of Yartsagunbu in higher altitude is a gamble. The efforts made by the household go vain when they are not able to collect any. Besides this, the age of the Yartsagunbu collector plays an important role both in terms of physical labour required as well as the sharpness of vision to identify it on the surface. Thus, the risk involved and hardship in collecting it has drastically reduced the household's involvement in collecting Yartsagunbu over the past few years in the Valley. The people in turn engage in the household activities rather than collecting it.

IV.7.b *Dhoop*

Dhoop is one of the most important NTFP that is used mostly during the religious ceremonies. It is the bushes available in the higher altitudes of Himalaya. They remain intact with the ground and grow up to the height of 1-2 ft. The scent that it emits makes it significant and is used for sacred purpose. There are of two varieties of dup that are available in the higher altitude. ***Sun pati*** is one of the best varieties of *Dhoop* with small leaves and tiny bushes.

The fragrance that it possesses makes it commercially valuable. This is usually silver colored bush and is rarely available. ***Vairung pati*** is the other variety, which is abundantly found in the higher ridges of Himalaya. It has relatively larger leaves as compared to *Sun pati*. The demand for *vairung pati* is relatively less in the market.

However, both the varieties are collected by the people in Lachung and are sold in the market. The Lachungpas and their labourers go for collecting *Dhoop* and get it in large sacks. However there are restrictions in collecting it as it falls in the forested land. The people go for collecting it during summer months and dry these leaves. This are finally sold in the small packets in the market.

Thus, the collection of these herbs also adds to the income of some of the households in Lachung Valley. The contribution of this produce is relatively low in contributing to the household's income. The dependency of household in collection of herbs is rare but it indirectly helps in supporting some of the household in Lachung.

IV.7.c *Toho*

The third variety of NTFP that is collected is *Toho*. It is the variety of tuber that is found in the forest. It is usually the root of the plant that is available in the higher altitude. This variety of tuber is used for making chapatti. The processing involves drying of root and then crushed to powder. It is then prepared as wheat flour.

It is generally available in Yumthang and Damang region of the valley at an altitude of about 3500 meters. It is available in large quantity. During the Chogyal's reign this product used to be served as gifts to Chogyal along with the other products like Yaksya (Yaks Meat) and apple.

The period for collection of *Toho* is fixed by Dzumsa, which usually falls in the month of August. At times, the collection of *Toho* could serve food for a month. However, the collection of Toho is mostly for the domestic consumption. This used to serve months food for the yak herders in the higher altitude.

Thus, NTFP collection was essential part of livelihood activity in the valley. However, the dependency on such produce at present has fallen down due to availability of other better sources of earnings. The livelihood of the Lachungpas today has been greatly influenced by the opportunities available within and outside the valley. Since these were once the intrinsic sources of livelihood, hence it becomes important to document all these activities in understanding the livelihood of the population. Today it has reduced to such an extent that the present generation hardly gets to know about it.

Table IV.4 Land Use and Land Cover Changes in Lachung Valley

Sl. No.	Category of Land Use	Area (in acres) (1997)	Area (in acres) (2011)	Absolute Change	Percentage Change
1	**Agricultural land**	176.08	192.44	+16.24	+9.32%
2	**Alpine forest**	162.26	167.22	+4.92	+3.03%
3	**Built-up area**	79.25	168.17	+88.28	+111.39%
4	**Dense forest**	264.32	254.08	-10.17	-3.84%
5	**Moderately Dense forest**	181.73	196.89	+15.05	+8.28%
6	**Open forest**	488.06	352.61	-134.47	-27.55%
7	**Scrub forest**	914.64	836.15	-77.92	-8.51%
8	**Tree clad area**	164.56	252.37	+87.17	+52.97%
9	**Wasteland**	11.03	22.01	+10.91	+98.91%
10	**Water bodies (Lakes/ponds-Perennials)**	37.75	37.75	0.00	0%
	Total	2479.69	2479.69		

Source: Department of Forest, Environment and Wildlife, Government of Sikkim

IV.8 Land use Changes and changing economy in Lachung Valley

Land use and land cover change in any region reflects the dynamics of livelihood in multiple aspects. Land use change is thus one of the most important aspects for reflecting peoples' livelihood choices. The decision for making use of land begins with the households' choices thereby bringing larger changes in the village level. The nature of change thus helps in capturing the changing dependency of the population in any geographical area.

The change (increase/ decrease) in the agricultural land reflects peoples' nature of dependency on land in multiple ways. Livelihood studies therefore closely linked with the changes in the nature and pattern of land use. Understanding these changes in temporal scale to large extent helps in bringing out the dynamics of livelihood dependency among the people.

The nature of change in pattern of land use in Lachung valley reflects a great degree of variation in the dynamics of peoples' livelihood. For instance, the decline in Forest cover including dense forest, scrub forest, and open scrub forest has been found between 1997 -2011. This has mainly been due to extraction of fuel woods by the villagers for the domestic usage (cooking and heating).

The reason for decline in dense forest cover in the region is mainly due to extraction of timber for the purpose of construction of houses and other furniture. Thus, the changes in the decline in forest cover in the valley are mainly due to extraction of forest products and utilization of forest resources for generating the livelihood needs. There has also been remarkable increase in the built up area in the valley over the period between 1997- 2011.

Rapid constructions of hotels and homestays mainly due to the tourism have brought such large scale conversion of land into built-up area. Besides this the increase in built up area during this period has been due to defense camps that have come up in the valley. Camps of Indian army and Indo Tibetan Border Police (ITBP) have come up utilizing some of the land for their base camps thereby increasing the built up area over the period of time in Lachung Valley. On an average more than 40 percent of the household in Lachung Valley today have the hotels for the purpose of tourism. The people generate their livelihood out of it differently at different levels.

The households with able members to run the hotels run their own hotels and business whereas the household that lacks able members to run the business lease out their hotels to the outsiders thereby making the living out of it. Thus the tourism boom in the valley has important role in bringing about the changes in the pattern of land use.

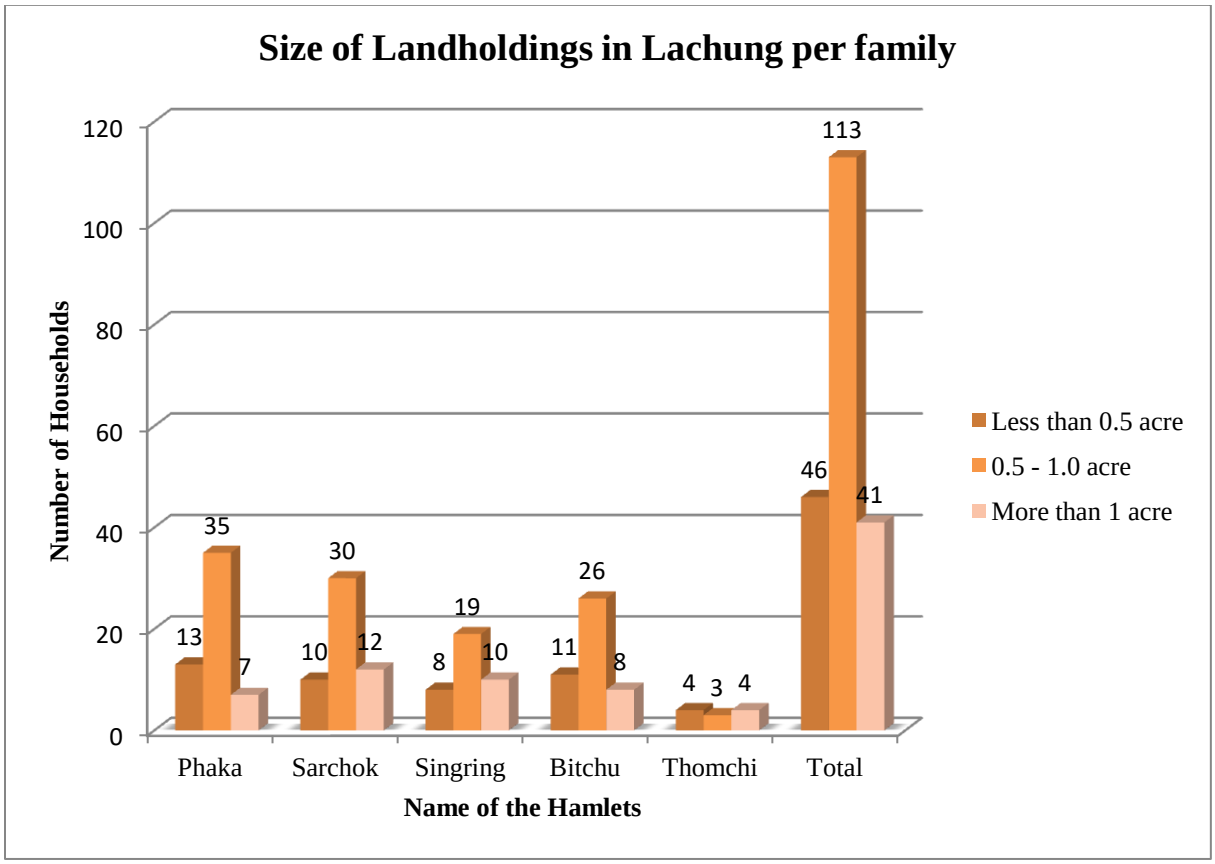
Agricultural land between 1991- 2011 has shown an increase of about 9.32 percent. This has mainly been due to use of land in the upper ridges of valley wall and making use of scrub forest in the region above Phaka. The increase in alpine forest has mainly been due various forest conservation policies by the government and restriction on Grazing. The diminishing size of Yak herds to certain extent responsible for increase in Alpine forest.

IV.8.a Landholdings among the Lachungpas.

The nature of landholdings among the Lachungpas has been greatly influenced by the Dzumsa. The size of land holdings, its location, distribution and crops to be

raised in different time of the year etc. are all governed by Dzumsa. Landholdings among the Lachungpas have been collected from the household survey. The data on actual land possession has been drawn out by calculating the total land i.e., both farm lands and land used for settlements. The size of land possession among the Lachungpas varied accordingly:

Figure IV. 2 Landholdings among the Households in Lachung.



* Size of landholdings include both farmland and settlements

Source: Field Survey. April 2016

The figure above shows size of landholdings among the households in Lachung. Due to unavailability of official records the size of the landholdings has been calculated based on

the responses of the households. The distribution of lands among the Lachungpas was basically allocated by the *Pipon* and their reallocation, division among the family members etc were controlled by the Pipon himself. Based on the field survey, the data on actual land holdings possessed by the individual household have been compiled to show the nature of land holdings and its relation to livelihood practices. There has been varying degree of landholdings among the households.

These lands are put to different economic activities in different hamlets of Lachung. On an average the size of land holdings of the individual households was 0.65 acres. Households in Phaka for instance had the highest share of land holdings ranging between 0.5 acre to 1 acre. Around13 households have their landholdings below 0.5 acre. The nature of land put to different uses is relatively different in Phaka in comparison to other hamlets. Most of the land (settlement zone) in Phaka has been used for the commercial activities i.e., running hotels and businesses whereas the farming has been given less priority.

Sarchok and Singring on the other hand had a balanced use of land available for commercial as well as agricultural activity. Despite running their hotels and small business, the households in Sarchok and Singring prioritize farming. Even in these two hamlets the size of landholdings are higher in the category ranging between 0.5 acre to 1 acre.

Most of the households with land holding less the 0.5 acre in these hamlets basically belong to the migrant labourers or the land left after construction of hotels. They have

been allotted small plots of land by their owner to have their temporary huts and assist them in their farming activities.

Bitchu on the other hand has the highest percentage of households cultivating these lands. Very few households run commercial business in Bitchu. Most of the households practice farming irrespective of the size of their landholdings in Bitchu. More than 80 percent of the households make use of their farmlands and as small patches of land around their houses for cultivation.

IV.8.a Changing Livelihood and the issues of Sustenance

The livelihood change in the valley had its connection with the nature and pattern of land distribution among the people. The equity in the land distribution reflected the level of bonding among the people in the valley. The ownership of land possession was controlled by the local administrative system.

The people had their own way of livelihood sustenance. Fruits especially the apples were produced in the orchards of their homes. Animals utilized the pasture of highland as well as the lowland. Yaks, Cows and other cattle were reared which added to the family's income. Very few migrated to distant towns for the livelihood.

The family practiced subsistence farming. The self-sufficiency was the important characteristics of the population in the valley. The unity among the people was the strength to have control over their resources and administrative system. The Lachungpas made enough income to sustain the family and the society. The dependency on farms and animals were high as these formed the security to the people both economically and socially.

Plate IV.6 **Changing Land Use and influence of Tourism in Lachung**

Source: Field Survey, April 2016

Change in the pattern of livelihood was observed only after the Year 2000 onwards when the people in the valley diversified their livelihood sources. The people in the valley started tourism as an alternative livelihood sources. The tourism in the valley flourished rapidly and the people started serving the tourist in different ways. It started with the home stays and slowly grew into number of hotels.

The people in the valley thus witnessed the opportunity of their location as the number of tourist flow increased in the valley every year. In fact the people generated more out of tourism than their agriculture. The interest of the people slowly shifted towards making more revenue out of service activities rather than the primary activities.

However, with the seepage of tourism in the valley, the people did not entirely made tourism as the only source of livelihood sustenance. Besides serving the tourist, the people cultivated the farms, reared the animals and maintained their other traditional

activities. The degree of dependency on agriculture changed in the valley with the availability of other means of sustenance.

The most important part of the diversification of livelihood in Lachung has been observed at household level where the entire family engages themselves in generating the livelihood needs. The presence of Military camps in an around the valley besides adding border security also adds security in terms of availing the essential household commodities including kerosene, basic household appliances and some food commodities that are meant for them. Valley populations are able to avail those essential commodities at lower prices due to which even the poorer households derive benefits of the presence of military camps present in Lachung.

The most important role has been that of women in the family. The women in the household takes care of the children, cultivates the farm both in the lower agricultural belt as the as the farms attached to their houses and maintains the tourists and other household business while the men are mostly seen engaged in the supplementing the activities carried out by the women.

IV.7 Participation of women in different activities in Lachung

Source: Field Survey, April 2016

The changing occupational structure of the valley is evident from the fact that today more than 40 percent of the household depend on tourism as their source of livelihood. The dependency on agriculture has drastically changed over the years. The changes that have been observed in the valley can be reflected from the following table:

Table IV.5 Households participation in different Livelihood Activities.

Hamlets	Cultivators (In %)	Government Services (In %)	Hotel and Business (In %)	Animal Rearing (In %)
Phaka	61.8	23.6	69.0	20.0
Sarchok	71.1	40.3	38.4	48.7
Singring	89.1	45.9	48.6	45.9
Bitchu	82.2	44.4	22.22	57.7
Thomchi	63.6	27.2	36.3	45.45

Source: Field Survey, April 2016

The occupational structure of the population reflects the fact that the dependency on agriculture has been changing over the period of time. Singring and Bitchu have the highest population dependent on agriculture. In addition to cultivation, these villages have diversified livelihood sources.

Singring has the highest percentage of population in the government sector. In addition to involvement in the government services, the village has good percentage of households with tourism and animal rearing. Bitchu on the other hand has the second largest percentage of population dependent on cultivation. However, the concentration of hotels in Bitchu is lowest in comparison to the entire village.

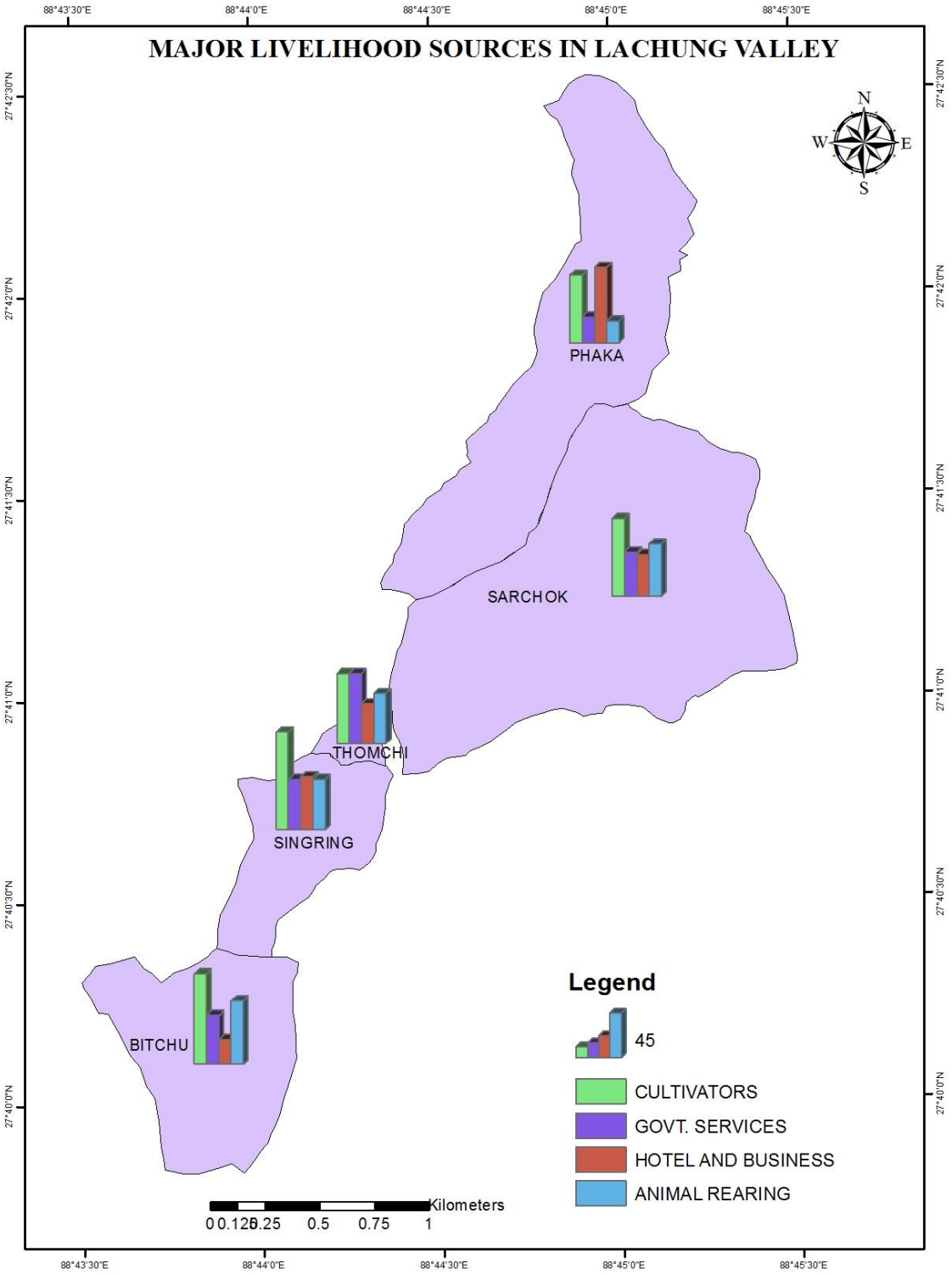
Thus the Bitchu's household economy is primarily based on agriculture and animal rearing. Phaka has the lowest percentage of cultivators in comparison to the entire villages of Lachung while the share of Tourism and business enterprises in this village is very high.

The dependency of population on animal rearing in Phaka is lowest in comparison to entire villages of Lachung. Thus it is evident from the fact that the pace with which Phaka is adopting itself to tourism has been quite rapid. Same has been the trend of Sarchok and Singring when it comes to adopting itself to livelihood needs.

The dependency of population in tourism activity in Phaka is quite high while that of cultivation and animal rearing is low. Hence Phaka clearly depicts the changing mode of sustenance among the valley population. The nature of economic characteristics of the valley can therefore be clearly visible from table IV.5 where there has been

Sarchok on the other hand has the balanced occupational structure among the population. It has 70 percent of household engaged in agriculture, 48 percent of household rear animal and more than 35 percent of people engaged in government services and hotel and business activities. Thomchi on the other hand shows less livelihood diversification with its less population engaged in different activities. The percentage share of all the four mentioned activities in Thomchi is relatively less in comparison to the activities carried out by the people in the valley. Thus different hamlets have different combinations of livelihood based on their financial strength and number of members in the family.

Map IV.2. Major sources of livelihood in Lachung Valley



Source: Field Survey, 2016

IV.9 Livelihood Diversification and Households Adaptability in Lachung

Diversification of household livelihood is a means to strengthen the adaptive capacity. These are the process of household security. The failure of one means of sustenance can be compensated by the other means thereby adding stability to the household in order to meet their needs. Livelihood diversification is a process by which rural household construct an increasingly diverse portfolio of activities and assets in order to survive and improve their standard of living (Ellis, 2000)

Understanding household diversification is an important aspect in understanding livelihood sustainability of the household. Involvement of household in different economic activity reduces the risk of being vulnerable in terms of meeting the basic needs. Diversification is thus one of the most important components of rural household as it provides multiple benefits to meet the need. Livelihood diversification is beneficial to the rural population because it can reduce risk and stabilize income flows and consumption and lead to improvements in quality of life, wealth accumulation and food security (Lliao , 2015)

Diversification might occur as a voluntary or an involuntary response to crisis, which can either diminish rural inequality (Ellis, 2000). The nature of livelihood diversification in Lachung Valley can be understood from the involvement of household in number of activities. The greater is the number of activity carried out by the household greater is its sustainability in terms of meeting the needs as it enhances household ability to generate more income.

Plate IV.8 **Diversification of farmlands and shops in Lachung**

Source: Field Survey, April 2016

Table IV.6 **Livelihood Diversification in Lachung Valley**

Name	Single Activity	Two Activities	3 or more activities
Phaka	29.09	54.45	16.36
Sarchok	30.76	32.92	36.53
Singring	10.8	56.75	32.43
Bithcu	13.33	60.0	32.43
Thomchi	36.36	45.45	18.18
Average	24.6	49.9	27.18

Source: Field Survey, April 2016

***Here livelihood activities has been segregated based on combination of following activities that include (agriculture, animal rearing, hotels, business and government services)**

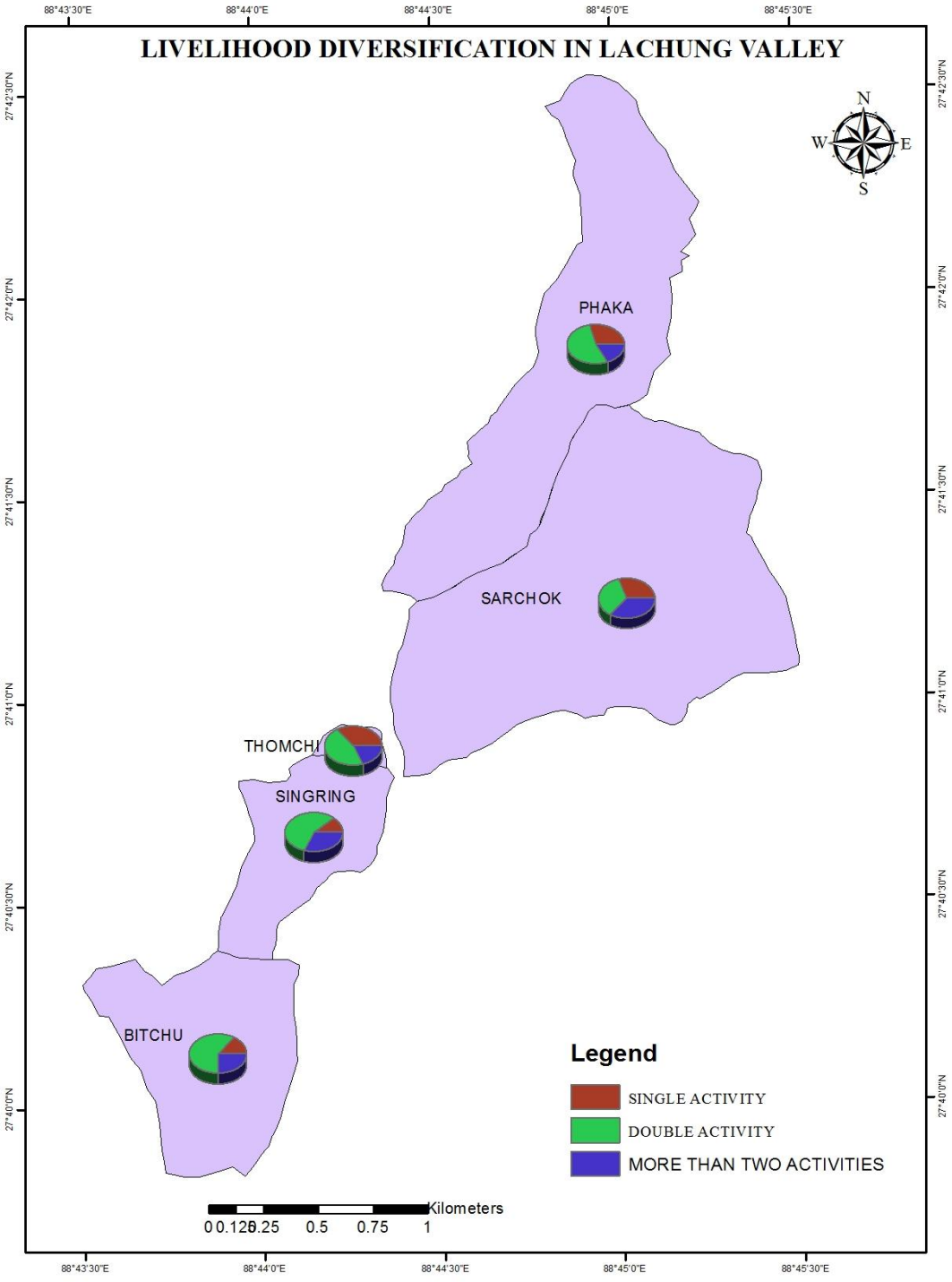
The potential benefits from diversification include more complete utilization of labor, increases income, stabilization of risks, enhancements of rural development. (Lliao, 2015). Thus understanding the level of household diversification in different villages provides abundant information about the level of stability that the particular village or the community has. The greater is the involvement of the household in greater number of activities; more is the inflow of income in the household thereby adding stability to it in terms of generating the household needs.

The household with the number of activity has been shown on the above table which clearly indicates the occupational diversification of households in Lachung. On an average more than 24.6 percent of the people engage themselves in more than one activity which itself reflects household's level of livelihood diversification in the valley. On an average 50 percent of the people engage themselves in the two different activities.

Thus when analyzed the overall average of household involvement in different activities, it is evident that diversification of livelihood in the valley has been quite influential however when this diversification is seen on individual hamlets, the scenario turns out to be entirely different. Thus the level of diversification varies differently in different villages. For instance, the involvement of household in single activity indicates more diversification of the household in other activities. Singring and Bitchu have the lowest percentage of population involved in single activity which indicates the greater degree of stability in terms of generating the household needs. The involvement of these two villages in more than one activity has been quite impressive.

Even Phaka has more than 70 percent household engaged in more than one activity. The level of diversification of livelihood activities in this region has been mainly due availability of opportunity to the people in the form of tourism and other allied activities. In addition to the available opportunity in the form of tourism, the other factor responsible for diversified livelihood has been the choice and preferences of the population in the valley. Their willingness to cultivate and rear animals despite of availability of other choices of living has helped the people to have multiple choice of generating the means of living. The level of household diversification of individual village has been mapped based on the household survey which has been shown below:

Map IV.3



Source: Field Survey, 2016

Table IV.7 Changing Dependency on Agriculture in Lachung

Hamlets	HH possessing Land	HH cultivating	HH left cultivation
Phaka	92.72	61.82	30.92
Sarchok	86.5	71.15	15.35
Singring	94.6	45.94	48.76
Bithcu	88.43	82.24	06.19
Thomchi	72.72	63.60	9.12

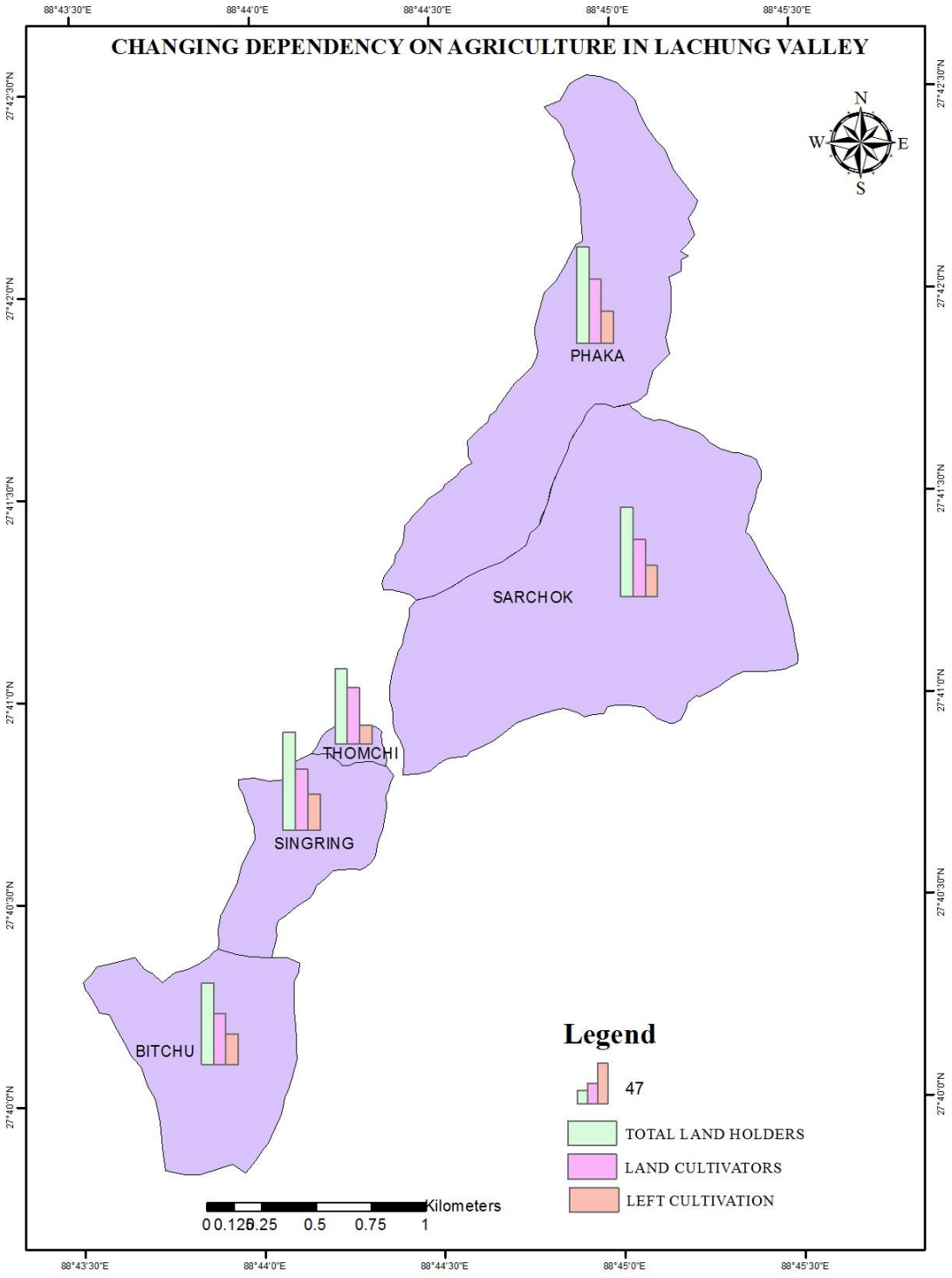
Source: Field Survey, April 2016

Understanding the change in occupational structure reflects the changes in new mode of livelihood sustenance. The change in one form of occupation results in incline towards the other means of sustenance. These changes in the occupational structure are important in understanding the livelihood adaptability of the community. The table above reflects the change in agricultural dependency of households in Lachung.

The shift towards other non-agricultural activity has been the reason for leaving the traditional means of sustenance. There are multiple reasons for people to leave agriculture and shift towards non-agricultural activities. Among these reasons, availability of other easy means of sustenance in the form of tourism and associated service activities have prominent role to influence livelihood choices in the valley.

The level of changes in agricultural dependency in Lachung can be shown in the following map:

Map IV.4



Source: Field Survey, 2016

Several factors have influenced the change in livelihood pattern in the valley. People's choices have important role to play the influential role to play. Positive factors influencing peoples livelihood choices include the tourism boom in the valley which provided other alternative choices in turn gets affected by other related factors. The factors that directly and indirectly influence the choices of the people are opportunities available (positive factors) sources in the form of hotel industry, as a tourist guides, shops and business, drivers etc.

Among the different factors that have influenced the interest in the people from leaving agriculture and adapting other means of livelihood include even the government policies. The ban on fertilizers for the crops has severely affected the productivity which has forced people to leave cultivation. Sarchok and Bitchu has been one of the examples where the effect of ban on fertilizer has been the maximum. Similarly, Phaka has been the example of influence of tourism for the change in agricultural dependency.

Thus, it is clear that within the same geographical unit, two distinct factors have influenced people's livelihood choices. The outcome of both are same but the operating factors behind are different. Hence the dynamics of livelihood change in the valley is the interplay of different factors acting at different levels.

IV.9.a Influences of Changing Climate on Livelihood

Livelihood of the rural agricultural households directly depends on nature of precipitation, duration of sunshine, and other elements of climate. The households that are more dependent on farm based activities are the ones to have greater impacts of it on their livelihood. Slight changes in the pattern and nature of these climate results in larger

impacts on the households and may have series of negative consequences on their farm productivity, growing season and other livelihood activities associated with it. Apart from farm based households, even the households based on tourism also fall under the impact of changing climate. The flow of tourists directly depends on the nature of prevailing weather conditions. Hence it becomes important to highlight the nature of livelihood changes brought about by the changing environmental conditions.

The interview with the farmers reveals the fact that there has been observed changes in the nature of rainfall, temperature and snowfall over the years in the valley affecting their livelihood to certain extent. The perception on climate change has proved that there has been rise in the temperature of the valley over the past decade.

"*The summer temperature has been constantly rising in the valley. Even the heat of May at times becomes unbearable in the field. We had never witnessed such temperature during our childhood" (**Phurba Lachungpa, 38)***

The increasing temperature in the valley has been reflected in the interview conducted in some of the households and the crops that are presently seen growing around the valley. The farmers have also reflected on the increased intensity of heat in the valley over the past few years that has affected their vegetables in the farms. The effects of rising temperature have slowly started showing their impacts on farms and croplands and farm productivity.

The interviews with the farmers reveal that the vegetable like squash that used to be commonly grown in the lower altitudes in relatively warmer temperature belt i.e. below

1500 meters are today commonly seen in Lachung i.e., around 2000 to 2500 meter altitudes.

The political factors have also affected farmers' willingness to cultivate the farm lands in Lachung. More than 60 percent of the farming household in the valley had suffered due to ban on the fertilizers by the state. The estate in order to promote organic farming had imposed barriers on chemical fertilizers which had series of problems among the farming households. The inadequate organic fertilizers had drastically reduced the production of vegetable crops in the valley due to which some of the houses had even stopped cultivating their fields.

"We do not have enough production these days. Initially the government itself introduced fertilizers in our farms and today they have banned the fertilizers. The effort and cost exceeds the return derived from farmlands. Hence we have stopped cultivating our field at Khedum." ***(Pemba Lachungpa, 48)***

The state policy also to large extent has been responsible for shifting the focus of the farming households from agriculture to non agricultural activities. The losses incurred in growing vegetables in the farmlands have made people to abandon their fields into barren lands over the past few years. The changes in institutional policies have left remarkable impacts in several smaller villages of Sikkim and Lachung being one among them.

Besides the changing dimension of States policy and peoples willingness to cultivate, the other factor that has resulted in diminishing interest of the people has been the wild animals that frequently invades the farmlands. Monkey, Bear and other wild species often destroy the crops grown in the farms. The lower productivity of the crops coupled with

the destruction of crops by wild animals have forced people not to cultivate their farmlands.

"These days our crops are frequently destroyed by wild animals. Beans, Maize, potatoes etc are all eaten by the bear. Rather it's better not to cultivate the farmlands" ***(Nim Lachungpa, 38)***

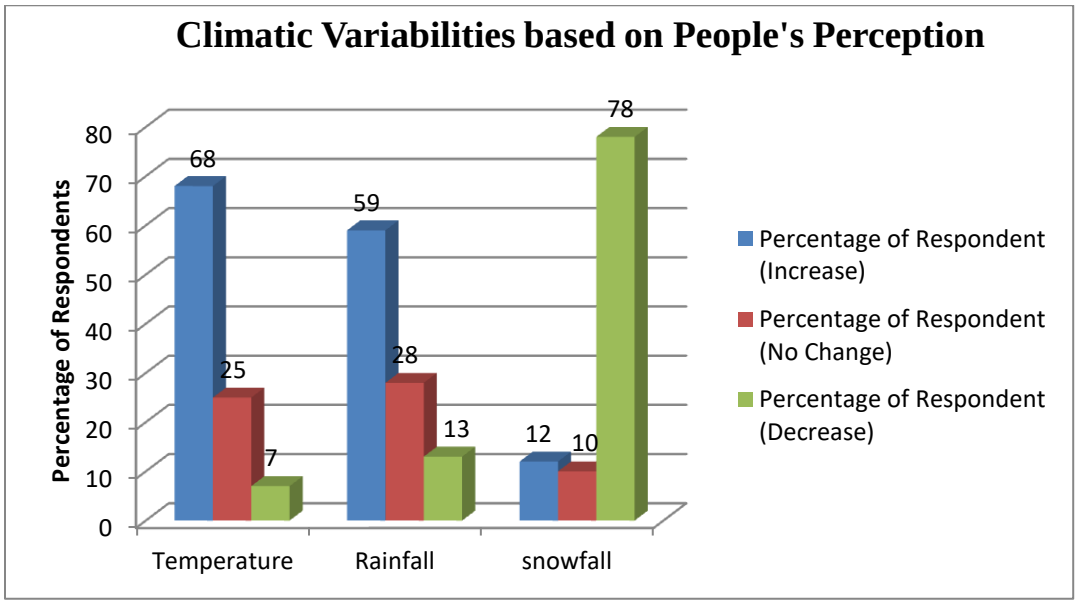
The push factors are numerous that has made the farmers to abandon their farmlands in Lachung. The nature of productivity has drastically reduced in the valley over the past few years. Hence the shift towards non agricultural activities has been rapid in the valley. The livelihood of the farmers that are totally based on agriculture and animal rearing seems to have been facing multiple distresses. The need to understand their problem and making them sustainable in terms of their daily needs has become very important for the authorities concerned.

Dzumsa has been trying its best to function and run smoothly with the changing development in the valley. However the proper availability of funds, timely availability of compensation to the agricultural farmers in Lachung has become very essential today. Households that are entirely dependent on farm activities need to have monetary benefits and skill based trainings to cope with the changing livelihood scenario of the valley. The sustainability of the household that are solely depended on single mode of sustenance needs to strengthen itself through livelihood diversification and other mode through which more of returns can be availed.

Dzumsa has been one of the primitive systems of governance where it had to function with small number of households with abundance of resources. It had enough of

resources to improve upon the livelihood and provide diversified livelihood options. However, today the scenario of the valley has drastically changed. It therefore needs enough of sources of funds to sustain itself which itself is a concern for its long run sustenance.

Figure IV.3 Perception on Climatic variability



Source: Field Survey, April 2016

The nature of climatic variability in the study area has been based on the perception of the people over the past few decades. The People's perception on climate change has been shown in the chart above. The data reveals the fact that the valley has been witnessing the rise in temperature over the past few years.

About 68 percent of the respondent agreed to the fact that the temperature in the valley has been increasing while 25 percent of the respondent had a view that it has not changed over the years. The nature of such changes has been revealed by the farming households. The availability of crops of lower altitude also reflects the rising temperature in the

valley. The rising temperature has brought certain alteration in the usual pattern of growing season among the farming households.

The other major change that has been observed in climatic parameters based on people's perception is the increasing rainfall in the valley. More than 59 percent of the respondent had the view of increasing rainfall over the past few years. Rainfall of higher intensity has been in short duration has been reported by the farmers. The farmers were of the view that such rainfall has been largely responsible for washing out the soil fertility of their farmlands. Besides this they supported their view of several landslides due such intensity of rainfall. 28 percent of the respondents were of the view that there has been no change in the nature of rainfall that has been taking place in the valley.

The other important climatic variable that has changed over the past few years in the valley has been the nature of snowfall. The interview with the senior citizens revealed the fact that there used to be snowfall almost up to their knees i.e. more than 2 feet when they were young. The snowfall in winter often used to last for 10 to 15 days and block the roads and transport system in the valley. There have been drastic changes in the nature and pattern of snowfall toady. The valley hardly receives snowfall of 2 to 3 days which melts down easily.

The data reveals the fact that about 78 percent of the respondent were of the view that snowfall in the valley has drastically reduced both in terms of quantity and number of days. The Farmers were of the view that potatoes thrived well when the valley received snowfall for more days. However, today the decreasing amount of snowfall has resulted in declining productivity of the potatoes. The quantity of potatoes that a farmer used to

grow initially was 70 to 80 *maan* (1 maan =40kg). Today the quantities of potatoes have drastically reduced to 10 to 12 *maan.*

The livelihood of the people in the valley has undergone drastic change owing to changes in different key factors ranging from climatic factors to political factors. Household's livelihood choices are therefore to large extent in the valley has been governed by external influences rather than their own choices. Diversification of livelihood in the valley therefore lies in the degree of influences posed by the external agencies of which the climate has been the most important determinant.

The changing climatic parameters like temperature, rainfall and snowfall in the valley captured through peoples' perception has been verified from the climatic data available and has been found true in many instances.

IV.9.b Tourism and Livelihood in Lachung

Tourism has the most important role in bringing the changes in the livelihood system of Lachung Valley. The way it has flourished in the valley reflects the peoples' responses in adopting it. The benefit acquired out of tourism in the valley has been immensely contributing in supplementing the household income. Besides supplementing the household's income, tourism in other way has formed additional security in terms of meeting their needs.

Different villages in Lachung have different levels of tourist activities. The benefits of tourism in the valley can be categorized in two different forms a) **Direct Benefits:** Benefits acquired by the household through hotels, guesthouses etc by making large investment. The profits generated are in the form of cash. b) **Indirect benefits:** Benefits

acquired by the household serving as tourist guides, drivers, cooks and other services. Besides this even the households that are not directly involved in tourism but also are able to derive benefits like easy accessibility to roads and other forms of services that are actually meant for tourism in different ways fall under the category of indirect benefits.

Table IV.8 Benefits acquired by the Households from Tourism in Lachung.

Hamlets	Directs benefits acquired (In Percent)	Indirect Benefits (In Percent)
Phaka	67.27	14.5
Sarchok	59.6	11.53
Singring	64.8	18.91
Bitchu	31.11	15.5
Thomchi	45.45	9.09

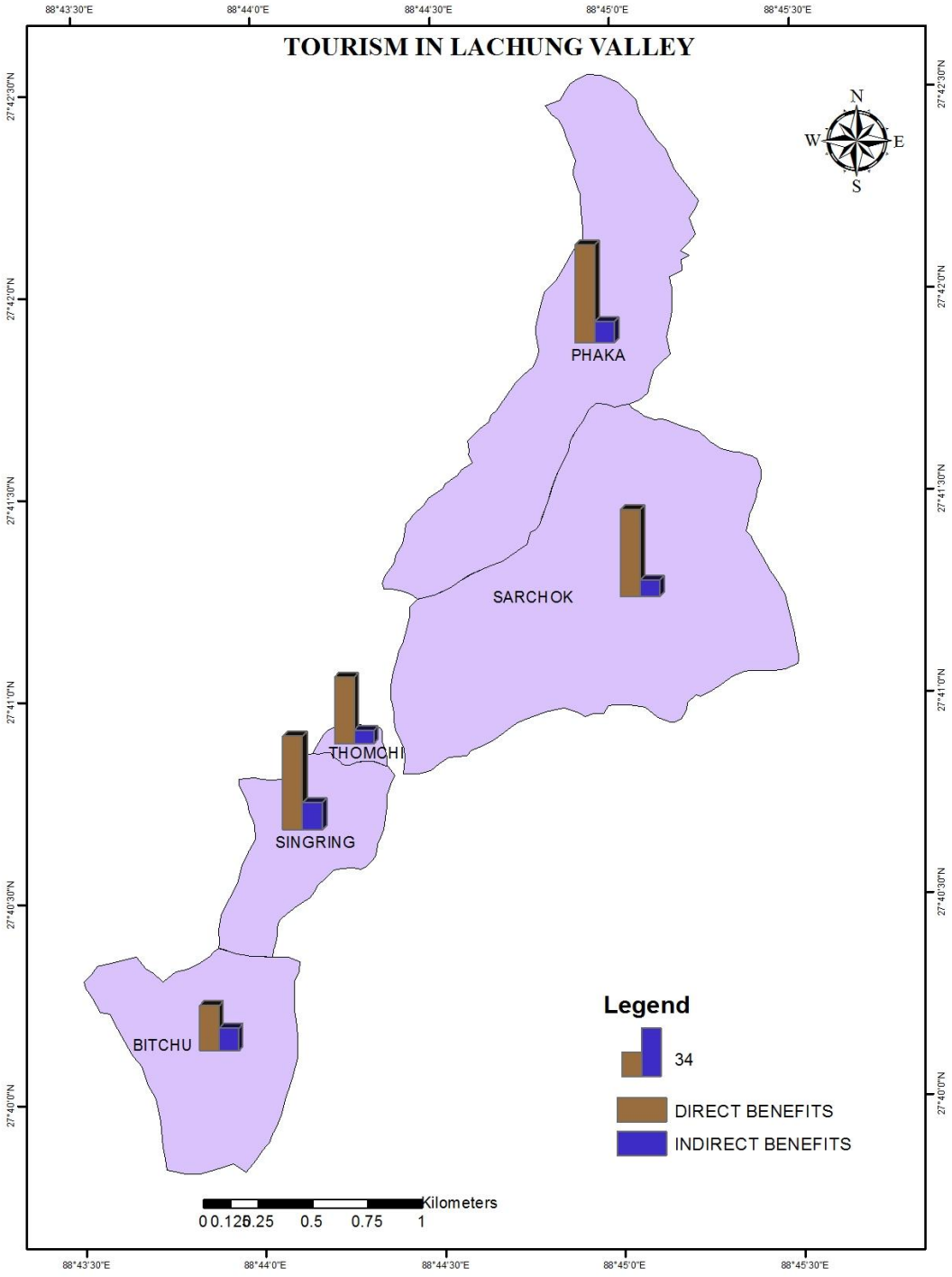
Source: Field Survey, April 2016

The data above shows the benefits acquired by the households that are classified as direct and indirect benefits. Tourism as an opportunity for the people in the valley has been able to provide means of sustenance and hence the hamlets that are more dependent on tourism activity i.e, in the form of hotels and business have larger share of households deriving direct benefits. Hamlets like Phaka, Sarchok and Singring are able to derive more of direct benefits through their active involvement.

Similarly, Bitchu and Thomchi does not derive larger share of their livelihood from tourism and hence directs benefits acquired is also less in these two hamlets. Indirect benefits acquired by first three hamlets is also high owing to the fact the facilities the households that are not dependent on tourism are somehow able to get that are actually meant for serving the tourist.

Hence, the nature of benefits acquired out of tourism varies considerably based on the nature of livelihood choices that the people in the hamlets have chosen in the Valley.

Map IV.5 Tourism Potential in Lachung Valley



Source: Field Survey, 2016

Phaka, Singring and Sarchok are the villages in Lachung where the influence of tourism has been the maximum. These three villages have more than 50 percent household involved in tourism activity. Phaka being the central place in terms of its location has maximum population involved in this activity. The spread of tourism in the valley initially had started from Phaka followed by Sarchok and Singring simultaneously. Thomchi and Bitchu have been less influenced by tourism activity. Bitchu has large proportion of population involved in agricultural activity and very few houses give priorities to Hotels and business enterprises. The dominance of agriculture and animal rearing in Bitchu has made it acquire fewer benefits out of tourism.

The level of tourism in the valley varies spatially based on the choice and preferences of the people. Besides this the variation in tourism is dependent on the level of education that the village has. For instance Singring and Phaka have the more percentage of literate household which has helped the household to diversify their livelihood sources. Hotel and business enterprises are dependent on the factors like level of education, loans available from financial institutions, and able members of the family to run the Business. Bitchu on the other hand has the lowest percentage of literate household to run the hotel and business enterprises which has also turned out to be one of the determining factors for having less influences of tourism.

The reason for differences in the spatial variation of tourism has been due to lack of financial resources among the poorer households and there connections outside the valley especially in Gangtok. Lack of these two essential criteria for opening hotel and business makes the household to continue agriculture as only the means of sustenance. As narrated by the respondent in the Valley:

"It's really a difficult activity to be carried carry out. People having more of financial resource to invest and having more connection with hotels in Gangtok can only run this business. I hardly know anybody outside Lachung" **(Wangchuk Lachungpa, 54)**

Thus, the household decision and level of education in the village has turned out to be the crucial elements influencing the livelihood sources within the same geographical unit. Hence understanding the dynamics of livelihood outcomes and processes needs better understanding of interrelated causative factors and studying it in isolation would not generate any fruitful outcome.

Hence, the nature and dynamics of livelihood are intrinsic part of peoples and households choices. It always has a close association with skill, opportunity, access to resources, availability of institutional aids and other societal linkages. Mapping the livelihood dynamics therefore needs careful understanding of the forces that tends to influence the peoples' ability in terms of meeting the need. Livelihood in broader aspect revolves around the different factors ranging from individual household decision to institutional responses.

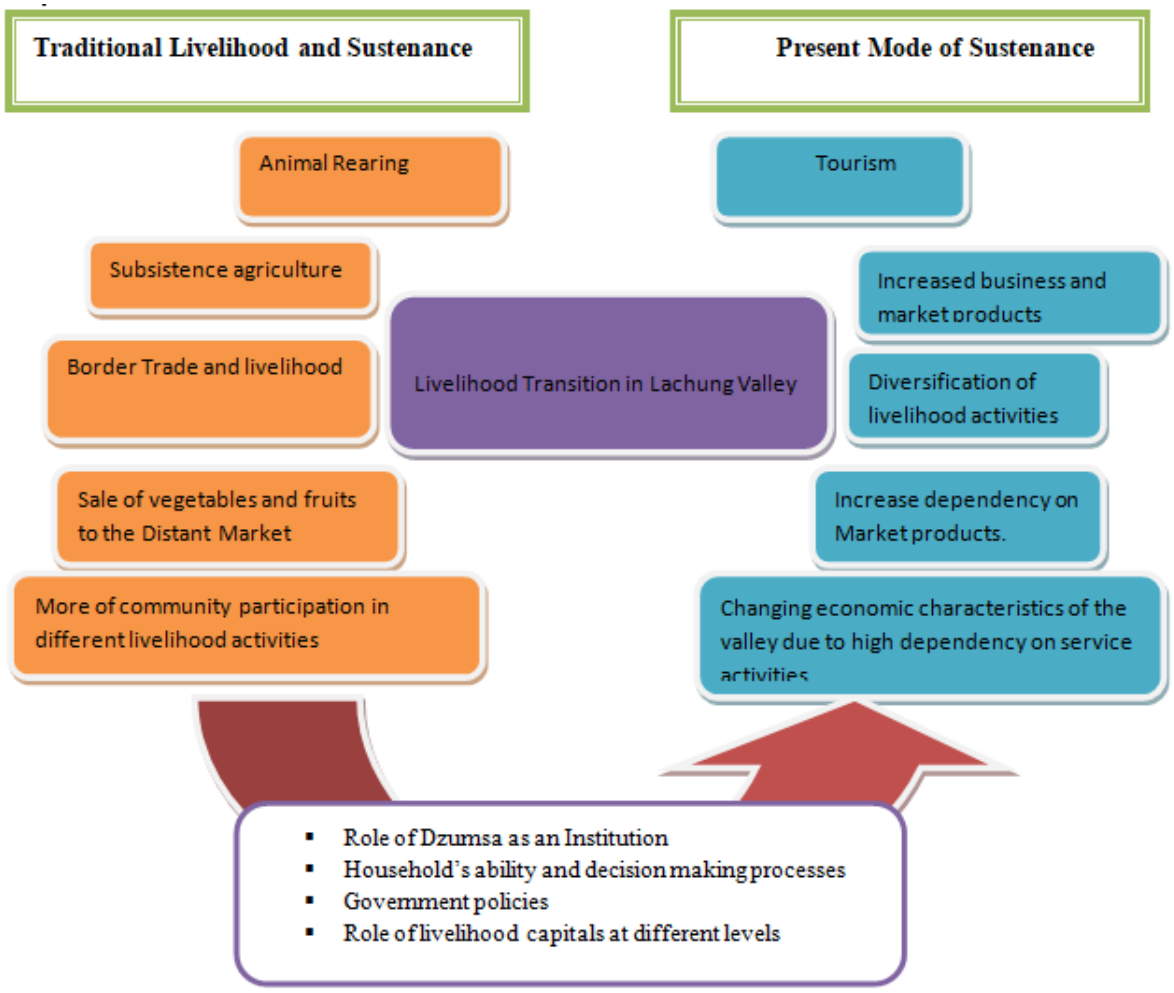
In fact, the livelihood itself is inter twined with different elements ranging from physical to social, political to economic, natural to cultural etc., which at times becomes difficult to distinguish the real factor acting on the change and the resultant outcome of such changes.

Thus, the chapter addresses the linkages of livelihood with the history, nature of governance, land distribution, traditional culture etc, and throws light on the present livelihood scenario of the valley population. The level of diversification, changing

interest of the people, nature of economy and the influence of tourism in mode of livelihood sustenance in the valley have been shown to show the level of changes that have taken place over the years.

The overall sequence of livelihood processes of the valley that has witnessed the change over the period has been shown in the flowchart in figure IV.4.

Figure IV.4: Livelihood dynamics of Lachung Valley



CHAPTER V.

Livelihood Adaptability in context of Sustainability

Adaptability or adaptive capacity refers to the ability of system to cope to the changing conditions. The most important part of the definition is the ability of a system to adapt which depends on number of influential factors. The factors of adaptability adapt ranges from social to economic, cultural to political and biophysical factors. Adaptive capacity of a system varies considerably among regions, countries and socio economic groups (Smit B et al., 2007).

The complex blend of conditions determines the capacity of system to adapt. Adaptability itself does not occur in isolation. It is the process that runs parallel to the natural system thereby making the population group to operate along with.

The ability of the system to adapt itself to the changing biophysical condition depends on the strength of the capital assets[10] they posses. The level of strength of these capitals in turn depends on the functioning of the institutions and processes. Assets are the building blocks of sustainable livelihood. By building assets, individual and households develop their capacity to cope with the challenges they encounter and meet their needs on a sustained basis. The greater is the sustenance of these capitals, greater is the degree of adaptability of a system to overcome the livelihood stress. The ability of the system to cope with these changes and meet the livelihood needs through different livelihood strategies addresses the issues of sustainability.

[10] Capital assets or livelihood capital/ assets refers to all forms of Natural, financial, Human, Social and Physical assets that forms the base for human survival

The ability of the system to adapt and cope with the impact of change is the function of wealth, technology, information, skill, infrastructure, institutions and equity (Smit B et al., 2007). Understanding the adaptive capacity therefore requires close look into the available opportunities in a particular system. All these available opportunities somehow revolve around the availability of livelihood assets. Making wise decision through community participation helps in strengthening the livelihood of the community as a whole. Successful adaptation requires a recognition of the necessity to adapt, knowledge about available options, the capacity to access them, and ability to implement suitable ones (Frankhausher et al., 1997).

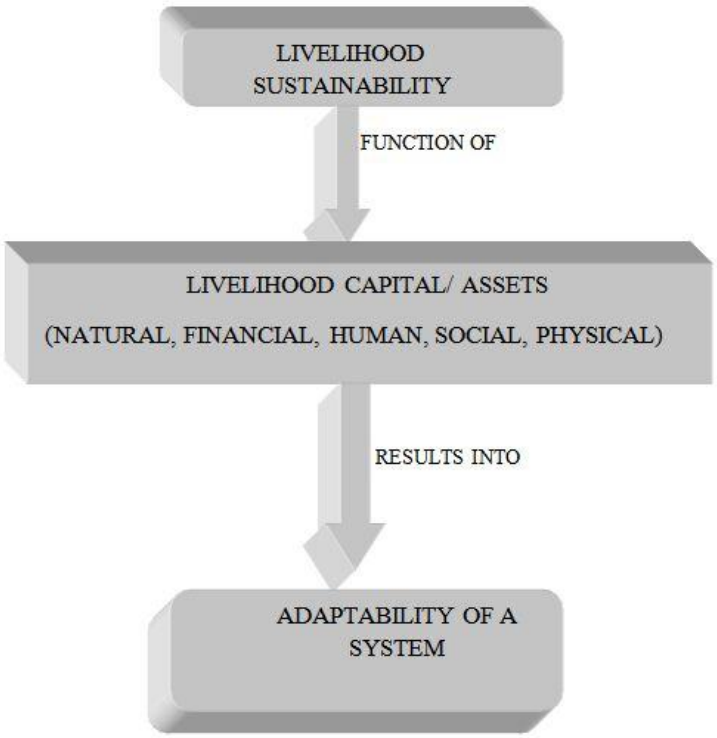
The available livelihood assets (N, F, H, S, P) and ability of the system to respond to the change (adaptability) is therefore interlinked in such a way that the possession of the former results in strengthening of the later. Understanding the livelihood capital/assets and locating its weaknesses and strengths therefore helps in identifying the adaptability of the system to respond to the changes that are yet to affect the system itself.

The external forces (changing biophysical conditions) that act as threats to the ecosystem can therefore be overcome by making the system strong enough to resist the change. The strength to respond to the changing conditions therefore lies in the adaptive capacity of the system in itself. Thus understanding the core of livelihood capitals and locating its strength and weakness is vital for the responding the problems of adaptability. Boosting these livelihood assets therefore helps in making the system to respond itself or adapt to the changing biophysical conditions.

The dynamics of livelihood change and understanding its weakness and strength therefore helps in building the system strong. All these can possibly be strengthened by understanding the core indicators of each capital in terms of its availability. The focus of each livelihood asset should be in understanding the internal processes involved in making these blocks and each indicators should reflect the need of the system to meet the problem arising out of systems ability to resist the change.

The entire dynamics of livelihood sustainability and adaptability of a system to respond can be shown in the following schematic representation:

Figure V.1 **Flow chart showing capital assets and sustainability**



V.1 Dynamics of Livelihood Assets and Sustainability

Livelihood dynamics can be best understood by understanding the livelihood assets. These assets determine the adaptive capacity of the population group to respond to the changing conditions. The inter linkages of these livelihood capital assets and their operation at different levels give stability to the given conditions. The functioning of these capital assets are as such that it becomes difficult to clearly distinguish which assets results in what form of change. For instance the strengthening of human capital in the form of education, skill development, and training results in flow of income in the household (financial capita) which further helps in building the social capital in the form of better understanding of the world by openness built in the educated minds.

The level of adaptability in the valley has been the interplay of different factors among which the geographical locations of the hamlets has been the most prominent one. The overall analysis of the result reflects the fact that all five hamlets vary considerably in terms of their level adaptability. Phaka stands top among the all five hamlets owing to its geographical specificity as it forms the oldest settlement among all five hamlets. The duration of sunshine, nature of terrain and its location at the centre of the valley has been able to give it a distinguished characteristic with higher degree of sustainability. Bitchu, Sarchok and Singring developed later as agricultural farmlands. However Singring being relatively gentler in its slope was preferred more for the settlement when the population in Phaka increased.

Expansion of Bitchu and Sarchok took later as an agricultural farmland of the people that was distributed by Dzumsa. People from Phaka and Singring used this land for

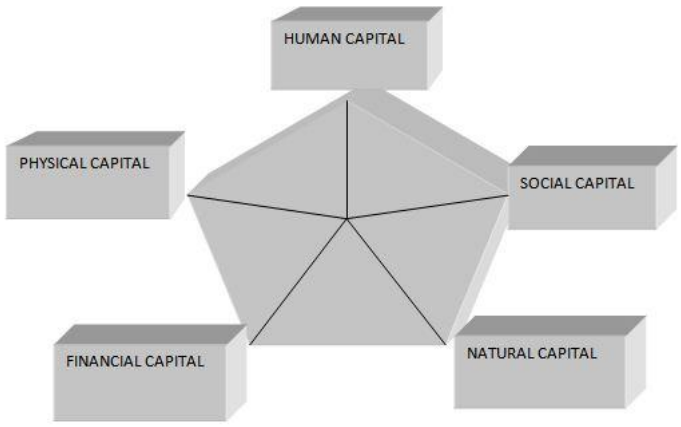
agriculture and slowly when the population and family sizes increased in the valley, it grew as a settlement. However Sarchok being attached to Phaka was able to adapt itself with the similar growth that existed in Phaka for which it today has considerably good number of hotels. The economic characteristics of the Sarchok were thus modified as per its nearness to the oldest settlement i.e., Phaka. Bitchu being the farthest town from Phaka and relatively steeper in slope could not grow as a tourist hub and remained confined as agricultural dominated farmland for which it still has a greater degree of population dependent on agricultural activities. Hence the varying nature and characteristics of the economy of the valley has been mostly influenced by its geographical characteristics including slope, duration of sunshine, and its distance from the main settlement. The level of adaptability also followed the trend of nature and growth of the settlement.

Besides this the skill possessed by the community when shared helps in strengthening the other interlinked livelihood assets. Hence, livelihood system can be brought into light by understanding the processes that operates at different levels in the society. Classifying these assets and understanding the relational cause and effects of these assets individually based on certain criteria helps in understanding the dynamics of livelihood system more comprehensible.

The study tries to understand the livelihood assets of the community in different villages of Lachung based on indicators of certain and tries to highlight the level of adaptability that the villages have. The household survey has been used as a tool for measuring the level of livelihood capital that the community posses and comparative study of different villages has been done to highlight the level of sustainability.

Livelihood Pentagon[11] has been used to show the level of assets that the villages in Lachung posses. Besides this the pentagon developed out of the assets possessed by individual village has been studied comparatively to assess the level of capital possessed and drawing out the conclusion on the issues of sustainability. Indicators for each livelihood capital has been developed and based on the percentage of household possessing the capital assets have been ranked accordingly. The ranks for each indictor have been developed and composite index of the capital based on the achieved rank has been used to measure the level of assets possessed by individual villages to determine its sustainability.

Figure V.2 **Livelihood Pentagon**



LIVELIHOOD PENTAGON

V.2 Livelihood Pentagon in relation to issues of Sustainability

The centre of pentagon shows the zero level of assets possessed. With the increasing asset in each category, the value move towards the vertex of the pentagon. The tip of the

[11] Livelihood pentagon represents five key livelihood assets (Physical, Social, Human, Natural and Financial) in its five vertex. The pentagon can reflect the amount of asset that a particular village posses.

vertex represents the highest level of assets possessed. Thus, the different asset possessed by the community varies accordingly within the pentagon based on nature of the available assets in community. The effectiveness of the community assets possessed can be mapped based on the available assets and the level of sustainability of different villages can be shown effectively.

Lachung valleys with five different villages have their varying degree of capital resources. The resources possessed by the community have been taken out based on the survey conducted in different households of Lachung and the households have been ranked based on the degree of availability of particular resources. The composite Index of all the ranks has been taken and their composite ranks of individual village have been shown. Different villages of Lachung with varying degree of capital assets possessed have been shown:

Table V.1 Participation rate of Households in Shared activities in Lachung Valley

Hamlets	Ploughing	Crop Cultivation	Harvesting	Livestock rearing	Sharing the seeds	Getting the tourists	Other social activities
Phaka	10.9	12.7	10.9	25.4	69.0	70.9	85.4
Sarchok	44.2	40.3	15.3	55.7	75.0	78.8	96.9
Singring	46.2	16.2	10.8	13.5	64.8	67.5	70.2
Bitchu	44.4	48.8	48.8	20.0	75.5	71.1	64.4
Thomchi	54.5	54.5	45.4	18.1	63.6	72.7	18.1
Average	**36**	**31**	**29.5**	**29**	**54**	**71**	**68.5**

***Shared community activity has been used as a social activity in the study area.**

Source: Field Survey, April 2016

V.2.a Analyzing Social Capital in Lachung Valley

Eight indicators have been selected to reflect the nature of social capital through participation of people in different social activities. Percentage of household involved in community services and their social relations have been identified based on the household survey. The higher is the involvement of a household in any community activity in the village, stronger is the social capital. The percentage involvement of household in different hamlets based on the nature of involvement in different social activity has been worked out.

The nature of involvement of households in different social activities reveals that average participation of household in ploughing comes out to be 36 percent. Four hamlets other than Phaka have the higher percentage share of involvement of household in terms of preparing the field. The greater involvement of households in agricultural activity make the household share their participation in terms of preparing the field for agriculture. The reciprocity of give-and-take relationship of the community strengthens the mutual trust and cooperation in the work environment.

In terms of cultivating, the average participation of the entire village comes out to 34.5 percent with Phaka while Singring has the lowest in terms of their involvement in crop cultivation. Phaka being the dominant point of tourism and resultant small and micro business enterprises has least population involved in agricultural activity. However households in Singring though involved in crop cultivation takes less participation crop cultivation owing to the presence of homestays and allied business enterprises. When it

comes to sustained involvement of manpower like that of activities like crop cultivation they give their land to *gothwalas* to make use of it.

The coincidence of growing season with the peak tourist season at times prevents the households to involve themselves in growing crops. Hence the households that derive more of benefits from tourism industry focus their man power and priorities less on agriculture like that of Phaka and Singring.

Dependency on animal rearing over the years in the valley has rapidly fallen down due to unavailability of fodder for the animals and also due to shortage of *gothwalas* in the valley. Increasingly fewer numbers of households have been rearing animals in Lachung. In terms of rearing the livestock, the average participation is just 15 percent. This is mainly due to diminishing economic returns and hard labour involved in animal rearing. Hence there has been shift in occupational interest of the people towards non-farm activities.

Seed sharing has also been taken as an indicator of household's social relation in order to understand the social relationship and to measure its social capital. It is evident from the table V.1 that on an average 57 percent of the households in Lachung involve themselves in seed sharing. Bitchu being relatively away from the influence of tourism due to its geographical location has been the hamlet dominated by agricultural workforce and less tourism and business enterprises has the highest percentage of households (75 percent) involving themselves in seed sharing followed by Singring and Thomchi. It is thus clear from the fact that the nature of social relations among the hamlets has its close linkages with the nature of livelihood practices. Higher is the involvement of household towards

primary activities like agriculture and animal rearing, higher is the involvement of household in social activities which gets clearly reflected in the Hamlets like Bitchu, Thomchi and Sarchok in Table V.1.

Involvement of households in tourism in Lachung has been very high. On an average 71 percent of the households directly and indirectly associates with tourism activity. Their dependence on tourism activity may range from serving the tourist by providing transportation to hosting them in the valley as well as serving the tourist as guides.

It is interesting to note that the involvement of households in tourism has been very high except for Thomchi. Most of the households responded positively in terms of getting the tourist to their villages as it forms the backbone of the valley. Their participation in tourism activity clearly shows that tourism and business enterprises can also help in strengthening the social capital as shown in table V.1 for instance Phaka and Sarchok have the highest percentage of household involved in tourism and allied business enterprises hence their participation in serving the tourist to the valley is higher thereby in turn helping the valley to have positive outcome. Nevertheless the participation of the entire population in serving the tourist through different means in the valley has been very positive in Lachung.

Other social services have been used to include the participation of households in marriages, Funeral and other religious ceremonies in the valley. The responses varied differently in different hamlets. These activities being the important part of any society thus had a greater participation of households involved in it. Thus the overall analysis of social capital reveals the fact that the involvement of hamlets in different social activities

varied based on the nature of occupation of the household and their location. Social capital thus reflects strength of the society in terms of meeting their social needs which in itself is important component of livelihood.

Hence seven indicators were used to capture the nature of social relationship. These indicators were basically the indicators of give-and-take relationship of rural society. Livelihood of the rural society largely gets influenced by these social relationships hence capturing these elements of participation was framed in analyzing the social capital.

V.2.b Human Capital

Human capital comprises of the amount and quality of labour available, skills, knowledge, and health that together enable individual or household to pursue different livelihood strategies to achieve their household objectives (DFID, 1999). The level of education, training, good health status contributes to greater earning opportunity to the household. Thus human capital adds opportunity to the households through enabling the skill, developing strength through decision making abilities.

Education can have two opposing effects on livelihood transition of farm household. Education increases access to information, which enhances farmers' ability to process information ultimately helping to increase their income. The increase income from farming will encourage an educated farmer's likelihood to continue farm. Conversely, and increase in education also increases skill and the opportunity for employment outside agriculture (Bhandari, 2013).

Human capital possessed by the population group in the region has been categorized based on the following indicators. The sets of indicators chosen have been developed

based on the nature and availability of human capital possessed by the population in the valley. Human capital has been captured through three indicators namely literacy, possession livelihood skills and availability of government services among the households. The table below reflects the human capital based on three indicators in the Valley.

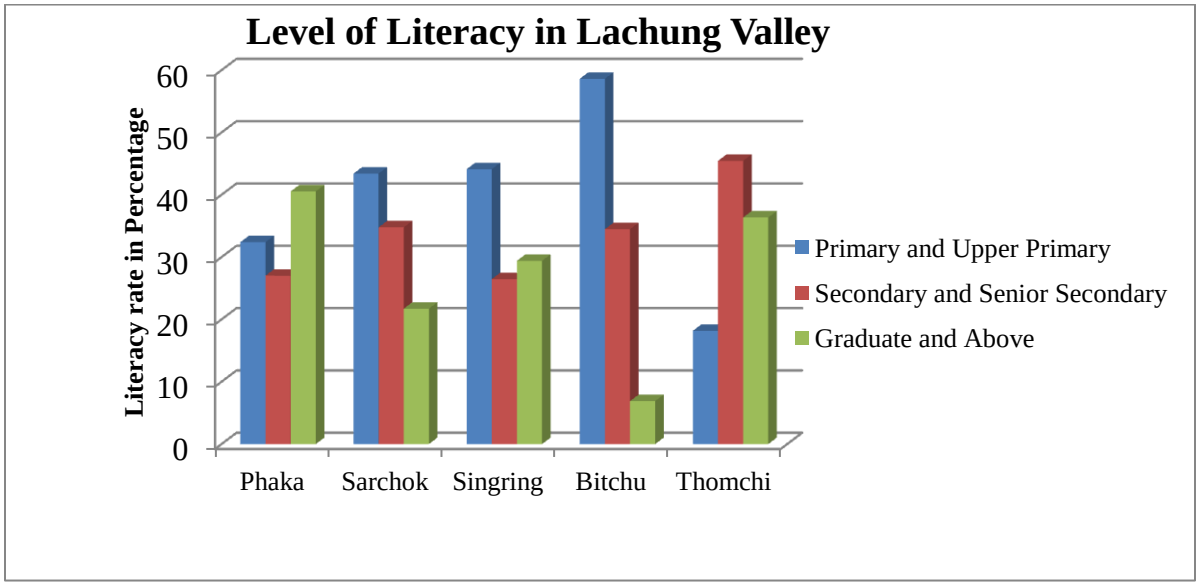
Table V.2 Household's level of Human Capital (In percentage)

Hamlets	Literacy	Livelihood Training received (in	Govt. Service holders (in percentage)
Phaka	67.2	14.5	40.0
Sarchok	61.5	11.5	48.0
Singring	75.6	10.8	48.6
Bitchu	57.7	13.3	40.0
Thomchi	63.6	18.1	36.3
Average	**65**	**11.5**	**43.5**

Source: Field Survey, April 2016

Literacy, livelihood training, government service holders in the households were taken as the indicator to measure the level of human capital possessed by the people in Lachung. The level of literacy in the valley has been shown in the table V.2. The data reflects the fact that the literacy above the village average has been found in Phaka and Singring. These two hamlets have high dependency on non agricultural activity whereas the other hamlets with high dependency on agriculture has literacy rate below the average literacy of the village as shown in Figure V.3 below. The varying level of literacy among the different hamlets has direct relationship with the nature of livelihood practices that the particular household practices. The varying level of literacy in the valley has been shown in the figure below:

Figure V.3: Literacy rate in Lachung Valley



Source: Field Survey, April 2016

The figure above shows the varying level of literacy in Lachung valley. Level of literacy has been classified under three categories. There exists a close relationship between the literacy and nature of livelihood in the valley. For instance the level of literacy in Bitchu has been fairly low among all the hamlets in Lachung with majority of its population engaged in agricultural activities.

Most of its population had the literacy ranging in Primary and Upper primary level. Graduate very few percentage of its population were Graduates and above. On the other hand Phaka, Sarchok and Singring have fairly good percentage of its population with higher level of literacy. These hamlets with higher level of literacy tend to derive their livelihood from tourism and business enterprises.

Thus, it is clear from the fact that owing to lesser economic prosperity and resultant lesser mobility has lead to lower level of literacy and hence involvement in agricultural activity of this hamlet is relatively higher than the other hamlets of the valley.

In terms of receiving any form of livelihood training in the valley, it is clear that the livelihood training provided to the people in the valley has been rather low. On an average only 13.64 percent of the population were affirmative for having received livelihood training. The availability of training in the form of making livelihood stable has been very poor. In addition to it, there has been restriction on use of chemical fertilizers in the farms. With the given level of training and restriction on various growing techniques, the farmers have adversely been affected in terms of productivity of farm outputs in Lachung.

In order to understand the level of human capital, the availability of government servants across the households were taken into consideration as it basically recruits the able skilled and educated members. Thus availability of government servants in different hamlets has also been taken into consideration to understand the level human capital in the valley.

On an average 42.58 percent of the households in Lachung possessed the government servants with Singring and Sarchok having the government servants' household with slightly above the village average. The lowest percentage of government servants have been found in Thomchi and Bitchu among the entire villages of Lachung mainly due to low level of education among the population in comparison to the other hamlets of Lachung.

Thus, in order to understand the level of human capital possessed by the population in Lachung, different measures and indicators have been formulated which reflects that Singring and Phaka are better in terms of availability of human capital based on the given sets of indicators.

V.2.c Physical Capital

Physical capital comprises of the basic infrastructure and producer goods to support livelihoods. Adequate access to energy, roads, and housing facilities, availability of sufficient sources of heating and lighting and household assets forms the physical capital. All these capital helps in building the other forms of capital and help in generating the livelihood to the population in the remote corners.

Insufficient or inappropriate producer goods also constrain peoples' productive capacity and therefore the human capital at their disposal. Thus the possession of physical capital helps in generating other productive assets for better living.

Based on certain indicators physical capitals possessed by the people in Lachung have been developed.

Table V.3 Household's level of Physical capital (In percentage)

Hamlets	Electricity	LPG	Solar Lights	Pucca	Transportation
Phaka	100	85.4	78.1	85.4	80.0
Sarchok	100	78.8	71.1	75.0	76.9
Singring	100	83.7	72.9	67.5	75.6
Bitchu	100	73.3	57.7	60.0	66.6
Thomchi	100	90.9	63.6	63.6	63.6
	100	**81**	**70**	**72.5**	**74.5**

Source: Field survey, April 2016

All those assets available to the people that are essential for daily activity have been considered as physical assets. It includes infrastructural as well as physical assets of the people into account. Thus availability of LPG, solar lights, Pucca houses and easy transportation system has also been taken into account to measure the level of physical assets possessed by the people. In terms of availability of electricity all the sampled household had electricity connections. About 82.42 households had LPG with Thomchi and Phaka with highest LPG possession. The availability of Solar lights in the households has been fairly good, 60.56 percent of the households have solar lights available in their houses with Bitchu having the lowest availability of solar lights connections.

It is interesting to note that 70.3 percent of the households in Lachung have Pucca houses with Phaka, Singring and Sarchok with higher concentration of Concrete Dwellings mainly due to the presence of tourist guest houses. In addition to concrete buildings for hotels and business, some households often possess wooden houses close to it in order to have cozy winter with fire burnt in it.

On analyzing the physical capital possessed by the household in Lachung it was found that Phaka had good level of physical capital possession. Easiness in transport services, houses with higher possession of physical infrastructure made it higher in terms of availability of physical capital. Sarchok and Singring also have a good degree of physical capital. The village being the high tourist service centre has greater possession of basic infrastructure.

Bitchu on the other hand dominated by higher percentage of population based on agricultural activity and less numbers of tourist serving hotels therefore has less physical

assets needed for the livelihood. Thus there existed a variation in possession of physical capital within the village based on the nature of activity carried out by its population.

V.2.d Financial Capital

All those financial resources that people use to achieve their livelihood needs fall in the category of financial resources. The stock of wealth possessed by the people or the cash deposited in financial institution which help to earn other means of living are regarded as financial capital. These stocks of resources help people to purchase other means of livelihood.

The investment made by the people in any productive activity, the savings in banks, the stock of resources that serves the livelihood needs in financial crises and help people adapt themselves are the examples of financial capital.

The financial capital, serves as the security to the people when needed. They help to generate other forms of livelihood capital. For instance the cash possessed the household can be used for donating in the village development fund thereby developing (social capital), it can also be used to purchase household infrastructure (physical assets).

Thus among all the assets financial assets have an important role in livelihood adaptability as it can be used in multiple ways at any point of time in need**.** The possession of financial assets varies differently among different hamlets based on the type of activity the household carries out. The level of financial capital possessed by the villages in Lachung has been shown based on the indicators given below:

Table V.4 **Household's level of Financial Capital (In Percentage)**

Hamlets	Bank Account holder	Savings	Loans/ Borrowings	Insurances
Phaka	74.50	67.20	54.50	40.00
Sarchok	65.50	48.00	34.60	19.20
Singring	56.70	35.10	24.30	16.20
Bitchu	44.40	20.10	15.50	20.00
Thomchi	54.54	45.40	10.90	18.18
Average	**61**	**44.5**	**32.5**	**24.5**

Source: Field Survey, April 2016

The availability of financial capital has been reflected based on the indicators such as possession of bank accounts, availability of household savings, loans borrowed and availability of insurances. All these indicators reflect the household's participation in terms of availability of financial services as well as to make the livelihood stable in terms of getting the benefits of such institutions when needed.

The level of financial assets possessed by the population has been measured using four indicators. The indicators reflect the level of financial assets that the different villages in Lachung has. Phaka, Sarchok, and Singring has higher influence of tourism which helps in earning more out the services and population dependent on such services has higher savings and insurances. Bitchu being the agriculture dominated have fewer saving. The crops that are raised are generally used for domestic consumption and hence the level of savings is low.

Thus, the financial assets that the population own in Lachung varies accordingly based on their earning, the nature of occupation, the level of households education etc. which generally remains low in high agricultural dependent households.

V.2.e Natural Capital

Natural Capital refers to all the stocks of natural resources that are vital for human survival. The dependency of population in isolated mountainous is relatively higher when the issue of livelihood is concerned. Some of the example of natural capital includes the services derived out of land, forest resource, wild resource, water, clean and fresh air to breathe etc. The livelihoods approach tries to take a broader view, to focus on people and to understand the importance of structures and processes determining the way in which natural capital is used and the value that it creates. The better is the store of natural asset, better is the ability of people of the community to adapt them to the changing environment.

Besides this the Natural capital are the assets of all community members irrespective of their social or economic backgrounds. The rights to make use of these assets are equal among entire population. It in fact are the real resource of the poor as they make higher use of it in the form of grazing herds or any other primary activities. Thus the Natural capitals are of immense value to the low income group especially to the population with lower level of education whose dependency relies mostly on forest, land and water.

Table V.5 Household's Level of Natural Capital (Access In percentage)

Hamlets	Firewood	Drinking water	Grazing land	Cultivable Land
Phaka	85.4	94.5	74.5	92.7
Sarchok	78.8	98	65.3	86.5
Singring	83.7	97.2	75.6	94.6
Bitchu	88.8	95.5	68.8	77.7
Thomchi	81.5	100	72.7	72.7
Average	**84**	**96.5**	**71**	**87**

Source: Field Survey, April 2016

The selection of natural capital were based on four indicators namely the availability of firewood to the households, availability of safe drinking water, availability of land for grazing the herds and availability of land for cultivation. There has been variation in availability of Natural assets among the different hamlets. The use of natural capital in fact depends on household choices; however the data represents only the availability of particular set of natural capital in different hamlets.

It was found that the availability of firewood has been very uniform with 83.6 percent of the households having access to firewood for heating and cooking. Every year the individual households can get the firewood required by paying certain amount of taxes to the forest authority. The forest authority selects the trees to be cut for firewood in order to prevent the loss of vegetation from the same region. Similarly the availability of safe drinking water has also been very high. More than 97 percent of the household had a positive response in terms of availability of safe drinking water. The presence of river Lachung Chu with its tributaries from different melting Glaciers makes the region plenty in terms of availability of water. Some of the households located relatively at the isolated zone had little difficulty in terms of availing these resources easily.

The availability of grazing land for the herds has been good in Lachung. Though the people have lost their interest in rearing the animals however more than 70 percent of the population responded positively when enquired about the availability of grazing land. Similarly the availability of land for cultivation has also been very positive.

More than 84 percent of the sampled household possessed the land for cultivation. Some of the households have left cultivation and their fields remain barren throughout the year,

however all these cultivable land were taken into account while analyzing the availability of these capital assets. The loss of interest of the people in cultivating has been mainly due to low productivity of the farm output. The policy on fertilizer ban in Sikkim has largely discouraged people from cultivating their farm lands. Besides this the inclinations towards serving the tourists and getting other forms of employment outside the village have created labour shortages in farm lands. Thus, the availability of natural capital in Lachung has been very interesting when the entire assets are seen together. Making use of these assets however depends on household's choices and preferences.

V.3 Understanding Livelihood Sustainability in Lachung Valley

Sustainability of livelihood has been analyzed based on the aggregate score under different categories of livelihood capital. The score of each capital asset under different sets of indicators with the assigned weightage has been shown in order to understand the role of each indicator in livelihood. Each indicator has been separately assigned with varying weights based on its importance in everyday lives of the population. The score of each asset under each category of indicators has been calculated and analyzed to have overall idea of livelihood sustainability. The score of overall capital is then finally compiled in order to reflect the level of livelihood sustainability in the valley.

Table V.6 Composite Index of Overall Livelihood Capital of Lachung Valley.

Hamlets	Ploughing	Growing crops	Harvesting	Animal rearing	Sharing the seeds	Getting the tourists	Other social activities	Literacy	Livelihood Training	Govt. Service holders	Electricity	LPG	Solar Lights	Pucca House	Easy Transportation	Bank Account holder	Savings	Loans /Borrowings	Insurances	Firewood	Drinking water	Grazing land	Cultivable Land	Average (In percentage)
Phaka	11	13	11	25	69	71	85	67	15	40	100	85	78	85	80	75	67	55	40	85	95	75	93	**64**
Sarchok	44	40	15	56	75	79	97	62	12	48	100	79	71	75	77	65	48	35	19	79	98	65	87	**67**
Singring	46	16	11	14	65	68	70	76	11	48	100	84	73	68	76	57	35	24	16	84	97	76	95	**57**
Bitchu	44	49	49	20	76	71	64	58	13	40	100	73	58	60	67	44	20	16	20	89	96	69	78	**55**
Thomchi	55	55	45	18	64	73	18	64	18	36	100	91	64	64	64	54	45	11	18	82	100	73	73	**56**
Average	**36**	**31**	**30**	**29**	**54**	**71**	**69**	**65**	**12**	**44**	**100**	**81**	**70**	**73**	**75**	**61**	**45**	**33**	**25**	**84**	**97**	**71**	**87**	

***Figures in the table show the percentage household possessing particular livelihood capital.**

****Source: Computed from livelihood Capitals of the study area.**

The overall livelihood capital has been shown in the composite index taking twenty three indicators into account. All these indicators have been grouped and comparatively analyzed. Five Hamlets have been analyzed based on the nature of variations of different livelihood capital. The figure clearly shows the distribution of different livelihood indicators with varying degree of their strength and weaknesses.

The first six categories of social capital reflect the weakness of it in terms of people's participation in social activities. Similarly the weaknesses of human capital have been reflected in ninth, tenth and eleventh category of livelihood capital. Among all the capital assets the indicators of human capital have the lowest value especially that of training livelihood training received by the households.

Access to Physical Capital has been fairly good with all the values above 60 percent. The graph shows that among the financial capital insurance and participation in borrowing have been relatively low. Access to Natural resources in Lachung has been very positive owing to the proper resource management by Dzumsa and hence the bars in the extreme right reflects the access to natural capital which shows fairly positive outcome in terms of availability of these resources among the households in Lachung.

Thus the composite index representation of livelihood capital in Lachung valley has been very fairly good with more than 45 percent of the overall capital lacks the good results in terms of its availability among the population.

The improvement in Social, Human and Financial capital would definitely result into larger positive outcome to attain the greater degree of livelihood sustainability.

The total average score of each hamlet was computed to see the level adaptability in terms of access to resources and it was observed that Sarchok and Phaka had the highest score of about 65 reflecting their ability to have access to the capital assets of all forms when taken in aggregate.

Similarly, Singring also had the average score of about 57 across all the assets showing it to be relatively good in terms access to capital assets in the valley. These three hamlets being more influenced by tourism have fairly good access to almost all the livelihood Capital assets. Hence the average score of these three Hamlets are closer to 60 percent on an average.

However Bitchu and Thomchi have the score value of 55 and below. These two hamlets being more dominated by agriculture and less of tourism have fairly good social capital however in terms of their accessibility to other livelihood Capital they have lower score value especially in terms of access to financial capital and Human Capital.

Hence, the Composite value of the overall capital reflects the fact that within Lachung the nature of livelihood practices has brought about differences in the level of access to different capital thereby making some hamlets with greater degree of sustainability for livelihood. Some hamlets have relatively lower degree of sustainability in resource use and access in comparison to the others. Those households with lesser degree of sustainability basically have lesser diversification of livelihood and limited resource access set by different forms of financial constraints.

Table V.7 Average score of Social Capital (Shared mutual labour force) in Lachung

Social Capital	Ploughing	Crop Cultivation	Harvesting	Livestock Rearing	Seed sharing	Const. of houses	Involvement in tourism	Other social services	Grand mean
Average	36%	31%	29.5%	29%	54%	71%	68.5%	88.5%	
Weight assigned	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	**100**
Score	4.50	3.87	3.68	3.62	6.75	8.87	8.56	11.06	**50.91**

Source: Field Survey, April 2016 (Average Derived from Table V.1)

Social capital has been analyzed based eight different indicators. The social relationship being an essential part of livelihood component cannot be easily based on fixed set of indicators, however have been captured on the basis of its relevance in the valley. These indicators reflect the people's participation in social activities which has been captured based on percentage of household respondents in different hamlets in Lachung. The Percentage of household involved in different social activities has been shown in percentage and their average participation has been derived from it.

The overall analysis of social capital shows the fact that the social relationship among the household have been changing with the changing economic activities. It has been found that with the influence of tourism in the valley, the level of participation in different social activities among the households have gone down. The gradual shift from primary to non primary activities has largely been responsible for bringing the changes in the nature of involvement in social activities. The change in the pattern of household occupation brought a remarkable shift in the nature of involvement of households in different activities.

The loss of traditional nature of occupation especially agriculture and animal rearing have in fact widened the level of interaction among the household in Lachung. The narratives from the field reveal that the influence of tourism and change in the nature of livelihood has greatly influenced people's level of participation in village activities. The Dzumsa however have been able to maintain the level of interaction among the population with its meetings, village development plans and during developmental activities. However the changes that have occurred in the social system due to changing nature of economy slightly have larger impact than the social system that existed before.

Table V.8 Average Score of Human capital in Lachung Valley.

Human Capital	Literacy	Livelihood Training received	Govt. Service holders	Grand Mean
Average	65%	11.5%	43.5%	
Weight assigned	30	40	30	**100**
Score	19.50	4.6	13.05	**37.15**

Source: Field Survey, 2016 (Average derived from table V.2)

Human capital though takes into account the number of indicators ranging from education, health and skills, has been simplified based on three indicators namely the literacy of the population in the valley, availability of training and livelihood enhancement skills and availability of government services among the households in Lachung. The availability of government services indicate the level of skill and qualification possessed by the individual.

Thus even the government services availability has also been taken into account to indicate the level of human capital in the valley. Different weights have been assigned to different indicators based on their importance to household livelihood in Lachung

Valley. Livelihood training being the most important element of livelihood outcomes has been assigned the weight of 40 while the literacy and government services have been assigned the weightage of 30 respectively. Despite giving the higher weightage to the livelihood training, the score of it is the lowest among all the indicators owing to the poor performance of availability of trainings among the population. However the percentage share of education was relatively higher among all the indicators which made the score highest in comparison to all the indicators of Human capital.

Table V.9 **Average Score of physical capital in Lachung Valley.**

Physical Capital	Electricity	LPG	Solar Lights	Pucca House	Easy Transportation	**Grand mean**
Average	100%	81%	70%	72.5%	74.5%	
Weight Assigned	15	15	10	30	30	**100**
Score	15	12.5	7.0	21.75	22.35	**78.6**

Source: Field survey, April 2016 (Average derived from table V.3)

The physical capital based on five set of indicators have been computed based on the average of total human capital across different indicators. The average of five different indicators has been used to reflect the availability of physical capital among the households in the valley. The possession of different capital across the households has been used to reflect the nature of access to different livelihood capital under the category of Physical assets.

Five indicators have been assigned different weights based on its importance in generating the livelihood. Hence Electricity and LPG were assigned the weightage of 15 each followed by solar lights with 10 as it does not form an important component of livelihood. Similarly availability of Pucca house and easy transportation was assigned

the weightage of 30 each owing to its real need in terms of generating the livelihood needs. Score of each as per the weights assigned has been taken out using basic percentage techniques and has been found that the performance of Physical capital in comparison to all the livelihood capita was much higher.

Table V.10 Average Score of Financial Capital in Lachung.

Financial Capital	Bank Account holder	Savings	Loans borrowed	Insurances	Total
Average	61%	44.5%	32.5%	24.5%	
Weight assigned	15	30	30	25	**100**
Score	9.15	13.35	9.75	6.12	**38.37**

Source: Field Survey, April 2016 (Average derived from table V.4)

The score of financial capital have been identified based on four sets of indicators. Four indicators have been used to assess the nature of financial capital. Possession of accounts, savings, and loans borrowed for productive purpose and possession of insurance across the households has been used to show the access to financial capital across the household. The absence of access to financial services like banking, insurances and local self help group among the rural households has led to the lower score of financial capital in the valley. The households that are more dependent on agricultural activity have lesser access to financial capital.

Only about 61 percent of the households in the valley have their bank accounts while 39 percent of the households do not even have their bank accounts which itself is the indication of lower level of involvement in terms of financial services. Only about 44.5 percent of the households have their savings and only about 24.5 percent of the household possesses insurances of any form in the valley. Only about 32.5 percent of the total sampled households in the valley have borrowed loans for productive purpose.

Most of the loans that have been borrowed have been used for the construction of hotels and buying of tourist vehicles. Thus the investment of the borrowed loans has also been towards tourism industry reflecting the tourism as an agent of livelihood generation in Lachung valley.

Different weights were used to understand the score of financial capital and compare it with other livelihood capitals. Savings and loans borrowed for productive purpose were assigned the weights of 30 each followed by possession of insurances with the weightage of 25. The overall score of financial capital was not very positive as the access to financial capital among the rural households was very poor thereby leading to fall in the score of financial capital as low as 38.37.

Table V.11 Average Score of Natural capital in Lachung Valley.

Natural Capital	Firewood	Drinking water	Grazing land	Cultivable Land	Total
Average	84%	96.5%	71%	87%	
Weight assigned	30	30	20	20	**100**
Score	25.20	28.95	14.20	17.40	**85.75**

Source: Field Survey, 2016 (Average derived from table V.5)

Natural Capital has been identified based on four indicators namely the availability of firewood, access to safe drinking water, availability of grazing land and availability of cultivable land. The access to different natural capital among the household in Lachung has been used to assess the natural capital. The average value of total natural capital has been shown in the table obtained from table V.5 above.

The table reflects the access to natural capital among the households which has been very positive in the valley with the grand score of 85.75 percent of the total households having access to it. The valley being richly endowed with natural resources and *Dzumsa* having control over its uses have been able to make use of resources available to all in the valley.

About 84.6 percent of the household have access to firewood in Lachung. Every household have the right to get a truck full of firewood from the forest once a year paying a certain amount of tax forwarded to the forest officials by the *Dzumsa*. Most of the household makes use of this firewood for heating and cooking in winter months. Even the hotels make use of firewood for cooking in severe winter months. The valley being situated in the bank of river Lachung Chu, have less problem of availability of water resources. Almost all the households have access to water that has been tapped from the river. Besides this the numerous streams that are around the valley also serves the need of water for the households making 96.5 percent of the household having access to it.

Access to grazing land and land available for cultivation has also been used to assess the level of natural capital among the households. The access to land available for grazing herds and land available for cultivation has been very positive with more than 80 percent of the households having access to it.

On analyzing the score as per the weights assigned to each of the indicators, it has been found the total score under each category remains very positive. Hence the overall value of the average of natural capital in Lachung has been very good with the grand

average of about 85 percent of the household having access to it. Besides, the functioning of Dzumsa in the valley has been able to make fair decision in terms of its access to different households in Lachung.

V.4 Analyzing the Livelihood Capital Assets in Lachung Valley

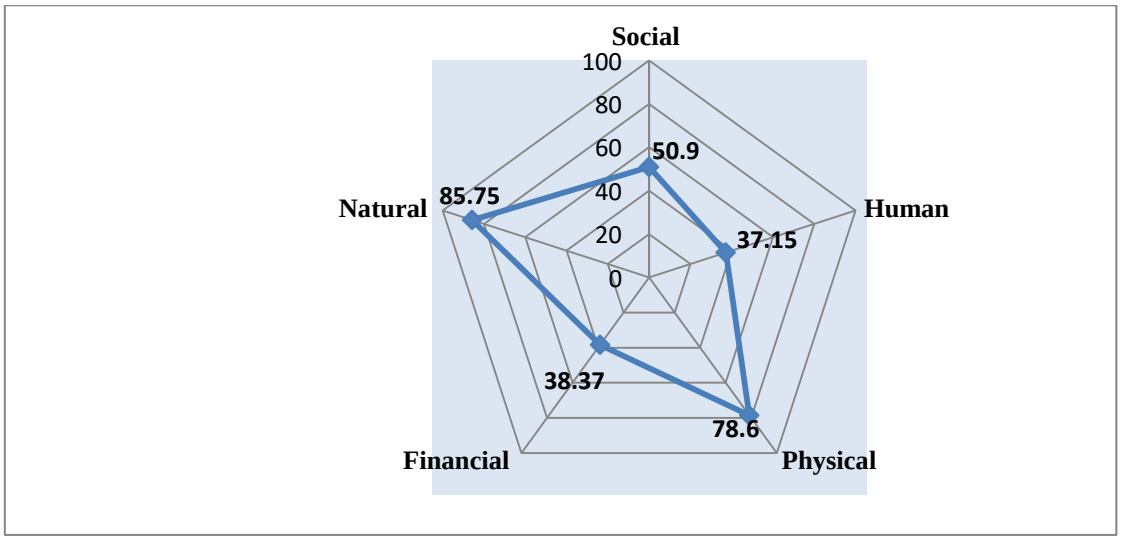
Livelihood capital assets that have been quantified based on the sets of identified indicators. It reflects the dynamics of different Livelihood assets that exists in the valley. The data acquired from the household scheduled has been quantified and assigned. The value of grand average has been used to analyze the overall livelihood capital in the valley which has been shown through livelihood pentagon.

Table V.12 **Grand Mean of all Livelihood Capitals in Lachung Valley**

Livelihood Capital	Social	Human	Physical	Financial	Natural
Grand Score	50.9	37.15	78.60	38.37	85.75

Source: Tabulated from the score of overall livelihood capitals.

Figure V.3 **Livelihood Pentagon of Lachung Valley**



Source: Derived from Table V.11

The pentagon above shows the availability of capital assets in entire valley of Lachung. Based on the score of the different indicators, it is found that the valley has strong hold on the availability of Natural capital. The value of Natural Capital is 85.75 as per the grand average of its indicators. Availability of natural assets like flowing rivers and streams make the region plenty in terms of availability of water, the forest resources, the open grazing land and the land available for cultivation to the individual households in Lachung makes the strength of Natural capital much stronger in comparison to the overall capital in Lachung valley.

The strength of physical capital in the valley has been 78.6 percent. The rural electrification has been very successful in the valley with 100 percent of the sampled households having access to electricity for heating and lighting. The availability of LPG has also been very high which accounts more than 80 percent of the household in Lachung valley. More than 70 percent of the households responded easy availability of transportation system except for rainy summer and cold winter in Mid December and January, the transportation system has been efficient which makes the strength of physical capital to be 78.6 on grand average in the valley.

The two capital assets namely Human and Financial capital has been very low in Lachung valley. The score of Human capital was found only 40 on an average. The poor level of household literacy, unavailability of livelihood training and skills development schemes in the Valley, less percentage of government services among the sampled households has made the Human capital low. Life skill training being an essential part of livelihood needs to be taken care of, however the availability of human capital has been not strong enough when measured in terms of other livelihood capital.

Similarly the financial capital has also been very weak in the valley. Limitation in terms of availability of easy loans among the poor households, inadequate savings, and poor insurances among the population for earning their livelihood makes the livelihood capital weak in terms of availing the financial services. The poor access to financial services among the households in Lachung makes the other capital also weaker when related with the other capital in some of the hamlets in the valley. The total score of financial capital based on its importance in the valley has been 38.37 which the lowest among all the capital assets needed for livelihood Sustainability.

V.5 Understanding the issues of livelihood sustainability in Lachung Valley

Sustainability of any ecosystem depends on the nature of the environment that exists in the system. It includes economic sustainability; social sustainability and environmental sustainability. Livelihood sustainability therefore takes into account the economic, social and environmental system that brings about changes in households ability to meet their daily needs. In other words Sustainability of livelihood directly depends on the strength of livelihood capital.

The stronger the livelihood capital assets, the greater are the sustainability. The adaptability of the population that is basically dependent on the access to all the resources that are essential for meeting the livelihood, needs strengthening of these capital assets. These livelihoods can be made more sustainable provided the proper balance is made between the functioning of these assets. The imbalances in use of these assets in individual households make it more vulnerable.

As stated above that the livelihood capitals are so intertwined that it becomes difficult to analyze clearly that which form of capital assets are responsible for creating imbalance in livelihood at household level. However, when these assets are fragmented based on the identified set of indicators, it becomes clearer to analyze the cause and effect relationship of one capital asset on the other.

The analysis of livelihood sustainability in the valley reveals the fact that it has abundance of natural resources that are needed for fulfilling the livelihood needs. There has been balance between the use of its availability and access to these resources. The household data shows that most of the valley populations are satisfied in terms of availability of Natural capital. Easy access to these resources makes even the poorer household in the valley to use these natural capitals thereby increasing its score to 85.6 percent of households having access to it.

The sustainability of livelihood revolves around the functioning of all the capital assets in a balanced way. However, if the availability Financial and Human capitals are seen separately in the valley, it becomes very clear that these two capitals stand very weak in terms of its availability. The strengthening of all the capital is very essential for the effective functioning of the economy, but the score of financial capital and Human capital in Lachung has been very poor which close to 40.

The availability of credit facility for the farmers, loans for various economic purposes, insurances available to the farmers has also been very poor in the valley which makes the hold of financial capital weak in the valley. Human capital has also been very poor in the valley. The level of literacy, availability of livelihood training, government

service holders etc has also been poor in valley. The response of the population in terms of availability of training and livelihood skill enhancement schemes has also been not positive enough. The human capital of score of 37.15 reflects the need to focus in this section more effectively. Measures to improve and provide basic livelihood trainings especially in the isolated mountain are very essential.

The sustainability of any ecosystem is possible only when the interaction of basic human needs and environment takes place in a balanced way. The imbalances that occur in meeting the human needs fulfilled by capital assets may turn ineffective in the long run. The development of society and its functioning can be more efficient when the process of livelihood adaptability balances the resources availability. Thus the sustainability in a broad sense is the reciprocal relationship between the resources available and the nature of adaptability that takes place within the ecosystem.

Sustainability of livelihood in Lachung valley can therefore be been understood in terms of access to different livelihood capitals, nature of administration of the resources and community's participation in resource governance. The valley of Lachung therefore reflects the system having good governance in terms of resource use and distribution. Strength of economic aspects of sustainability has also been fairly good with tourism industry largely supporting its population and farming households dependent on diverse livelihood activities.

Besides this the *Dzumsa* has been able to monitor the equality of resource distribution to its population. The sustainability if seen from the lenses of economic aspects has been relatively good in the valley with varying options of livelihood available to the

people. The changes in nature of economic activity from agro based to service based itself directs towards increased level of economic resources and its flow in the valley.

There has been rapid rate of environmental changes brought about by the tourism in Lachung. The nature of changes in land use pattern itself reflects the nature of impacts that it can have in the long run. The rapid growth of tourism industry in the valley has transformed its natural landscape. Focus on developing the tourism industry has rapidly transformed the land use. Rapid growth of concrete buildings has been on rise and the affluence generated by the hotel industry has not been systematically taken care of thereby degrading the natural environment to certain extent.

However, there have been efforts taken in every sphere of development by *Dzumsa* in Lachung. The overall analysis of sustainability reveals the fact that there has been progressive development in Lachung despite changes brought about tourism. The opportunities from tourism available to the people along with the agriculture have made the livelihood more stable. The households are able to have access to different livelihood capitals most of which are governed by *Dzumsa.* The administrative role of *Dzumsa* has been very vital in maintaining the equality in resource distribution, resource use and developing the village through different action plans. The Livelihood sustainability has largely been shaped by *Dzumsa* in Lachung. As long as *Dzumsa* functions in Lachung, the sustainability of livelihood remains very positive.

Hence the livelihood sustainability in larger sense encompasses the functional aspects of society, economy and the environment. The senses of mutual understanding among the population followed by good governance keeping in mind the environmental

development are the ways to achieve livelihood sustainability. Lachung valley has all these elements of development in it with sense of oneness among its population, diversified livelihood opportunity and efficient administration through *Dzumsa*.

Chapter 6

Summary and Conclusion

I.1 Environment has been the governing element in remote corners of the world. Its dominance is more acute when the dependencies of Humans are more inclined towards it. Forces of nature acts in different forms and humans cope themselves from these acting forces and make their living. The risks involved are very high in isolated region due to inaccessibility and other associated factors. The threats involved are high and hence proper measures of adaptations are important for attaining the sustainability of livelihoods.

I.1.a Adaptability basically refers to the ability of the system to respond to the changing ecological, social and economic phases. It is in fact the process of adjustment of community in the dynamic environment. It involves the process which may not be visible in short period of time, however in the long run it becomes distinct. The ability of the system to adapt depends on complex process that operates at different level of economy. Hence distinguishing these adjustment needs proper understanding of the system, external threats and opportunities and processes involved.

I.1.b Livelihood sustainability basically is the ability of the community to meet their need thereby taking consideration for their resources in the long run. Livelihood can be considered sustainable provided it takes multiple aspects of society into account. Sustainability depends on the strength of assets, community participation and environment into account. Sustainability therefore encompasses social adjustment,

institutional function and environmental aspects into account. Livelihood sustainability is therefore the functional process of economy, society and environment at large.

I.2 Literature on livelihood adaptability focuses on the inter relationship between the human and environment relationship. Understanding the nature of relationship and strategies of individual or community with their environment is the way towards understanding the issues of adaptability. Ziervogel G, 2003 relates rural livelihood in relation to the nature of stress the people are subjected to. Coping these stresses with the available resources is the mechanism towards understanding livelihood dynamics. Smit et al., 2007 relates climatic variability, adaptation processes and risk management towards attaining sustainable livelihood. IPCC, 2008 links adaptation as adjustment between the natural and human system.

I.2.a Sustainability of livelihood encompasses wider view into consideration. It links environment, accessibility and productivity into account. Agricultural productivity is also an important component of livelihood and making it sustainable is the process of managing farm practices and strengthening other agro based activities. FAO, 1991 takes the issue of productivity, equitability and environment friendly means of agricultural system into account. Blakie 2001 is of the view of managing the land resource for achieving the livelihood sustainability.

I.2.b The Mountains have become a tourist destination today because of its scenic beauty and favorable environment. These have become a source of generating income for the people in the mountains and sustainable management of tourism industry is the way towards livelihood of the people of in mountains. Price, 1992 tries to show the

importance of tourism for the mountain communities and even highlights the consequences of its overgrowth. Schwabe 1984 shows that influence of tourism with the changing settlement forms and its impact on human habitat.

I.2.c Landscape gives the identity to the people. The people become attached to their land and the sense of belongingness develops in them. Mountains in similar fashion are the home for the people with different religions, culture and ethnicity. The sense of identity makes people associate themselves with their land. These lands then become the most comfort place to live in for the communities. The humanistic perspective in Geography talks about peoples association with their landscape.

The sense of belongingness binds them with their land and eventually they develop their culture and flourish their generations. Livelihood to large extent falls under the process through which the people derive their means with close association with their immediate environment and develop the sense of belongingness within the communities. Hence livelihood can be understood from the humanistic perspective so as to understand the linkages of peoples' belongingness, and their work culture can be understood in terms of human environment linkages.

I.2.d Livelihood framework by Ellis conceptualizes the six fundamental elements of livelihood. These fundamental elements are the assets (physical, human, financial, natural and social assets) and access to these assets governed by institutions results into livelihood outcomes. Thus, the framework analyzes the overall livelihood components and the process of interaction that takes within such interaction. The livelihood outcome

is thus the function of assets, strategies and activities of the community to fit them into the system.

I.3 Livelihood itself is a dynamic process and understanding the dynamics in the mountain ecosystem itself is an important issue that draws an attention of the individual. High altitude livelihood posed by threats and survival strategies of the communities need careful categorization of fundamental elements in it. Thus the entire rationale behind choosing the topic was to see the livelihood process of the mountain communities and their nature of interaction with their environment. The objective of tracing the change in the livelihood of the mountain community in the valley of Lachung in North Sikkim and understanding its sustainability based on the role of institutions and access to resources among the user group was the driving force for taking the study.

I.4 Human environment relationship encompasses all the human activities with their immediate environment. Livelihood can be understood as functional relationship between the natural environment and the process that govern human activity. The process that operates within human activity is governed by various institutions at different level. Adaptability is governed by the institutional process and their functions. The relationship between the processes of adaptability has its linkages with the institutions and environment. The role of institutions and environment is the source of understanding the adaptability of the population which is governed by physical, social and cultural environment. The functioning of the economy is intertwined with the physical, social and cultural environment. Environment determines humans' ability to

adapt them. Understanding every element of environment governing human action is important in analyzing the ability of the population to adapt.

Sustainability is therefore the outcome of relationship between the human and environment where the institutions has important role to play. The nature of use of resources for the long run needs to be governed and managed at different levels. Adaptability becomes successful provided the institution functions smoothly embracing the society, economy and environment into account.

I.5 The study thus investigates the natural environment and its relationship with the population. The role of physical parameters on humans and human responses to such parameters has been understood taking the livelihood in the centre of the study. The issue of livelihood adaptability has been analyzed based on keeping the access to resources into account to measure the level of sustainability.

I.7 The study makes use of flowcharts to show the relationship between the variables. The data acquired from the household interview have been mapped and represented using bar diagrams and pie diagrams. The qualitatively data obtained from interviews, FGD and oral histories have been used. Livelihood pentagon has been used to show the household level of assets availability and determine the level of sustainability. Besides this imageries obtained from DEM has been used to determine the slope and aspects of the valley. The figures obtained DEM has been used to analyze the scope available for the people to adapt to such environment. The study also makes use of score method to get the clearer picture of the level of Sustainability of the valley.

I.8 The study makes use of both primary and secondary source of data. Data on population change has been obtained from the Census reports from 1991 to 2011. The data on Land use and land cover changes obtained from Department of Forest has been used to show the level of land use changes that have taken place over the years. The primary data obtained from the field has been quantified and interpreted to measure the level of sustainability.

II.1 North-South extension of the valley is about 60 kilometers on an average which is drained by three major rivers namely Yumthang Chu, Sebozung Chu and Lachung Chu. Lachung Chu drains through the main settlement of the valley and meets Lachen Chu in the Southern part of the valley at Chungthang. The entire valley can be divided into three major divisions. The lower valley comprises of agricultural fields or the farmlands of the people. Khedum, Lema and Luten are the three division of Lower valley. The Middle valley comprises of the zone of Settlement of Lachungpas. The Upper valley comprises of northern part of the valley with altitude of more than 4000 meters.

II.2 The entire valley extends from the elevation ranging from 1500- 5000 meters. The elevation of 1500 meters is found in the lower part of the valley i.e. towards Chungthang. The elevation gradually increases as one ascends towards the North. The zone of settlement is found in the elevation ranging between 2500-3500 meters. Thus with the changing elevation, different part of the valley experiences different micro climates and vegetations according to which the population adapt themselves.

II.3 The spacing of the contours reflects the presence of ridges both towards the East and West of the Valley. The widely spaced contours in the central portion of the valley

shows that it has flat surface available for the cultivation and human settlement. The northern part has the contours lines with the value above 5000 meters which does not permit Human habitation despite having flat surfaces.

II.4 Drainage system reflects that the valley has numerous streams flowing to the main river of Lachung Chu. These streams have their origin in different glaciers present around the valley. The streams flowing from both the sides of the valley towards the main central river reflects the presence of ridges on the sides of the valley.

II.5 The entire river system of the valley comprises of three major river system Yumthang Chu (flowing from the North West direction), Sebozung (flowing from the North Eastern part of the valley) and Lachung Chu (formed by the confluence of Yumthang Chu and Sebozung Chu). These three rivers with its tributaries give dentritic pattern to the river system of the valley. The total length of the river and streams comes out to be 278.1 km giving it a drainage density of 0.37 km/sq.km.

II.6 Livelihood is governed by the climate and understanding the climate helps in making the nature of season available for the growth of crops and cultivating the farms. The valley altogether experiences five major climatic zones from North to South which determines the presence of flora and fauna in different belts.

II.7 North Sikkim owing to the presence of and numerous peaks having an altitude of 5000 meters and above has numerous Glaciers which influences the micro climatic conditions and forms the major source of rivers flowing across the valley. These glaciated fields around the valley largely influence the nature of micro climates and seasons available for the growth of agriculture and animal rearing.

II.8 The region experiences temperate, alpine and even arctic type of climate owing to high altitudinal variation. It experiences the lowest temperature of about 6 degrees centigrade in winter and 35 degrees in summer with the rainfall of about 150 – 350 cm.

II.9 Precipitation determines the nature of vegetation. The lower portion of the valley receives the rainfall of about 280cm which gradually decreases with increasing altitude towards the North with upper part of the valley receiving the precipitation in the form of snow of about 80-120 cm. The central part of the valley receives the precipitation of about 160-240 cm which helps in the growth of different horticultural products.

II.10 The general slope ranges between 15 to 70 degrees. The slope between 15-30 degrees is generally found in the central portion of the valley which encompasses the total area of about 58 percent of the total valley. The percentage area of slope between 15-30 degrees shows that the actual land available for the people is very limited within which people make their living.

II.10 The amount of sunlight received by the slope is determined by the aspect of the valley floor. South, East and South East slope receives the maximum sunlight which helps in the growth of vegetation. More than 35 percent of the valley falls in the above mentioned category. The agricultural zone of the valley faces South Easterly direction which receives enough sunlight for the growth of horticultural products. Thus the slope and aspects if seen in the valley seems to favour the habitable and agricultural zone which helps in sustaining the livelihoods of the valley population.

III.1 The shift that livelihood research has taken place has been quite interesting. Most of the studies have linked poverty with the people's capability. Murray 2001 took

quantitative approach for understanding livelihood using household survey as a unit of analysis. Ellis 2000 has carried out participatory wealth ranking exercise to household income from different economic activities as a measure to know the livelihood.

III.2 Institutions have been kept at the centre of focus in evaluating the process of livelihood research. Institutional processes allow the identification of barriers and opportunities to sustainable livelihood. It acts as a moderator in generating livelihood outcomes. Institutions control the process at different stages and allow the access to and restrict the overuse of resources and maintain inequality in its distribution which helps in bringing the inclusiveness among the resource user groups. Focus on the role of institution is a way to understand the household livelihood research

III.3 Assets has been considered as an important component of livelihood. Measuring assets available to the people at their disposal is the way to understand livelihood research. Access to different capital assets guided by institutions help in making the livelihood outcomes easier.

III.3.a Natural capital accessibility is the process of making people livelihood sustainable especially among the poor households. The dependencies of population in the rural household are more on forest, water and land. Thus, allowing them to have access to these resources help in making their livelihood more stable. These resources itself forms their livelihood assets in the long run.

III.3.b Physical capital includes all infrastructural facilities that add strength to household ability to meet their need. For instance transport and services, tools,

machinery, buildings some way or the other help in generating the livelihood of the people. Availability of these capital assets makes the livelihood easier.

III.3.c Human capital basically the level of skill, knowledge, trainings, education and health are the way towards achieving sustainable livelihood. Human capital provides platform for the people to achieve and make their livelihood processes functional. Availability of education, training, and health services adds more sustainability to the households.

III.3.d Access to financial capital reduces the household ability to meet the need in the phase of acute shortages. Availability of savings adds financial security in terms of meeting the household needs. Similarly the loans available to the population help them in making use of their existing resources to generate more profit and make a living. Thus access to these financial services is the way towards strengthening the livelihood of the population.

III.3.e Social capital attempts to measure the level of social relationship among the households. Good social relationship itself is the resource of the households as these social groups help among one another in terms of meeting their needs when needed. The levels of trust, openness social relationship of the households in remote corners are their assets. Understanding these assets can help in making the livelihood research more valid.

III.4. Livelihood processes entirely revolve under the sphere of social, economic, and political arena. Institutions act as a moderator while the capital assets function within them. Different capital assets functions in the process and evolve with different

outcome. These outcomes indeed are the products obtained out of functioning of the institution and responses of the households. The nature of outcomes varies considerably on accessibility of resources among the user groups. This interaction among the processes, agencies and environment at different level adds sustainability to the household livelihood.

III.5 The livelihood research has followed multiple methodologies. Some of the research relies more on qualitative approaches to focus the problems while some rely on quantitative approach to see the problem. However the central core of the study always remains the same i.e., the resource access, poverty reduction and institutional functions. Household assets ultimately form the base for understanding livelihood research. The present study makes use of five capital assets to understand the level of sustainability by making use of both quantitative and qualitative approaches.

IV. The chapter in broad sense reflects the livelihood process of Lachung valley. It shows the nature of household dependencies in different activities. It tries to relate the nature of livelihood shifts that have taken place in the valley. These changes have been mapped based on the past histories collected from narratives and data on land use and land cover changes. The changes have been detected based on the nature of growth of household in Lachung. Changing dependencies on agriculture have been shown by looking the present economic activity in the valley. The use of governance and livelihood has also been focused on the Chapter to map the nature of livelihood changes that have occurred over the years.

IV.1 Economy of Lachung valley has come across the drastic transformation over the years. Economy based on past literature and oral histories have shown that the dependency on agriculture, animal rearing and trade was very high. However, the present study reveals that all these three form of dependencies have change over the years in the valley. Population rely more on and some agricultural activities. Thus, based on the changing nature of households economy present livelihood in the valley has been reflected.

IV. 2 Land distribution and holdings of the past have been shown based on the secondary sources of data. The nature of land holdings among the Lachungpas was controlled by their own system of Governance. The way it was governed by Chogyal and how it got transferred to the population has been shown. *Pipon* (the elected headman) of the village had the right to distribute the land. The land distribution was fairly done to maintain the equity among the people. Every household had their share of land in the valley. The people then relied more on agriculture and animal rearing. Thus the nature of economy that existed was relatively close type.

IV.3.a The changing nature of economy with the issue related to the closure of border and its impact on people's livelihood has been identified. The actual loss of Lachungpas due to closure of the border has been shown. The impact on domestic economy in the form of loss of herds (Yaks), wool from trade, export of domestic goods has been shown to understand the real essence of resource available for the Lachungpas to adapt themselves in such environment has been shown. Thus tracing the past history is very important in order to understand the livelihood changes of any region.

IV.3.b The effect on closure of border was not only felt in the form of exchange of goods but also restricted the women participation in contributing to the household economy. The wool available from Tibet was restricted as a result the women had to shift their household contribution from carpet making to agricultural activity.

IV.4 The nature of governance and the role of Dzumsa in maintaining the justice among the population has been shown. The role of Pipon in Lachung has been shown in order to understand the livelihood process that operated there.

IV.5 Changing livelihood with the process involved have been reflected focusing the present livelihood scenario in the valley. The change has been drawn in the nature of economic activities in the valley. The present economy based on tourism and other activities with limited agricultural practices have been shown from the data collected from the household survey in Lachung valley.

IV.6 Basic functions of Dzumsa in Lachung have been discussed in order to understand it involvement in resource management and maintaining the decorum of the valley. Its role in different activities and the process through which livelihood process operates within it has been shown.

IV.7 NTFP collection adds income to the household economy. It was found that some of the households in Lachung collected NTFP like herbs, *Yarsagombu* and *Toho.* Thus evaluating these assets in household is very important as it adds some financial security to the poor households in the valley.

IV.8 Land Use and Land cover change in the valley have been shown based on the data available from the Department of Forest. The data available on the land use change

show that the settlement has grown very high in the valley. Conversion of agricultural land for the settlement has been observed. The temporal variation in the nature of land use change reflects the nature of livelihood practices adopted by the people in the valley. Within this change sustainability has been drawn to capture the household availability of goods and services.

IV.8.a Changing economy of valley population in individual villages has been identified. The household dependency on agriculture, tourism and other activities have been collected from the field survey and represented in the form of bar diagrams in respective hamlets to reflect on the present livelihood practices in the villages.

IV. 9 Livelihood diversification in the household has been identified based on the data available from the field survey. The number of economic activities that an individual household practices has been shown to reflect on the level of household diversification in different activities. The data shows that the high agricultural dependent households have very low level of diversification and tourism based households have more livelihood diversification. This makes the agriculture dependent household more vulnerable then household based on other activities.

IV.9.a Tourism in the valley has been shown to reflect the level of opportunities available to the people to diversify their livelihoods. The benefits acquired out of tourism services have been shown to see the nature of economic transformation that has occurred over the years in the valley. Benefits acquired out of tourism have been categories as direct and indirect benefits to see the household's level of adaptability in the valley.

V.1 Livelihood adaptability is the process of interaction of individual to their surroundings. The ability to adapt to the given environment is governed by a number of factors. The capacity of individual or community to the changing nature of environment depends on the way the population respond to it. This itself is governed by inter related factors that varies over time. Assets possessed by a community forms tool for responding itself to the prevailing environment and reduce the impacts of external threats. Understanding the process of adaptability is relatively complex. Identifying the assets, strengths and weakness of individual capital helps in reducing the vulnerability of community and to face the challenge to meet the need.

V.2 Livelihood dynamics basically is the interplay of livelihood assets. Access to all the livelihood assets adds sustainability to overall livelihood. These assets are very complex in their function and hence it becomes difficult to distinguish and categorize the function of particular asset resulting in specific consequence. V.3 Pentagon has been used to reflect five capital assets can be used to show the level of sustainability of five livelihood capitals. Indicators set under different category have been used to measure the score of sustainability.

V.3. Five vertex of the pentagon represents five capital assets and the availability of assets possessed under different category helps in determining the sustainability of the system. Social capital has been captured using eight different indicators based on the level of interaction among the households in Lachung. The percentage availability of household with different level of social interaction has been used to map the level of adaptability which later is used for estimating the sustainability.

V.3.a Human capital measured in terms of level of education, trainings available, and availability of government services in the household has been used to calculate the level of Human capital in the valley. The score of Human capital varied differently in different hamlets and had close relationship with the nature of livelihood practices. For instance households having high dependency on agriculture had relatively lower degree of possession of Human Capital. The data also reveal that the overall level of Human capital possessed by the population has been very low in the valley. When measured in quantitative terms the score of human capital was as low as 37.5 out of 100 which itself reflects the immediate need of working on indicators like livelihood trainings.

V.3.c Physical capital availability measured in terms of infrastructural facilities among valley population have been quantified and analyzed to measure of sustainability. Access to physical assets among the households in Lachung have been identified and measured to make a comparative study in relation to other capital assets. Indicators like Access to electricity among the households, possession of LPG cylinders, solar lights, Pucca house and access to transportation services were quantitatively evaluated to identify the strength of different capital. The overall access to physical capital had been very good in the valley with the score value of 78.6 thereby reflecting the positive outcome of household's access to different physical assets.

V.3.d Availability of financial capital measured through access to different financial services among different hamlets in Lachung have been taken and based on the availability of these assets. Financial capitals were assessed in terms of people's participation in borrowings, Possession of insurances by the households and the households having savings. The overall score of financial capital was just 38.37 thereby

showing the immediate need of banking services and other institutions to make the households to have access to different financial services in the valley.

V.3.e Access to Natural capital measured through the availability of natural resources i.e. forest, land and water among the households in Lachung have been identified and based on the availability of assets on the basis of identified indicators have been used to measure the level of sustainability. The overall score of Natural Capital was 85.7 thereby reflecting the role of Dzumsa in maintaining natural resource balance in the valley.

V.4 Sustainability of livelihood has been analyzed based on the average value of the asset available. Score of individual assets based on the score of individual assets based on their importance have been shown to understand the level of sustainability in Lachung Valley.

V.5 The overall analysis of livelihood assets reflects that the Natural and Financial capital has a overall score of 75 plus out of 100. However other three capitals, namely Social, Human and Financial capital has the score below 50. Financial and Human capital have the score below 40 percent which is very poor in comparison to other capital. Very few agricultural dependent households have their access to Financial and Human capital. Hence the focus on these two capitals is important in bringing the overall balance in livelihood in Lachung.

Conclusion:

Livelihood has always been a dynamic process and has been influenced by series factors ranging from people's decision to the decision taken by the institutions. Besides this the environmental factors also influence the livelihood outcomes. Human adaptability is thus constrained by series of limiting factors that forces people to adapt within the limitations. The responses to adapt accordigly to the existing environmental conditions are in turn determined by the nature of resources available to the population. Within these dynamics of livelihood change, the institutions come into existence thereby giving a proper direction to the livelihood processes. *Dzumsa* in Lachung has been one such institution that has been very active since last hundred years or so for which the valley has been able to thrive even in such remote location of Sikkim. However, *Dzumsa* being one of the traditional systems of governance had to adjust with the new economic system. There have been several forms of changes that have come up in the valley in terms of choices available for meeting the livelihood needs. Hence it has been relatively difficult for Dzumsa to adjust itself with the changing socio political scenario of the valley.

Livelihood though governed by environmental factors, however today depends on more of people's decisions and other factors like improved technology, changing demography etc. Institutions, power relations, policy, livelihood needs etc operate more intensely rather than the natural environment. Understanding livelihood processes therefore requires close investigation of the factors that shapes peoples choices. Nature remains a constant factor whereas the livelihood processes continue to function within the limitations of the natural environment. Hence, livelihood research is more towards

understanding the level of interaction among different livelihood agents such as institution, policy, household decisions etc. Lachung valley though geographically isolated with greater influences of nature on livelihood needs; however is being able to sustain with varying degree of changes in agricultural pattern, and changing needs of the human population.

Resource allocation and distribution among its population though maintained by *Dzumsa*, however there exists varying degree of development among different households. Household investment, kind of livelihood adopted, strength and skills of its members etc sets household apart from each other in terms of prosperity. This difference finally set the adaptability of the household and determines its sustainability. Knowing such differences and implementing the action plans by the institutions would help the relatively poor households to withstand livelihood challenges.

Access to resources is important determinant of livelihood choices which in fact is the dynamics of power relations. Ability of the household to have access to particular resources in turn determines the livelihood outcome. Hence, analyzing the nature of resource distribution and accessibility of the household is important in understanding the livelihood system. For instance, some of households had no access to banking services owing to their low level of literacy and poverty as well as associated livelihood needs. This prevented the household to have access to other resources making them more vulnerable to meet their livelihood needs. Hence, understanding the level of access and claims over the resource use of households reflects larger aspects of livelihood dynamics.

Livelihood diversification is the process through which the households can have access to multiple economic choices. These choices are more determined by the nature of interaction of the households in the society. Limited choices available results in relatively low level of diversification due to which the poorer households suffer more in terms of meeting their livelihood needs. Here the role of institutions becomes more visible in making the livelihood diversification possible through implementation of plans that benefit rural households in broader sense.

Thus, livelihood adaptability is the process of interplay between the resources available, people's choices, household decision, institutional control and above all the environment. The limitations set by climate make people to adapt themselves within the set of given priorities. Ability of the people to adapt to the changing environmental and bio physical conditions revolve around both physical and human factors with varying degree of their influences.

Diversification of livelihood is an essential way to overcome various forms of stresses and minimizing the level of livelihood vulnerability. High dependency on single mode of sustenance adds more stress to the livelihood system of the households. Hence, the households with more choices and options of economic diversity would always have stable livelihood outcomes than the households that depend on particular source of livelihood.

Livelihood adaptability is as per the options available to people within the sets of restriction provided by natural factors, which therefore needs close monitoring and mechanisms to overcome the stress. Community participation strengthens the ability of

this system to reduce the stress and help overcome the problems arising out of its functioning.

Sustainability of livelihood has remained an important issue among the livelihood researches. Most research focus on understanding the socio economic conditions to understand the issues of sustainability. However, some researches focus on understanding the capital assets and households' possession of these assets in analyzing the sustainability. Quantitative analysis of this assets helps in measuring the level of sustainability and understanding its varying degree of influences on household's livelihood decision.

Tourism has been one of the most important livelihood sources for people in remote corners of the mountains. The people get both direct and indirect benefits of it irrespective of their involvement. Direct benefits tend to generate more revenues for the households while the indirect ones are acquired in the form of availability of easy transports and other basic services that are meant for tourists. Lachung has not remained away from the influences of such gains and therefore it has been witnessing improvement in forms of livelihood capital. However, close monitoring of these activities is of prime need to fine tune it and sustain for longer duration.

Dzumsa in the valley has been active in monitoring the livelihood. Involvement of *Dzumsa* in managing the resources, controlling the resource use, bringing the community together and maintain the social fabrics along with the other forms of collective development. The engagement of *Dzumsa* in collecting the taxes from the hotels and business enterprises and utilization of funds for the purpose of development

itself has been very positive in bringing oneness among the population. The system of governance in the valley itself is rather unique in terms of understanding the role of institution that makes the valley different from many other Himalayan regions. Hence the role of *Dzumsa* has been crucial in analyzing the issues of livelihood sustainability in the region.

Livelihood dynamics is therefore the overall interaction of all human and physical structures that operates in a system. It operates in entire geographical space irrespective of level of development. There exists a varying degree of influence of individual resource/ livelihood capital based on the type of the location and people's dependency in particular region. Analyzing these interactions needs careful observation of the system in a place like Lachung Valley.

The research in livelihood itself is unique in its nature and flexible in terms of its outcomes. Outcomes of Livelihood researches are therefore location specific and are temporal in nature. Livelihood itself is a social process and therefore, varies with change in social phenomena, changes in nature of economy and other influences of social diversity. It tends to influence the overall pattern of its sustainability. Institutions can play a great role in terms of providing better livelihood opportunities especially in rural economy.

Livelihood studies therefore needs close understanding of these interrelated capitals that can help modify and improve households' limitations and attain sustainability in the long run. The flexibility in livelihood researches demand careful observation of the phenomena, close interaction with the community, proper framework for analysis and

careful understanding of both physical social systems to generate the positive outcomes. Active involvement of the researchers in the activities at the community level helps in knowing the depth of the livelihood research. These interactions cannot be understood taking individual factor or cannot be generalized easily and hence the researchers need to keep the influencing factors and human agencies in the centre, the level of interactions and livelihood processes to understand the change.

Limitations of the study:

The obvious limitation of the research was the area being under *Dzumsa* which had several restrictions in terms of access to information from the village as well as the authorities. The closeness of the border had very close impact on the nature of availability of data. The restrictions set by the authorities in reaching the place, need of permits at different checkpoints also hindered the research to certain extent. Besides this the authorities as well as the households in Lachung were not very friendly in terms of sharing the information as the valley shared its border with other nation. The settlement and farmlands being separated from each other over a distance of about 8 to 10 km made it difficult to commute between them for collecting the data. Lastly the location of settlement being in higher altitude posed problems in terms of unpredicted weather conditions due to which the schedule for the interviews and data collection had to be altered frequently. The higher altitude of the valley also limited the research in terms of reaching the far flung located huts in the Valley. The collection of data in the valley was very difficult especially during winter months when there was around and most part of the valley remained inaccessible.

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Appendix I

Household Schedule

Livelihood Adaptability and It's Sustainability in the Mountain Ecosystem: Lachung Valley, Sikkim Himalaya

Date of Survey.....

Household Schedule

Name of the Village	
Respondent's Name	
Are you the permanent resident of Lachung	**Yes.....No.....**
Age	
Sex	
Level of Education	
Relationship with the family	

Household Details

Total Number of Members in the Family.....Male members.....Female Members.....

Religion.....

Number of Literate Members of the family.....Male.....Female.....

Number of School going Children in the family.....

Livelihood Strategies

1. Basic source of income of the family.....
2. Income from other Sources a) Agriculture
   b) Animal Rearing
   c) Govt. Services
   d) Hotels and business
   e) Remittance
   f) Any other.....

3. Major source of Fuel a) wood.....b) LPG.....c) Electricity.....d) other sources...

4 Sources of water.....

5. Does your family cultivate? Yes.....No.....If No why.....

6. Does your family Rear animals? Yes.....No.....

7. If Yes composition of animals reared a) Cow.....b) Yaks.....c) Horse.....d) Goat.....

Capital Based assets and Livelihood

A. Natural Capital

1. Do you posses land? Yes.....No.....
2. Area of Land owned (approx).....
3. Do you cultivate.....
4. Land Leased in/ out
5. Kind of access to Natural Resources a) Forest resources (Open/ Restricted)
   b)Water (Open/ Restricted)
   c) Grazing land (Open/ Restricted)

Major crops grown in your farm?

Summer crops	1.....	Winter1.....
	2.....	2.....
	3.	3.....
	4.....	4.....

Has there been any new crop introduced/ stopped growing in your farm? Yes....No.....
Reason if any.....

Has there been any change in the area of land being cultivated Yes.....No.....
Nature of Change Increase..... Decrease.....
Reason for Change.....
Does your family engage in collecting any of the following Non Timber forest Produce (NTFP)?

a) Yartsagunbu ..... b) Herbs..... c) Fodder.....

Does it contribute to your family's income Yes.....No.....
If yes, what has been the change in nature of collection?

Physical Capital

Nature of Dwelling

1. Nature of building a) kutcha..... b) Pucca.....
2. Number of rooms in your house.....
3. Do you completely depend on electricity as a source of light.....
4. What are the other sources of light other than electricity 1. Kerosene.....
   2. Solar cells.....
5. How far do you travel to reach the road a) Ground distance.....Time Distance.....

Human Capital

1. Highest level of education received by any of the family member.....
2. No. Of members working in the field.....
3. Ratio between family members engagement to hired members.....
4. Has any member of the family received any formal trainings on livelihood.....
5. How has the education helped your family member?.....
6. Has any member of you family posses life skill training?.....

Social Capital

People employed to look after the following household and related works

Involvement in activities	**Helped received**	**Help Given**
a Growing crops		
b. Harvesting		
c. Looking Livestock		
d. Borrowing seeds		
e. Construction of houses		
f. Getting tourist		

How important do you find is important for you to involve yourself in such activities?

Financial Capital

1. Is the banking facility available to you? Yes.....No.....
2. Does your family posses insurances or any other deposits.....
3. Is any member of your family part of micro credit organization.....
4. Have you borrowed loans from the bank? Yes.....No.....
5. If Yes amount borrowed? ..... Purpose.....
6. Does your family receive any remittance? Yes.....No.....
7. How easy or difficult is it for you to borrow loans? .....

Major Economic activity in different months

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grains												
Vegetables												
Grazing												
Migrate												
Others												

Perception on Climate Change

What according to you has deviated most in the last few years?

Parameters	Rank in terms of Deviation	Nature of Deviation
Snowfall		**Early/ Late** **High/ Low**
Rainfall		**Early/ Late** **High/ low**
Temperature		**Increased/ decreased**

How has the deviation of affected your livelihood?

Snowfall.....Coping Strategies.....

Rainfall.....Coping Strategies.....

Temperature.....Coping Strategies.....

Tourism and Livelihood

How has the tourism grown over the past few years in the valley?

Does your family get benefits out of tourism? Yes.....No.....

If Yes Nature of Benefits acquired.....

According to you how has the tourism helped your village? .....

What is your opinion on tourism being prioritized over agriculture?

What according to you is important for developing tourism?

APPENDIX II. List of Plates

A. Growing Tourism in Lachung Valley

Source: Field Survey, 2016

B. Women Participation in Agricultural activities in Lachung.

Source: Field Survey, 2016

C. Cattle as an important component of Household livelihood

Source: Field Survey, 2016

D. Fenced Farm at Lachung

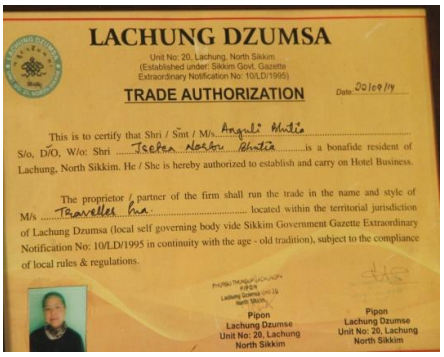
Source: Field Survey, 2016

E. NTFPs that form supplementary livelihood sources

i) Yartsagunbu **ii) Dhoop**

Source: https://www.alamy.com/stock-photo/himalayan-vegetation-trees.html

F. Trade License issued by Dzumsa


LACHUNG DZUMSA

Unit No: 20, Lachung, North Sikkim
(Established under: Sikkim Govt. Gazette
Extraordinary Notification No: 10/LD/1995)

TRADE AUTHORIZATION

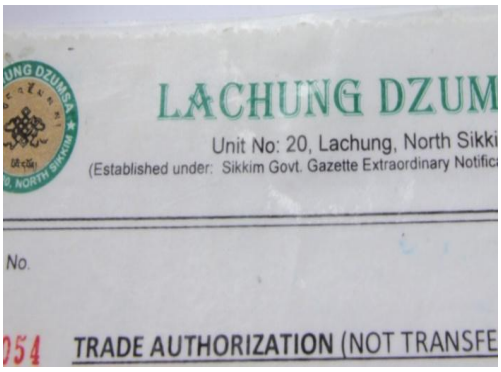
Date: 20/09/14

This is to certify that Shri / Smt / M/s. Angeli Ahuja
S/o, D/O, W/o: Shri Jeeban Mohan Ahuja is a bonafide resident of Lachung, North Sikkim. He / She is hereby authorized to establish and carry on Hotel Business.

The proprietor / partner of the firm shall run the trade in the name and style of M/s Traveller Inn located within the territorial jurisdiction of Lachung Dzumsa (local self governing body vide Sikkim Government Gazette Extraordinary Notification No: 10/LD/1995 in continuity with the age - old tradition), subject to the compliance of local rules & regulations.

Pipon
Lachung Dzumse
Unit No: 20, Lachung
North Sikkim

Pipon
Lachung Dzumse
Unit No: 20, Lachung
North Sikkim


LACHUNG DZUM

Unit No: 20, Lachung, North Sikki

(Established under: Sikkim Govt. Gazette Extraordinary Notifici

No.

054 TRADE AUTHORIZATION (NOT TRANSFE

Source: Field Survey, June, 2016