SPATIAL PATTERN OF AGRO-BASED LIVELIHOODS OF THE COMMUNITIES IN THE TANKHUWA KHOLA WATERSHED, EASTERN HILLS, NEPAL

A Dissertation

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By

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RECOMMENDATION LETTER

This is to certify that the dissertation submitted by Mr. Shambhu Prasad Khatiwada entitled **SPATIAL PATTERNS OF AGRO-BASED LIVELIHOODS OF THE COMMUNITIES IN THE TANKHUWA KHOLA WATERSHED, EASTERN HILLS, NEPAL** has been prepared under our supervision in the partial fulfillment of the requirements for the degree of PhD in Geography. We recommend this dissertation to the Research Committee for evaluation.

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APPROVAL LETTER

This dissertation entitled **"SPATIAL PATTERNS OF AGRO-BASED LIVELIHOODS OF THE COMMUNITIES IN THE TANKHUWA KHOLA WATERSHED, EASTERN HILLS, NEPAL"** was submitted by **Mr. Shambhu Prasad Khatiwada** for final examination by the research committee of the Faculty of Humanities and Social Sciences, Tribhuvan University, in fulfillment of the requirement for the Degree of DOCTOR OF PHILOSOPHY in GEOGRAPHY. I hereby certify that the research committee of the Faculty has found this dissertation satisfactory in scope and quality and has therefore accepted it for the degree.

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DECLARATION

I declare that **SPATIAL PATTERNS OF AGRO-BASED LIVELIHOODS OF THE COMMUNITIES IN THE TANKHUWA KHOLA WATERSHED, EASTERN HILLS, NEPAL** is my own works under supervision of Prof. Pushkar K Pradhan (PhD) and co-supervisor Prof. Hriday Lal Koirala (PhD) that it has not been submitted before for any degree for examination in any other University. That all sources have used and quotation has been indicated or acknowledged by complete references.

Shambhu Prasad Khatiwada
2014

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Shambhu P. Khatiwada
2014

ABSTRACT

This study is an attempt to analyse the spatial pattern of agro-based livelihoods of the people of the Tankhuwa Khola watershed in eastern hills, Nepal. The work deals basically with an understanding of the interconnected livelihood phenomena at places which is established as the central task of geographic research. This also makes attempt to integrate between spatial theories and socioeconomic conditions by the people centred perspective in resource poor areas. In this context, this study has three-fold objectives: (i) to analyse spatial patterns of resources in the livelihoods of the local communities; (ii) to assess the trade-off of livelihood between farm and non-farm activities, and (iii) to examine the role of existing local organizations in improving livelihood of the communities.

The study has used both quantitative and qualitative data source. Data were collected from both primary and secondary source. Primary data were collected from different methods like field observation, in-depth interview, personal interview, focus group discussion and market survey carried out in 2009. For in-depth interview, 207 households were selected by using standard error method. In addition, other information supplementing to the in-depth interview was gathered from other survey methods as stated above in the field. Secondary data related to the study were collected from the available existing archives such as Dhankuta District Development Committee profile, CBS reports and other publications and documents.

In the first objective, the available environmental resources in the study area are soils, land, water, plants, animals and scenic beauty. Among them arable land is the predominant resource for agricultural activity on which the living of the majority of the households has been based. However, the extent of the agricultural activities has been determined by the locally available physical factors, such as topography, soils and climates in such hilly area. Access to land resource varies remarkably, for instance 23.2 percent households have owned less than 0.4 ha while 19.8 percent households have more than 1.7 ha. This has determined largely the livelihood conditions of the people. In addition a combination of other factors such as social relation, networks and wealth of the households and available facilities like financial

capital, credit, education, skills, health, irrigation, transport and communication, and markets have also determined the degree of accessibility to the resources. The study site is made up of diverse ecological conditions and cultures which offer a wide range of economic possibilities and niches to the communities. But the major issue is the inability of the households to utilize locally available resources such as water for drinking, hydro-power, and agriculture, forests and recreation to maximum level for income-generation due to lack of infrastructure facilities.

Secondly, in the trade-off between farm and non-farm activities, the former has dominated over the latter. For instance, agriculture sector has provided employment to about 81 percent of the economically active population and the agriculture is basically subsistence level, as over 65 percent households have produced foods like paddy, maize and millet for their own consumption. Few households of the middle and lower hill-slopes of the study area have grown off-seasonal vegetables like tomato, beans, cauliflower and onion for selling purpose and likewise most of the households of the upper hill-slopes have replaced their traditional crops by new ones such as vegetables, potato, large cardamom, tea, broom-grass and dairy products such as milk through livestock rearing for marketing purpose. Livestock rearing is nowadays very significant to supplement to households' income from selling milk, meat, chicken and eggs. Altogether about 35 percent households have grown cash crops, giving rise to better livelihoods.

Compared to the farm sector employment, the non-farm sector is less to the household for augmenting their livelihood, which provides employment only to 19.3 percent gainful population. The non-farm employment has been provided by the people from schools, hydropower, army, public service centers, cottage industry, petty trade and migration. Investment in agribusiness such as tea estate, chilling centers, milk collection, and resin and log collection has appeared recently, but their contribution has officially unrecognized. Livelihood of the ethnic communities is also based on the selling of the local beer and spirit (distilled from millet).

Livelihood of those households who have their family members working abroad is better due to remittance income. About 5 percent were

migrant workers. On the other hand, scarcities of labour to work in the agricultural and livestock activities appear to be crucial in those areas where there are migrant people working abroad.

In the third objective, the local organizations including public, private, non-government organizations and donor agencies are providing supports to make available for local needs and priorities such as agricultural inputs, infrastructure development, capacity building, coordination and linkages in order to utilise the local productive resources. Yet, there appear to be limited in such services as irrigation in the upper slope, drinking water and road access in lower and middle slopes and therefore the communities' livelihood is passing through hardship.

To conclude, the livelihood of majority of the households is based on subsistence agriculture and therefore is poor compared to those who have adopted high value crops such as vegetables, poultry, livestock, and cash crops though in limited scale. There is close trade-off between farm and non-farm sector in the sense that those households having adopted both farm and non-farm activities have better livelihood than those only in one sector, primarily agriculture. Likewise, recently the households having remittance income from migrant workers have better off condition. Road infrastructure in the middle and lower hill-slopes is extremely poor, making more expensive household goods as well as difficulty for marketable cash crops than in the upper hill-slope. The poor and marginalised households have comparably poor access to productive resources and infrastructure. The local governments should provide focus on to providing basic infrastructure and delivering a wide range of services related to agricultural inputs, capacity building, linkages and coordination, planning and implementation for the overall development in general and to poor households in particular.

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ACRONYMS AND ABBREVIATIONS

AKRS	Athapahariya Kirat Rai Samaj
AM	Anti-meridian
APP	Agricultural Perspective Plan
APROSC	Agricultural Projects Services Centre
CBOs	Community-based organizations
CBS	Central Bureau of Statistics
CEAPRED	The Center for Environment and Agricultural Policy Research, Extension and Development
CFUGs	Community Forest User Groups
CLPN	Community Literacy Program, Nepal
FAO	Food and Agricultural Organization
FECOFUN	Federation of Community Forest Users Nepal
DADO	District Agriculture Development Officer/office
DDC	District Development Committee
FGD	Focus Group Discussion
FGP	Future Growth Potential
GDP	Gross Domestic Product
GLAs	Government line agencies
GNP	Gross National Product
ha	Hectare
HH	Household
HUSADEC	Human Right, Social Awareness &Development Center
HYV	High Yielding Varieties
ILO	International Labour Organization
INSEC	Informal Sector Service Centre
KHDP	Koshi Hill Development Programme
KHARDEP	Koshi Hill Area Rural Development Programme

LES	Livelihood Endowments Status
LEZ	Lower Elevation Zone
LG	Local governments
LGP	Low Growth Potential
LRMP	Land Resource Mapping Project
masl	Meter above sea level
MASS	Madhuganga Samaj Sewa
MEZ	Middle Elevation Zone
MOF	Ministry of Finance
MOI	Ministry of Information
MT	Metric Ton
NEFAS	Nepal Foundation for Advanced Studies
NGOs	Non-government Organizations
NLSS	Nepal Living Standard Survey
PM	Post-meridian
PRED	Population, Resources, Environment and Development
SL	Sustainable Livelihoods
SOLVE	Society for Local Volunteers Efforts, Nepal
SPSS	Statistical Package for Social Sciences
SVDGs	Sustainable Village Development groups
UEZ	Upper Elevation Zone
UGC	University Grants Commission
VDC	Village Development Committee
VP	Village Panchayat
WCED	World Commission on environment and Development
WEST	Women Empowerment Support Team

CHAPTER I

INTRODUCTION

This chapter deals with major issues related to agro-based livelihood, problem statement, objective and hypothesis.

1.1 Issues in Livelihood Activities

This study explores the concept of livelihood and demonstrates its relevance for geographic research in rural sector. It is considered that household as the resource users or the immediate setting of livelihood generator. Livelihood issues are emerging as a new field of inquiry in development studies with the pioneer work of Chambers in the mid-1980s. In this field, geographers have contributed to promoting more geographic skills in the study of human-environment relationships in the early 20th century. They look at how society shapes, alters and increasingly transforms the natural environment in different regions and sub-regions. The systematic core of geography is a study of nature-society interrelations. This notion of legitimation theory is crucial for understanding geography into the form of environmental determinism (Peet, 2011).

Chambers (1988) argues that livelihood encompasses an eclectic mixture of ideas, theories and empirical researches of population, resources, environment and development. Its theoretical foundation is based on more open-ended field work rather than the closed concerns of survey and statistics (Chambers & Conway, 1992; Carney, 1998). It takes vital inputs from various branches of disciplines, like economics, sociology and rural development although its academic relations are based on geography and development studies (Ellis, 1998).

In the 1940s, a group of geographers have advocated a modern science of human activity with a strong emphasis on space. A new kind of geographical discourses have emerged in the study of economic geography. The basic approach of spatial science has applied to search for greater resource efficiency in the analysis of human activities and patterns of human settlements (Grainger, 2005). They relate to spatial distributions, spatial integration, spatial interaction and spatial processes. These concern the worldwide ecosystems of which humans are the dominant part (Berry, 1964 cited in Peet, 2011, p. 23). Peet (2011) refers to Garrison (1960)

geography as regional description to as spatial science, in terms of the mutual relations between geography and economic forces (p. 22). The quantitative revolution was thus inspired by a genuine need to make geography more scientific. The nomothetic approach to geography basically meant observing and describing regularities, as with spatial arrangements of human activities (Peet, 2011). In this way, human activity continually remarks to natural context where people's livelihoods are existed.

But human mentalities and social activities are difficult to realize in practice and to theorize adequately. Social theory swings widely from natural determinism to social constructivism and the study of nature society relations appears to stress one aspect of the field (resources or physical environment) at the expense of another (space or spatial relations). Geographers have recombined space with its natural base, it is that part of nature most involved in human activity (Peet, 2011) because resources are related to source. Resources are considered as a means which attain given ends. The operational theory of resources claims that resourcehip evolves through the interaction of natural, human and cultural assets (Zimmermann, 1951, p.15).

Zimmermann (1951) argues that one must understand resources as the relationship that exists between man and nature … Those aspects of nature which man utilizes in the satisfaction of his creature wants. The extent of want satisfaction is a function of resources (p.8). He cites to Mitchell human resource (the capacity to take advantage of opportunities) is the mother of other resources (p.9).

The development of geographic research on the mode of human-environment interaction has changed fundamentally a number of times. The philosophical base of early geographical works was positivism and quantitative methods as applied to analysis. In the late 1960s, humanistic geography's critique of positivist theory was emerged. It main tasks were clarifying the philosophical base of humanism in geography, developing methodologies, and making substantive contributions to understanding of the human's place in the world (Peet, 2011). It contrasts with positivism theoretical approach that is, its methodological unity between natural and human sciences because humanism gives existential meaning to concept of traditional significance of geography. Place is redefine as centre of meaning or a focus of human emotional attachment rather than mere physical point in space. This

approach is advocated in geography by Edward Relph (1970), Tuan (1971). This progress has sought a current research theme and noted a shift away from the mainstream geographic research with integrating the livelihood issues by Bebbington (1999) and de Haan & Zoomers (2003).

Agro-based livelihoods of the communities basically involves in three sets: technology, resources and institutions. The role of local organizations is equally important to address more complicated activities. They involved into two different types of activities: supporting organizations and units of production. Local development planning and implementation are the relationships between individuals and organizations that physical, economic, and social circumstances both horizontally and vertically at different levels (Uphoff, 1986, P.137).

This statement is entirely applicable to human geography; if we accept that human activity remarks with its natural context in a particular place, then the study of livelihoods of the communities can be understand in a broader context of spatial units like watershed areas (Grainger, 2005). This is one of the major challenges in geographic research. In this context, it can pose an inner question, in which ways and to what extent does geographical space facilitate people's day to day living.

This study may address the following three prominent issues: (i) what are the theoretical issues regarding the livelihood concept (ii) what are the changes and developments occurred in livelihoods of the communities and (iii) what are the strategies so far carried out in the community to secure livelihood. Thus, theories of sustainable livelihood approach, spatial perspectives and local institution developments are added to organize this issue in geographic research.

First, most of the households have derived their livelihoods and addressed their urgent needs mostly from their environment (Peet, 1998). This complexity is inherent in the disciplinary viewpoint but it intensifies as the physical, socio-economic and institutional conditions of the area. It provides a basis for the interesting and intellectual debate on the human-environment relationship understanding (Mitchell, 1979; Carter & Jones, 1989). Any given area is made up of distinctive geographic conditions with its own resource characteristics. Geographers have enhanced the talking about spatial pattern of livelihoods of the community, as resources are interconnected in a place or definite location (Holt-Jensen, 1996; Peet,

1998). They have traditionally given much attention to the household, which they consider the most important unit of spatial analysis (de Haan & Zoomers, 2003, Grainger, 2005). As a result, livelihood opportunities are rigorously varied from place to place as well as community to community.

Chambers & Conway (1992) have placed people living at the centre and described people's livelihood activities by linking their capabilities, access to tangible and intangible assets. Their work provide theoretical base for livelihood analysis. These groupings can be compared with the ideas of Zimmerman (1951) who argued that the underlying biophysical, social, economic, political, legal, institutional and technological conditions are main causes of differential access to resources.

These discussion shows that livelihood is in unique position to prosper from such a trend as a field of inquiry respectable alternative ad hoc interdisciplinary arrangements, with the introduction of new concepts and theories. In this field, if spatial and temporal components are added then it helps to treat the spatial variations of resource analysis in the same space.

Second, population growth, rapid urbanization and regular market have influenced the livelihoods of the communities in many developing countries. Most of the households have changed their traditional livelihood pursuits because of growing needs of their family as well as requirement of cash income for other uses. It is also the result of human effort, their knowledge of agricultural inputs and use of technology. All these factors are related to the growth and development of new economic opportunities in the rural areas (APROSC/ Mellor, 1995). Earlier, most of the households were satisfied with their limited product which was sufficient for their family needs and a little surplus for markets. Since the 1960s, the concept has changed because of growing interests of development approaches towards changes in the socio-economic conditions of rural people (Appendix 1.1). Trickle-down development was one of the approaches progressively used to small and marginal mountain farmers from the international agricultural research centres (Rhoades, 1997).

The regional development model has provided some basic consideration in the standards of living of the rural people. It was postulated by the works of Perrux (1955) and Hirschman (1958). Among various forms of development priorities, increasing

agricultural productivity is prime concern for rural development (World Bank, 2008). Because agriculture provides food to billions of people and it occupies largest share of the Gross Domestic Products (GDP) in many developing countries. Thus, development priorities of Integrated Rural Development (IRD) and Green Revolution were aimed to increase GDP with addition of farmers' effort, skills of agricultural inputs and use of technology (Streeten, 1979; Stewart 1985; Westley, 1986; Pieterse, 2001).

The basic needs and anti-poverty approach was more popularly used in the early 1980s in rural areas. Most of the poor countries have organized women and disadvantaged groups into saving and credit groups. Their priority was focused on households' poverty reduction with increasing access to individual capacity through socio-economic and political empowerments. As a result the most economically disadvantaged groups of women and marginal households are enabled to combine crop production with a variety of non-farm and off-farm income-generating activities (FAO, 1981).

The sustainable development approach has recognized a development strategy in resource poor areas. This strategy has focused the relationships between poor people's living conditions and resource depletion in order to achieve desirable livelihood outcomes. Thus, priority has given an increase in people's quality of life that support their basic needs and increasing access to opportunities in the resource poor areas (WCED, 1987). Sustainable livelihood approach (SLA) has been popularly used to the people-centered perspective and its relevance to the individuals or different groups of people which treats in a holistic view (Chambers & Conway, 1992).

Lastly, a variety of socio-economic trend can be observed in rural areas. With the growing complexity in society, the pattern of livelihoods has also become complex due to the causes of spatial variations in geo-economic, socio-cultural and political factors. In relation to their geographical environment, majority of the households have developed traditional adaptation mechanisms of shifting cultivation, agro-pastoralism and migration. They believed in self-sufficiency and had no idea of alternative use of resources. Their limited needs were fulfilled either by the immediate environment or by the migration in search of food, water and favourable climate (Hudson, 1969; Daniels, *et al.,* 2001). Their efforts and skills have not been experienced as more profitable resource utilization for surplus produce because of the

limited needs of their family. Moreover, it also depends upon the individual's perception towards alternative resource use for surplus production. Blower (2001) argues that the surplus produce, products specialization and essential needs are supporting to the spatial pattern of life-style in the rural areas. Zimmermann (1951) suggests that the natural endowment of man is clearly reflected in the uneven distribution of the people … and in the wide differences in their economic development and living standards.

The rural area consists of a unique combination of phenomena which can be defined by uneven distribution of resources and opportunities where people's livelihood existed (Peet, 1998). Space in this view is the medium of the reciprocal of human-environment relations and stock and flows of resources. Climate varies widely, topographical features add to the diversity of picture, a diversity that applies to both opportunities and constraints. Resource provides directly as factors of production, such as soils, water, forest and animals and topography, climate and locational factors much as a catalyst affects. But nature sets outer limits to mans' potential resources to utilize either a subsistence basis or commercially (Carter & Jones, 1989).

In addition, accessibility of a village to road transportation facilities was significantly related to its rate of technological change in agriculture (Wilbank, 1971). The adoption and spread of technological innovations in agriculture is a case in many Asian and African countries. The diffusion of innovations has been accelerated in the process of commercialization in rural areas. To the extent personal contact and media effects, now farmers know the price of various agricultural products and many of them take a decision to produce crops for the market. They have started production of new crops as these crops are considered one of the most important vehicles for rural development (Sorre, 1962; Allan, 1986; Carter & Jones, 1989; Holt-Jensen, 1995; Ham, 1998; de Haan & Zoomers, 2003). The fuller utilization of agricultural resources may lead to the trade-off between rural products and purchase needed in the urban markets (Clawson, 1964). Its effect has been gradually seen in the growth and development of non-farm activity in rural areas (Uphoff, 1986; Shand, 1986).

Thus, the discipline of geography treats these issues as the study of human-environment relationship. A similar idea of a theory of space has been developed on its fringes to look at the distribution of resource utilization and management practice.

In this study emphasis has been placed households' livelihood activity upon the links between the resources, operation of the livelihood activities and the demand for effective service delivery systems of local organizations. These three are intimately related to the spatial pattern of agro-based livelihoods of the communities for the present discussion.

1.2 Statement of the Problems

Agriculture is main source of livelihoods which is at semi-subsistence level in rural areas of Nepal. It means that whatever produced is consumed by the family with little surplus to sell in the market. Although agricultural income alone is insufficient to fulfill households' needs, household members are involved in various other activities along with agriculture. The largest proportion of the economically active population (74%) are directly or indirectly involved in agriculture in 2011 (NPC, 2011) and it covers about 33.5 percent of total GDP in 2010 (NPC, 2011). Indeed it was 33.0 percent in 2009/10 (MOF, 2010). The bulk of people lived in rural areas (83%) in 2011 and it was 14 percent in 2002 (NPC, 2011). Official government figures assert that 31 percent of Nepalese lived below the poverty line in 2003/04 (CBS, 2004a; 2004b; MOF, 2010); indeed it was 42.9 percent in rural eastern hills (GRM, *et al.*, 2012). As a result, agriculture is considered as the pathway of poverty reduction strategy since 1950s and their relevance to the livelihoods of different communities are still related to agricultural sectors (NPC, 2011). The Three Year Interim Plan assessment reveals that the overall return from agricultural sector has not been possible at desired levels (3.2%) despite the priority because of the adverse monsoon conditions, lack of irrigation facility, lack of agricultural extensive services of improved seeds, fertilizer and pesticide and agricultural roads (NPC, 2011).

The household and their family holding is the basic unit of livelihood analysis although it consists of a small-size of holdings. These holdings are also known as a spatial unit. The overwhelming rural communities were still satisfied with their subsistence food crops (77, 62,000 metric tons) in 2010 (NPC, 2011). The productivity per ha is too low and also insufficient to sustain households' needs (APROSC/Mellor, 1995). The household members are seeking diverse livelihood options either on regular or seasonal basis to compensate agricultural income (Bishop, 1990; NPC, 2011).

The provisions of research and development in agricultural sector and improvement in transport and communication facilities have changed the traditional adaptive mechanism with the introduction of new crops. These changes are important for hill-slope areas which often remain in economic isolation for long. But its own unique geographical conditions and ecological characteristics provide both economic opportunities and constraints for the livelihoods of the communities. Increasing demand for hill-specific products of high-value cash-crops outside the areas is considered comparative advantage of the hills and drudgery of road transportation is constraint (APROSC/Mellor, 1995).

But some areas have achieved more successes from the adoption of new crops where farmers know the price of the various agricultural products and some of them get benefit from that crop which is greater in demand in the market (Khatiwada, 2010). Thus, increasing agricultural income majority of the households have started a higher rate of stock and flow of capital in the agricultural sector. In this context, spatial pattern of ago-based livelihood is considered to be most appropriate for the present discussion in the hills of eastern Nepal.

From the above discussion, agriculture is a point of departure for all efforts of rural livelihoods in this environment. Indeed, there have been little changes in hill agricultural system compared to increasing demand as producers and consumers are seen as assets for the future development in this area. The producers and consumers are seeking wider market-outlets for agricultural products. Thus, contributions of agricultural sectors in the household livelihoods require increasing productivity and income which enables a higher rate of stocks and flows of capital. The flow of capital also increase demand for agricultural inputs (fertilizers, pesticide and HYVs) and other non-farm goods and services in the area.

Increasing agricultural income will be expected a win-win calculus to changes in existing livelihood situations which supports poverty reduction. But the governance system makes questionable situation for many agricultural development agencies as either their policy priorities improves individual/group of communities' well-being or beyond market arena. For instance, the DADO, Dhankuta (2009) remarked:

> There is no clear link between farmers and markets. It is more of a market demand and farmers' empowerment on risk bearing as they are undertrained to adopt more profitable products. Besides, its uptake will require an integrated

> approach: (i) specialization of more profitable products for which there is attendance outside demand; and (ii) trade-off issue for enterprises development in the rural area. These must be integrated yet the cost implications are such no government is willing to allocate budget and manpower. We just have to exclude it from our services.

This statement has clarified the relationships between existing support of government policies and individual farm-household. This view is still prominent as it is paralleled by Zimmerman's (1951) study is that nature provides the opportunity for man to display his skills and apply his ever expanding knowledge (p.9).

From this position, attributes of nature are nothing more than impartial substance until people are able to recognize their presence to know their capacity to making a meaningful living, and to utilize them. But the locational problems are often seen as the foci of differential impacts of agro-based livelihood used to verify the theory of change in livelihood endowment status. Thus, three analytical methods and concepts such as sustainable livelihood approach, spatial outlook and local institutional development are adopted to explain issue of spatial patterns of agro-based livelihoods of the communities in the Tankhuwa Khola watershed, eastern hill-slopes, Nepal. In this context, the following three crucial questions may be addressed:

1. To which and what extent do resources facilitate to spatial patterns of livelihoods of the communities?
2. How has the existing livelihood strategies trade-off with the livelihoods between farm and non-farm activities?
3. Are the existing local organizations playing role to promote livelihood strategies?

1.3 Objectives

The general objective of the study is to analyze spatial pattern of agro-based livelihoods of the communities in the watershed area. The specific objectives are as follows:

1. To analyze spatial patterns of resources in the livelihoods of the communities;
2. To assess the trade-off of livelihood between farm and non-farm activities;

3. To analyze the role of existing local organizations in improving livelihood of the communities.

1.4 Hypotheses

A basic assumption is that livelihoods of the communities represent the entire assets portfolios, which household has got and its relevance to the changes in the livelihoods of individual household or group of communities. The following hypotheses have been formulated in this study.

i) The effect on distance makes differential in the livelihood options and access to services.

ii) Improved agriculture brings about changes in livelihoods of the communities.

iii) Agricultural activities change at varying magnitudes due to increasing access to roads and markets.

1.5 Scope and Significance

This study concentrates on spatial distribution of resources and dimensions of disparities in agro-based livelihoods of the communities. The correlative approach of analysis has made two types of resources.

First of all attention has been paid upon the resources and their distribution characteristics in the study area. At the same time, specific variables, such as natural, physical, social, economic, technological and institutional conditions were identified. Mainly these factors determine the spatial patterns of potential comparative livelihoods of the communities. Along with the analysis of resource distribution, emerging spatio-temporal trends have been analysed in this consideration. For this purpose the geographical traditions of spatial-ecological and regional analysis have been followed.

Secondly, single elements of natural resources and their combinational studies in broader spectrum of bio-physical, socio-cultural environment and agro-based economy has also been analysed. This study aiming at the presentation of the holistic view of the spatial framework of the resources and livelihood phenomenon are humble effort to add new research theme in geography. At the same time, hypotheses have been attempted concerning the natural resources and the attributes of households'

location, their economies and socio-cultural practices. Thus, the subject matter, approach and methods of analysis are new as far as geography is concerned. Hill area in general and Bhirgaun in particular is the smallest, most diverse and possibly the most economically and ecologically important for the livelihood of the communities.

The scope of this study is two-fold. First, this study makes a policy contribution in view of human-environment relation in the hill-slope. Most of the households in this area depend on agriculture for their livelihoods, and many development planners and policy maker should focus on harnessing the potential comparative resources of the great variety of hill specific farming niches for improving well-being status.

Second, there is lack of methodological tools to evaluate those changes and to manage potential agricultural and natural resource bases. A methodology that can be used to identify and map hills farming niches and resources is needed as a basis for planning further actions. It makes a methodological contribution to the assessment of empowerment-oriented impact studies in the hill-slopes. Most of the development projects have used criterion of economic, social, political and gender participation in their empowerment considerations. However, livelihood phenomenon in turn, may vary depending on location, household wealth and status, and individual knowledge, gender, age and ethnicity. These characteristics are likely to affect access to assets such as arable land, education, skills and health, transport and markets. Social assets of networks and relations are also important; they often mediate access to assets. This study explores how such further research issues can be undertaken in the hill-slope environment that helps to plan the agricultural development programmes in the local area and impact appraisal in different perspectives

Theoretically it provides a new perspective about what can be determined spatial patterns of agro-based livelihoods and how can be examined such livelihood patterns individuals as well as household levels.

Empirically it helps to understand the access and control over resources in order to involve diversify livelihood opportunities.

Both of the significances contribute to understand the current livelihood situation in the hill-slopes of Nepal both theoretically and empirically.

1.6 Limitations

The knowledge of hill-slope environment is basic thing to understand household living conditions and to plan their livelihood in changing situations. The hill-slope environment has different aspects which can be grouped into two classes: topographical and geo-economic, and socio-cultural factors. The topographical factors are vital to know the hill-slope nature system. It comprises various physical features which create spatial variations in livelihoods, while geo-economic and socio-cultural factors which are the basis of human-environment relations. It is important to understand human adjustment and plan the developmental activity in the hill-slope environments. It requires different types of data of large geographical environment such as watershed.

The Tankhuwa Khola watershed has taken in the process of this study which covers two VDCs and half-part of Dhankuta municipality, although only Bhirgaun VDC is taken for consideration. The data and information of the whole watershed area are collected from review of DDC and VDC profiles. This study has contextualized spatial pattern of agro-based livelihoods from the household's existing living conditions of Bhirgaun. The regional variations of biophysical, socio-cultural, economic, infrastructure and distance factors are considered as determinants of agro-based livelihoods. Thus, coverage of study area, local people's responses are to be considered limitation of this study. It is mainly due to time factor, financial limit and purpose of the study.

1.7 Dissertation Layout

This dissertation is organized into eight chapters. Chapter first deals introduction of the study, a problem statement, objectives and scope. Chapter two assesses with theoretical argument of livelihood and its conceptual development. In order to explore the creation of household relations, the livelihood perspective is used as an analytical tool.

In chapter 3 the research methodology is presented and it starts with conceptual clarity of the research design as well as the triangulation methods used in data collection and analysis. Chapter 4 contextualizes the change and development of study area. It describes the physical, social and economic settings of the study area because livelihood is to be considered highly localized phenomenon.

Chapters 5, 6 and 7 present result and discussion using the spatial perspective. Chapter 5 assesses the natural resources as the basis of livelihoods; Chapter 6 explains livelihood activities and trade-off between farm and non-farm activities on household well-being. Chapter 7 explains role of organizations in local livelihood improvement in the study area. Chapter 8 consist summary, recommendation and conclusion derived from the study. At the end of this dissertation references, appendices are given.

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the current debates on livelihood perspective in rural development. The attempts are based on three levels of analysis: theoretical framework and concept of livelihoods, empirical researches on livelihoods, and the government policies addressing issues in livelihoods in Nepal.

2.1 Concepts and Theories

Geographers have focused on environmental and spatial features of life, portraying people as mere victims of structural constraint. Even-though increasing attention has paid to human agency, and the capacity of man to choose between a range of possible response to physical conditions (de Haan & Zoomers, 2003), French geographers have considered as the first conception of livelihood in modern geography. Vidal de la Blache who introduced *'genre de vie'* in early 20th century, explained that within a specific geographical setting, there is a highly localized, rooted and stable socially bounded connection between people. The land was called *pays* (Sorre, 1962). Blache and his leading members formulated historical method by which distinctive character of regions were shown as having developed through a long history of interaction between man and nature (Holt-Jensen, 1996:819).

Tuan (1976) has also analysed the term livelihoods in humanistic perspective in geography. According to him:

> Livelihood is the life-sustaining activity, in the human context does not merely mean activities that maintain a community's biological life. It is used foremost of human beings . . . primitive people gaining a living is colored by unzoological aims and values. In advanced societies the unzoological nature of many economic activities is conspicuous . . . that provides a livelihood for many workers (pp. 270-271).

Indeed, livelihood concept has gained popularity among researchers, development thinkers and policy makers. Robert Chambers was credited the first for introducing the term livelihood in mid-1980s, but it, did not get underway until the turn of the early 1990s, when Chambers & Conway (1992) emerged in the development field.

Chambers (1988) provides a functional interpretation of livelihood which is still relevant in research and developmental activities. Most of the poor people make their adequate and decent livelihoods from agricultural activity. They require variety of assets in terms of resources. Assets are playing vital role in order to achieve positive livelihood, although single category of assets are insufficient to earn desirable livelihood outcomes. It is mainly due to poor people have very limited access to assets that nurture their survival.

Conway (1987) analyses a hierarchy of asset portfolios which is made up of many different agro-ecosystems and sub-systems. Each system develops its own diverse human-environment interactions to support livelihood characteristics of the communities. This system has own biophysical, socioeconomic and technological conditions to produce food in different types of resources. The characteristics of soil, climate, forest, minerals, fisheries and water are inputs of stock and flow of capital in order to achieve livelihood outcomes from both farm and non-farm activities.

Chambers & Conway (1992) have made more precise input in people's way of living not only in the development studies but also in the field of social sciences research. They devise their initial work from the reviewed of Sen's (1984) Capability approach and Swift's (1989) Assets and Human Vulnerability Context. Chambers & Conway (1992) have jointly defined:

> A livelihood comprises the capabilities, assets (store, resources, claims and access) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets both now and in the future, while undermining the natural resource base. Sustainable livelihood provides opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels in the short and long-term (Chambers and Conway, 1992, pp. 7-8).

This discussion shows that two interlinked factors have been playing on the emergence of livelihood thinking. The success story livelihood study is based stock and flow of resources and access/control over resources.

2.1.1. Theories Related to Resources and Livelihood

(i) Development Theory Related to Livelihood

The development theories have largely considered livelihoods of the people as a part of the economic growth. The initial development discourse was dominated by modernization theory in 1950s and 1960s. This theory had given priority to the expansion of industry and commerce to generate more income and employment. The developed countries had planned massive investment in different financial and technical assistance in less developed countries. But they had not been generally successful in development and poverty reduction (Grainger, 2005). Rostow in his stage theory has paid more attention to the role of agriculture in supplying more food and to the growth of modern sector. He argues that infrastructure play a crucial role in economic development (United Nations, 1979).

Over the past half century, for instance, there have been numerous approaches to agricultural improvement in the Hindu-Kush Himalayan region. The final goal of international support centres to increase production.

> The fact is that agriculture in the mountains has been approached as part and parcel of the standard development package applied, rather uniformly, throughout the developing world. The mountains have been treated essentially in the same way as the lowlands and little effort has been made to tailor these internationally-designed approaches to variations in mountain farming systems (Rhoades, 1997, p. 9).

Although the primacy of each approach diminished over time, the result is that, agricultural research is expected to do much more than simply raise productivity.

Dualism and Modernization Theory

The Dutch economist Boeke postulates the concept of dualism and theories of modernization. Dualism concept emphasizes on the lack of employment opportunities in prevailing agricultural sector, where most of the people live in rural areas and produce for their own subsistence. In this situation, Boeke focuses on commercialization of agriculture which support to the growth and development of non-farm employment opportunities, but lack of organized market is considered as constraints. Lewis (1954) argues that development can occur only through a process of capital accumulation in modern sector and the absorption of agricultural labour in

industry. Modern sector can be considered as employment provider sector for agricultural surplus labour force. The growth of industrial sectors can be considered as a driver for agricultural development (Dasgupta, 1974).

Modernization theory pays attention to the spatial diffusion of innovations which is based on the pioneer works of Häggerstrand (1968). He introduced the effect of distance on the spread and acceptance of new ideas and techniques from the initial adaptors' location. Many innovations are introduced and diffused in successively lower levels of the centred hierarchy. This represents the probability of someone at the edge of the area having contact with someone at the center. There are two types of innovations underlying containing a teller or farmer ready to pass information to potential receiver or adopter of the innovation. The rate of diffusion is, therefore, rather less than a geometric ratio. Häggerstrand theory is based on distance-decay function and his empirical data shows the decline of innovation rate by increasing distance. It supports to the development of new production system with the introduction of new crops to meet a changing household demand. At the meantime, some cultural ecologists argue that modernization is not necessarily a desirable process, and if pursued blindly:

> Mountain cultures and natural systems will be left in a more precarious position than before. For example, promoting high-yielding, uniform crops or fruit orchids may reduce the diversity of strategies by making hill farmers dependent on inputs and distant markets (Rhoades, 1997, p.9).

Increasing access to transport and communication networks are considered fundamental aspects of modernization. Communication and diffusion are essential to the spread of development. This spread is influenced by the capability of traditional peasant producers and adoption of agricultural innovations and production process (United Nations, 1979). The locally available agricultural opportunities provide greater the numbers of human activities. It needs physical links between and among different areas which have spatially separate elements.

Dependency Theory

The dependency model is used to analyse existing inequalities between different countries. The distinctive characteristics of agro-ecological and geographical conditions are the major sources of resource transfer from the most backward and

dependent sectors and countries to the most advanced and dominant ones. The dependency theory focuses on structural element of world economy, like export dependency, deterioration in the terms of trade, import substitution and explains from the poverty and stagnation of the underdeveloped countries. It is then characterized as profound differences in wage levels as a consequence of the availability of cheap local labour and the use of capital-intensive technology (Santos, 1969 and Amin, 1973 cited as United States, 1979). Rhoades (1997) refers to Wallerstein, the dependency theorists argue that rural societies such as those found in the Hindu-Kush Himalaya (HKH) exist:

> On the periphery of the ongoing expansion of the world capitalist economy which constructs, this global economy around centres of concentrated industrial and post-industrial wealth in the West, which are linked, in turn, to satellite centres in colonial and post-colonial countries … the same structural exploitative relationship with their own rural hinterland (p.25).

The neo-liberalism theory claimed that a free market provides both opportunities and constraints in agricultural sector since 1980s. In terms of opportunities, the local diversity provides the greater number of opportunities. The level of local development is determined by the available comparative advantage of productive activities and its complementarities effects on international trade. It enables all participating countries to make more rational use of resources, reducing inequalities in living standards (Furtado, 1979).

Basic Needs Approach

The objectives of basic needs approach is to provide more opportunities for the full physical, mental and social development of the human personality. These objectives are derived from mobilizing particular resources for specific groups who are deficient in certain resources, like caloric adequacy by age, sex, and activity (Streeten, 1979). The basic needs approach was expected to satisfy human essential requirements within a specified time period, by the year 2000.

The Basic Needs approach is also concerned with tiny resource base which require more efforts and technology to increase a higher productivity in meeting basic needs. A combination of packages were selected to fulfill basic needs such as better health, education, sanitation, safe drinking water, nutrition. The locally available

resources have efficiently used to increase linkages, complementarities and interdependencies between different sectors. This strategy seeks the adoption of a policy to satisfy the basic needs of the poorest segments of population (Engberg, 1990).

Integrated Rural Development

Farming sector is considered as a supplier of cheap food and labour for local development. In this sector, women and poor people are involved to earn their livelihoods. They require more support from agricultural research and extension service centers to increase farming capabilities, skills and knowledge. FAO (1980) has recommended several Integrated Rural Development Programs (IRDPs) in least developed countries like Nepal. This program was based on western thought of economic growth by the process of education, health, infrastructure and technology and self-help organizations. The main goal of this theory was technology transferred from the north to the technologically handicapped south (Rhoades, 1997). The support package focus on the community based organization and increasing access to education, inputs, marketing services and non-farm activity development. During these years, IRDP gave virtually no thought to the impact of farming on the environment. A large numbers of people have experienced significant declines in their health, education and nutritional status in Africa, Asia, and Latin America (Engberg, 1990).

The green revolution

The green revolution (GR) program was a major government inputs in agricultural sectors in the twentieth century. The introduction of improved plant and animals in the less developed countries, like India, led to increase production. Until 1960s, these countries did not benefit from larger economic and technological changes, indeed it was experienced in the western world since the eighteenth century. Third World countries led to increase investment in achieving new techniques of food production, a thrust that began in the late 1950s through the efforts of the Ford and Rockefeller Foundations (Rhoades, 1997). The answer came in the form of advanced agricultural research system designed to transfer technologies in the cultivation of rice, wheat and maize. It is often labeled as the

application of High Yielding Varieties (HYVs), irrigation, fertilizers, diseases and pesticides in many developing countries including India (Norton, 2004).

Lipton (1977), Griffin (1974), Mellor (1978) and Westley (1986) have found doubled crop yields by the adoption of green revolution technology in India. Because India is a large country, diverse both physically and culturally, different strains and technologies are needed in different areas. The Punjab and Haryana regions can be taken as a successful example of green revolution, which involved expanded use of fertilizers, HYVs seeds, irrigation and pest management. However, critics have been made on new strains mostly adopted by those who are better-off, who have some capital and relatively large holdings, but poorest tenant farmers cannot afford the fertilizers and pesticides required to grow them. As a result, inequality and poverty have been increased due to adoption of mechanization has reduced wages and employment (Norton, 2004).

Participatory Approach

Participatory approach was introduced in 1970s. This approach is based on bottom-up philosophy to address basic requirements of the poorest people. The main objectives of this approach was meet to basic needs of populations with increasing access to clean drinking water, sanitation, shelter, food, fuel, income and employment opportunities in the first. Entrepreneurship skill development was Second objective and women entrepreneurs were trained in home-based cottage industry and small-scale income opportunities because they are looking for the well-being of her family. Meantime, equity approach was also adopted to increase participation of women, poor and marginal people in developmental activities. This approach considered that better education, training and skills are enabled to compete in more profitable job markets and opportunities. The participatory policy aimed to address both the condition and position of deprived groups of people who live in poverty, illiteracy, workload, and malnutrition. Rhoades (1997) finds that potatoes and user group association are involved in full participants in the agricultural sector. The process of participation holds the potential relationships between donors and recipients overtime. The anti-poverty approach was also adopted to increase incomes of women and poorest people (Todaro, 1977).

(ii) Sustainable Development Approach

Sustainable development approach was initiated in 1980s and it was widely adopted by many international agencies, governments and NGOs after the work of WCED (1987). This approach was devised as combinations of two contradictory issues, such as, environmental conversation, and the economic growth or development. The main focus of sustainable development approach was poverty reduction. Sustainable development holds to the understanding of historical development of human civilization that preceding to long-term prospects (Grainger, 2005).

The idea of sustainable development was first overcome in 1980s by analysing continue gap on the quality of life between developed and developing countries. The rise of political force was also increased efforts on the conservationists of many pristine natural ecosystems in the developing countries. The environmentalists were involved in the protection biological diversities where they are located. The demands for natural resources are increasing to accommodate their rising population (Grainger, 2005).

The United Nations General Assembly was established the World Commission on Environment and Development (WCED) and its report is known as the Brundtland Commission. The report prescribed to develop sustainable development (WCED, 1987) to address the essential needs of poor people. The priority had given to the limitations imposed by the technology and social organizations to meet present and future needs because poor people have distressed for food, fuel and income. They cannot always afford for their living to reduce their vulnerable livelihood conditions. In this context, the sustainable development was aimed to satisfaction of human needs, like food, clothing, shelter, jobs and of people's aspirations (WCED, 1987).

Sustainable development has discussed in both developed and developing countries, international conferences. The United Nations Conferences on Environment and Development (UNCED) in 1992 at Rio de Janeiro with including Convention of Climate Change, the biodiversity Convention and Agenda 21; the World Summit on Sustainable Development (WSSD), held at Johannesburg in 2002 were some examples of policy efforts. Johannesburg Summit had developed

mutual understanding on economic development, social development and environmental protection. These factors are known as pillars of sustainable development. The overarching objectives of sustainable development were poverty reduction, changing unsustainable patterns of production, consumption, protecting and managing the natural resources (UN, 2002 cited in Grainger, 2005:9; Krishna, 2007). In agricultural sector, food production and natural resource management practices are become more complex and complicated. Rhoades (1997) examines that 'immensely more difficult to operationalize, multipurpose sustainable agriculture with a strong agro-ecosystems' orientation makes more sense in mountainous areas… linkages are crucial and no single crop or farm enterprise dominates (p.17)'.

Grainger (2005) integrates geographical scales to attempt sustainable development issues in geography. He used the role of spatial scale and spatial interactions in different environmental conditions. His idea was based on the functional analysis of stock and reduction of capital, like very weak, weak and strong conditions. These conditions nested in hierarchical order in bounded spaces at differing size. The spatial units were consisted in ecological scales at one level and social science scales on the other. The local level has a well-defined boundary and it lays lower levels of spatial hierarchy. This is often known as locality where households are existed. Thus, households have considered as a unit of analysis as they are producers and consumers. He concludes that household is an important spatial unit, because they consisted of family farm or a collection of field and a variety of plots farmed.

These theoretical discourses have provided literatures on the growth and development of sustainable development approach. This approach is balanced between the economic, social and environmental dimensions of development in order to meet basic needs of poor people as well as poverty reduction. But humans' satisfactions are determined by the local resource base, production systems and markets. The spatial scale has become major discourse in households' participation at local level development. This is a central point of sustainable development approach.

(iii) Sustainable Livelihoods

The World Commission on Environment and Development (WCED) had played a major role in the growth and development of livelihood concept in 1980s.

The notion had received more attention with the problems of population, resources, environment and development (PRED) in Sub-Saharan Africa. But Chambers (1988) putting the poor first had provided conceptual base this issue because poor people have many priorities. They are varying from person to person and from place to place as well as time to time. Their priority is expressed as an adequate, secure and decent livelihood in order to achieve social and physical well-being. It is not the same as poverty, but its concern is based on flows of incomes, or of outlays to meet contingencies.

This statement has explored by the Brundtland Commission Panel on Food, Agriculture, Forestry and Environment. The Panel highlights an integrating concept of sustainable livelihood security, with definition:

> Livelihood is defined as adequate stocks and flows of food and cash to meet basic needs. Security refers to secure ownership of, or access to resources and income earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long-term basis. A household may be enabled to gain sustainable livelihood security in many ways- though ownership of land, livestock or trees; rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertoires of activities (as cited in Chambers, 1988, pp.9-10).

Sustainable livelihood security has focused on long-terms resource management practiced with integrating population, resources, environment and development. It shows livelihood concept has stressed both short-term satisfactions of basic needs and long-term security (Chambers, 1988, 1995), but WCED did not take the further step.

Sustainable livelihood thinking (SLT) has adopted to analyse poor people living conditions in resource poor area. The basic aims of this concept are to increase poor people's ability to save and accumulate, to adapt to changes, to meet contingencies, and to enhance long-term productivity as well as to search potential opportunities which can be addressed adequate, secure and sustainable livelihoods (Chambers, 1988). These potential opportunities in rural areas are immense and unorganized.

Chambers & Conway (1992) provide it theoretical base with regarding peoples' living at the centre. The capabilities (people), the tangible assets (stores and resources), and intangible assets (claims and access) are major components of livelihood approach. The combination of three factors would be advanced in means-ends paradigm. It can help to analyse people's living both normatively and practically.

The stock and flows of resources (in terms of capitals) is core of livelihood analysis in the poor countries where capital is scarce, manpower is unskilled and entrepreneurship is weak. The available natural resources like land (soils), forest, water, minerals, fisheries and aesthetic environments are considered as natural capitals or assets. They yield to support a flow of valuable goods and services to yield various livelihood outcomes year after year. The stock that produces this flow is known as capitals and its flow is livelihood outcomes (Chambers & Conway, 1992).

The primary concern at household level is gaining their livelihoods, rather than the development as a whole. People's capability can make this sustainability. The capability refers to the capacity that people need to exercise choice and achieve valued objectives, given the resources at their disposal and their location within relationships of power (Sen, 1984). The centre point of asset distribution represents, if the extent of outer perimeter is maximum accesses to assets or ownership over (right) productive resources may more replicate to use. If these resources are intensified, people's well-being would per se be in livelihood activities at the local context. If household's well-being will be strengthened, the government policies and service delivery systems will also be appreciated to local knowledge, effective service delivery systems and increase alternative income opportunities in rural areas. In this context, livelihood thinking provides both methodological and operational instructions in developmental fields (Chambers & Conway, 1992; Scoones, 1998, 2009). After Chambers & Conway (1992) Carney (1998), Scoones (1998, 2009), Ellis (1998, 2000) and Bebbington (1999) have further applied livelihood framework for analyzing rural livelihoods. Their implications for rural poverty analysis have increasingly important in the development discourses.

Scoones (2009, 1998) provides a sustainable rural livelihood framework by employing five indicators. The combinations of factors are: (i) contexts and trends, (ii) livelihood resources, (iii) institutional processes and organizational structures, (iv) livelihood strategies, and (v) livelihood outcomes. According to him, sustainable

livelihood is achieved through access to a range of livelihood resources in a particular context, such as natural, human, physical, social and financial. These capitals are also known as livelihood assets. These assets are combined in different livelihood pursuits, like vulnerability (shocks, trends and seasonality), and institutional process that support to transfer different livelihood activities, like agricultural intensification, livelihood diversification and migration. All these factors affect sustainable livelihood outcomes which becomes central to rural development thinking.

Ellis (2000, 1998) adds to livelihood diversifications issue in livelihood approach. His contribution becomes most effective policy options to poverty reduction, especially in African countries. According to him, agrarian economy alone rarely provides sufficient means of survival. Thus, majority of the households derived their livelihoods from farm income, non-farm income, and off-farm income (i.e. wage and shared laborers, and other incomes). These income sources are considered as livelihood diversifications, like off-farm activities, rural non-farm self-employment activities and so on. The rural-urban interactions as well as linkages led to expansion of livelihood diversification and it becomes potential income and employment opportunity.

Carney (1998) argues that communities have accumulated stock of assets they increase the capital base overtime upon which their livelihoods are built. These assets can be divided into arable land, livestock, and bank account, credit and income opportunities. He shows the importance of five assets in DFID Guidance sheet, but it is named for Scoones (1998). The asset pentagon was developed to enable information about people's assets to show the variation in people's access to assets. On this basis of different shaped pentagons can be drawn to explain access to those assets for different places and communities.

Bebbington (1999) provides more comprehensive works on capitals and capability framework for analyzing peasant viability, rural livelihoods and poverty. To understand rural livelihoods it requires access to resources, and it often is considered as a capital or assets. Increasing people's capabilities have combined and transformed these assets in order to achieve both material and experiential needs. The expansion of asset bases is fundamental conditions for sustainable rural livelihoods. It can be improved with the collective actions of different development actors, like state, markets and civil society. They have engaged to deploy and enhance people's capabilities to

make their living more meaningful by changing the rules and relationships governing the ways in which resources are distributed. He concludes that assets are not simply resources that use people in building livelihood: but it gives them the capability to be and to act and to reproduce, change the rules and transform of resources.

de Haan & Zoomers (2003) attempt to analyse new insights in livelihood research with respect to poverty problems dealing with global changes. Their examination was based on the changing outlines of livelihoods in the present era of globalization. They argue that this fuzzy relationship between globalization and local development has been still unraveled by the development planners. Globalization provides both diversification of livelihoods and the emergence of multi-local livelihoods and livelihood networks. They conclude that future agenda for local development should include the study of rooted and dispersed livelihoods.

Livelihood Typologies

The livelihood concept has provided diverse outlooks in theoretical and methodological debates to understand people's day-to-day living. These are seen in systematic classification of livelihood paradigm and known as livelihood typologies. They are as follows:

a) Vulnerability assessment

Chambers (1983, 1987) and Moser (1998) have developed two-sided vulnerability framework. Household is largely affected by internal factors (access to assets) as well as external factors (shocks and stresses). Watt & Bohle (1993) have proposed three-stepped vulnerability model and known as space of vulnerability. Household livelihood is largely affected by the utilization of local potentiality. But it requires exposure and capacity to cope in changing situation. Sinha &Lipton (1999) added exposure to degree of freedoms (DFs) in vulnerability assessment. They used size, frequency, earliness and bunching to measure degree of freedom. Vulnerability exposures are affected by the portfolio of assets and activities because their natures are unpredictability, co-variance and exposure. The correlation between human capacity and potential environment can reduce vulnerability conditions.

b) Functional livelihood

The rural households derived their livelihoods from agricultural resources. But agricultural income source is insufficient to fulfill needs of their family. Thus, they are involved in diversify livelihood activities to supplement household incomes. The regional growth theory was adopted to transform agrarian economies into market economy (Carter and James, 1989). Market center is considered as a focal point to the study of functional livelihoods. For example, agricultural products demand in urban areas and urban products in the rural areas. The cumulative increment of agricultural income affects to both farm and non-farm economic activities. The urban-rural linkages have increased flows of people, goods and services. The interaction between producers and consumers are considered economic asset in the local development. The development of informal sectors is also changed nature of functional livelihoods, such as a rural activity has taken place in the urban areas and vice versa (Holt-Jensen, 1996; Tacoli, 1998).

Theodora *et al* (2008), Damisa *et al* (2011) and Devereux **(**2001) found that household livelihood strategies are diversified in nature. Some households were involved in agriculture other combined both agriculture and non-agricultural activities. In their finding indicate that lowest proportion of the households (3.0%) depended on agriculture, indeed, it was 70 percent in non-agricultural activities and 21 percent households adopt both agricultural and non-agricultural activities in their study site.

c) Local diversity of rural livelihoods

Livelihood outcomes are causal relations between particular human activities and in the specific earth's surface. The unique character of a place inspired to the growth and development of diversify rural livelihood. The local diversity provides both opportunities and constraints in livelihood strategies. The trade-offs between farm and off-farm activities were potentially profitable for women and poor people. Mosher (1971) suggests that spatial variations in local livelihood opportunities are associated with differences in soils, climate, topography (location), access to markets and road transportation and technologies. People residing along the road head links and markets can take more advantages than remote areas by the modification of their production systems.

Livelihoods and Well-being

The notion of well-being is always associated with capability suggested by Sen (1984) which is determined by people's capabilities. It is used to refer both to the overall conditions of a group of people and to specific components of well-being, like economic, social, psychological and physical landscapes at various spatial and social scales which differ all to widely in terms of the well-being of their occupants (Norton, 2004). In 1960s, concerns about social problems which prompted the development of spatial social indicators as measures of well-being in USA. Smith (1995) identified seven sets of indicators representing different components of well-being, such as income, wealth and employment; the living environment; physical and mental health; education; social order; social belonging and recreation and leisure.

UNDP proposed Human Development Index (HDI) as the measure of longevity, literacy and health, as compared to good life and food intake with Chambers. He stressed that a quality of life is a health (body being strong), social (safe and secure environments) and having freedom of choice and action for food security, self-esteem and happiness (Narayan, *et al.*, 2000).

Maxwell (1999) looks how people are involved in multiple activities to gain desired outcomes. The household is considered to be poor if their living standard falls below acceptable norms according to the prevailing socio-cultural values in that society. Bebbington (1999) academically argued that assets are vehicles for instrumental action (making a living); hermeneutic action (making living meaningful); and emancipator action (challenging the structures under which one makes a living). A household is dependent on a diverse array of assets to accommodate well-being. Given the extreme inequalities in the extent of quality of life Smith found differences among the different people and places in the USA (Smith, 1995).

Livelihoods and Poverty Analysis

Livelihood provides a way of thinking about the poor people living. It is also useful in assessing the effectiveness of existing efforts to reduce poverty at a local level. Within this context, people gain their meaningful living and value through the prevailing social, economic and institutional environments. These environments influence the livelihoods- ways of combining and using assets that are open to poverty

reduction strategies. The donor agencies and government efforts were confined to technical and financial supports through reliable institutional structures, such as women and disadvantaged groups into saving and credit groups (FAO, 1981). Their aids support programs are facilitated to generate more income and profitable activities, such as fruits and vegetable farming and livestock. Yet, past developmental activities are largely come back of the benefits of the poor and marginal people where only the rich household had advantages. Therefore, many donor agencies have adopted livelihood approach in their own versions since 1990s, such as DFID, CARE, OXFAM, ILO, FAO, World Bank and so on (Carney, 1998, 2002; Ashley & Carney, 1999).

Key Elements of Livelihoods

The livelihood concept is consisted by the three elements: (i) resources or assets, (ii) activities or strategies, and (iii) livelihood outcomes. Assets are considered as the engine for action, livelihood strategy is the ways in which households put assets into useful products (livelihood outcomes) through the application of knowledge and power. Household members are involved in a wide range of strategies depending on their asset portfolio. These activities are associated with primary, secondary and tertiary activities, such as production, processing, distribution and consumption. Other strategies were agricultural intensification, extensification, specialization; diversification and migration (Ellis, 1998; Scoones, 1998; http://tip.csi/co.za).

Theodora *et al*. (2008) and de Haan & Zoomers (2003) have also considered agriculture as a widely accepted livelihood strategy in rural areas. Agricultural sector is also a driving force in order to achieve livelihood outcomes. The construction of road and access to markets brought new economic opportunities in a particular place. The place specific characters of a place and innovative nature of people has ensured more profitable agricultural income opportunities. They become supreme assets for livelihood changes. This is often known as livelihood outcomes.

(iv) Non-farm Activities and Livelihoods

Agriculture alone rarely provides sufficient means of income and employment in developing countries. As a result, most household are engaged in diverse source of non-

farm activities to supplement their household income. The term 'non-farm activities' involve employment outside the direct soil cultivation and livestock breeding. They are petty trading, services, constructions, mining, processing and remittance and those carried out on the farm but not related to crop production. It provides between 40 to 60 percent of income and means of survival in many Asian and African countries. Indeed, non-farm activity can be ignored as an element of rural livelihoods (Uphoff, 1986; Shand, 1986; Ho, 1986; Ellis, 1998; Ashley & Maxwell, 2002; Davis, 2003).

Barrett *et al.*, (2001) argue that the changes in agricultural productivity and rural income would create different types of linkages to rural non-farm activities. Increasing agricultural outputs has broadly beneficial effects on the rural non-farm economy. Davis *et al.* (2000) Taylor & Yunez-Naude (2002) and Kuiper *et al*. (2006) suggest local geographical condition is considered as a determinant to the growth and extent of non-farm activities. Other factors, like access to assets, incomes, and activities are also important. Their findings indicate that the extent of non-farm activities can be used as a common departure to eke out poverty. Thus, policy-makers should focus on the wider rural economy either by endowing them with additional assets or by increasing the productivity of the assets.

(v) Institutions and Livelihood

Messer & Townsley (2003) and Carloni & Crowley's (2005) have revealed the role of local institutions to make effective service delivery system and poverty reduction in rural area. Most of the government policies in the poor countries have seen inefficient to provide basic services. It is mainly due to lack of their capacity, unrecognized to local priorities and low level community participation on developmental activities. The state has also introduced different types of institutions paralleled to existing local organizations. The newly established institutions are known as induced organization. This type of institutions did not care people's participation, but they are loyal towards government laws and policies. Policies and institutions are an important set of man-made external factors that influence the access or ownership of assets and range of livelihood strategies.

Uphoff (1993, 1986) provides a comprehensive theoretical model to the analysis of local institutional development. According to him, local organizations are legitimated with the collective actions of community. These institutions are considered as public

organizations, membership organizations and private organizations. Households are smaller and they cannot deal some kind of activities. They are involved into different groups to do more collective action and decisions. Agricultural activities can only be possible when natural resources are converted into useful products by the applications of human resources. Agriculture make more productive by the joint efforts of local organizations and community participation, like investment in capital, credits, infrastructure and equipments.

He illustrates schematic figure on levels of decision-making and activity under taken by different organizations. They are international level, national, regional, district, sub-district, locality, community, household and individual levels. The local level has at least three levels- locality (a set of communities having cooperative/commercial relations; this level may be as the Ilaka level in Nepal), community (a relatively self-contained, socio-economic-residential level) and group (a self-identified set of persons having some common interest; may be small residential group like credit and saving or women groups). According to him:

> These make up a nested hierarchical set of level of decision-making and activity, though from the perspective of rural people choosing whether or not to invest some effort in common enterprise with others… individual level is usually concerned with his/her family and relations (p.12).

Ellis (1992) examines three types of state economic interventions policies: like price, institutions and technology. He has elaborated the Tinbergen's (1952) objective-constraints-instruments model and suggests that government policy efforts should be maximized for social welfare and would achieve the targets through better instruments. It requires both resources and people's capabilities on the one hand and risk management on the other. Thus, Ellis stressed that agricultural policy should focus on prices, institutions (including extension services, marketing), physical infrastructure, technology and social services.

Padaki & Vaz (2003) have identified two dimensions of institutions for organization developments. They are different types of players in the development process, and the composition of an inter-organizational grouping. Fisher (1992) and Gilmour (1992) have understood the significance of indigenous systems of organizations in common property resource management and development activities in Nepal. They

observed that the roles of organizations are varying according to different situations and cultures.

(vi) Human-Environment Interactions

The analysis of agro-based livelihoods can be paid attention on the interrelationships between the cause (physical environment) and effect (human activity), understanding of people and how they endeavour to convert resources into positive livelihood outcomes. In this way, geographers create a bridge between evolutionist ideas embodied in spatial distribution of natural resources and production patterns. Their views are the essence of dualism in the parallel existence of subsistence and an exchange economy underneath a rural livelihood is existed. Arguing that people's livelihoods resulted from physical environment, but economic, political, and social environments are also important (Zimmerman, 1951; Norton, 2004).

Ratzel & Semple (1911), Huntington (1876-1974), Taylor (1880-1965) who favoured the cause perspective also known as environmental determinism did so simplicity in the early 20th century. It is commonly known as the study of the relation of individuals or groups of people to their environment. The view as the study of relationships between physical and human environment has long tradition. Their specific legacy is evident in much subsequent geography by Blache, Schlüter (1872-1952) provided a wide range of variables producing capacities to choose better alternative from the physical environment known as possibilism (Taylor, 1951; Mitchell, 1979; Gold, 1980; Norton, 2004).

Sauer (1889-1975) effectively introduced the various ideas of landscape school in analyzing people and their living characteristics. That grew out of his work focus on the transformation of physical landscape by human cultural group overtime. Together, the ideas of Blache, Schlüter and Sauer provide us with a clearly defined approach to life and living conditions of the people. The view is that human activities are determined not only physical environment, but also human choices (Mitchell, 1979; Norton, 2004).

Regional approach provides the most popular focus in resources and population distribution in the first half of the 19th century. Von Ritcthofen and Hettner, Herbertson and Hartshorne made substantial contributions to the study of

regions and areal differentiations. Its focus centered on the analysis of the relationship between resource and human occupations. According to them people's living conditions are exclusively dependent on the context of the region and variation manifested in the unequal distribution of resources and development process.

Spatial analysis

Peet (2011, p. 20) refers to Shaffer (1953) was a spatial theorist who introduced this approach for explaining the location of geographic facts in the earth surface. His attempts overlay special focus on regional distribution of resources that support more productive living conditions at different geographical scales. These scales are considering local (individual households) to global levels. The spatial analysts were concerned with location is somewhat limited, and hence that it tends to emphasize generalizations at the expense of specificities. The contribution of spatial analysts has been found in the analysis of niche resources since 1970s. They argue if place becomes more popular when its resources would support to varied lifestyle within environment (Mitchell, 1979; Norton, 2004).

Nystuen (1963) was 'to consider how many independent concepts continue a basis for the spatial point of view, that is, the geographical point of view' (cited in Johnston & Sidaway, 2004, P. 117). Rather than analyzing the 'real world' with its many distorting tendencies, he sought clarity in considering abstract geographies. To illustrate Bunge's (1962) basic concepts, he used the analogy of which arrangements has three characteristic features. Direction, orientation, distance (the activity cluster around the centers) are important because the degree of marketability diminishes with increasing distance. The exchanges may often be measured by the flows of people, goods or communications (cited in Johnston & Sidaway, 2004, P.117)

Haynes (1975) used mathematical procedures of dimensional analysis in human geography. He used five dimensions – mass, length, time, population, size and value – were defined and manipulated to indicate the validity of functional relationships, such as distance decay equations (cited in Johnston & Sidaway, 2004, P.118)

Harvey (1975) identified a group of concepts which could comprise geographical elements in building integrated social science theories – location, nearness, distance, pattern, morphology, most are compound of Nystuen's basic terms.

According to him, geographers introduced the effect of distance in this contact: much interpersonal communication is between neighbours, so information about innovations should spread outwards in an orderly fashion from the initial adopters' location with the pioneer work of Swedish geographers Hagerstrand in the 1950s (Thomas, 1992 cited in Johnston & Sidaway, 2004, P. 119).

Johnston & Sidaway (2004) refer to Cliff and Haggett (1955) changes in communication technologies, among others, have had substantial impacts on these flows, introducing new technical issues to measure distance in terms of opportunities, the greater the number of opportunities available locally, the less work that has to be expended in moving to one (pp.119- 120).

The idea of spatial interaction to the existing notion of regional geography; by spatial interaction I mean actual, meaningful human relation between areas of the earth's surface reciprocal relations and flows of all kinds among industries, raw materials, markets, cultures and transportation. Space in this view is the medium through which areas are related through flows (Ullman, 1953, cited in Peet, 2011, P. 20)

The relationship between distance and different type of interactions, migrations, information follows, movement of goods, etc. had been analysed in many geographic works although distance and connectivity are advocating geography as a spatial science than the other. Social scientists have looked spatial theories not only at the influence of distance, but also its meaning and measured so much by the distance between them, but rather by the number of intervening opportunities (Stouffer,1940, cited in Johnston & Sidaway, 2004, P. 119).

Berry (1964) put forward a series of basic concepts in new geography; geographers have studied as by their integrating concepts, the geographic point of view is spatial; they relate to spatial distributions, spatial integration, spatial interactions and spatial process. This is concerned with the worldwide ecosystems of which human are the dominant part (cited in Johnston C Sidaway, 2004, P. 119).

Grainger (2005) analysed spatial scale and spatial interactions in sustainable development. The spatial association may provide on indication of casual links between particular human activities and livelihood outcomes. It is expressed the unique character of specific earth's surface. This specific attribute of a particular place

inspire to differential livelihood outcomes. A greater degree of dependency upon local resources would…, encourage better long-term management of natural, human and other capital The spatial correlations in pattering of livelihood phenomena have the potential to enhance our knowledge of the scale. He refers to Gibson et al (1998) definition of scale as 'the dimension used to measure phenomena' (p.51). It encompasses the range of variation in phenomena and usually divided for convinence into a hierarchy of discrete gradations, or levels, Such as:

> Spatial planning is thus viewed as a tool secure with intra or inter-regional equity in resource distribution, promoting resource efficiency, social cohesion and improved access to essential facilities. At the same time, greater political autonomy at local level is presented as an effective means of securing popular participation in decision-making, this creating a guarantee of social justices (Grainger, 2005, p. 39).

Giddens (1984) gives an idea about the locale in his structuration theory. He provides more precise view on the interactions between human activities and geographical settings. It is subjected to the essence of a particular locale and its transformation. It provides both resources and knowledge on which actors can better their action. But constrain is seen in human actions due to the cause of resource limitation and lack of knowledge. Thus, locale becomes locality for everyday working and living space of actors.

Johnston & Sideway (2004) describe the importance of social relations in people's daily-life. It contains both similarities and differences of a place in order to achieve desirable outcomes. They have given more importance to local context and place is considered as a determinant of people's day-to-day living. Their livings have largely affected access to markets and cultures.

Zimmermann (1951) argued that neither environment as such nor are parts of the environmental resources until they are or are considered to be, capable of satisfying mankind's needs. Availability for human use, not mere physical presence, is the chief criteria of resources, in turn, depend on human wants and abilities. He stressed that natural resources are dynamic, becoming available to man through a combination of increased knowledge and expanding technology, as well as changing individual and societal objectives. Consequently, resources evolve to satisfy human needs from a three-way interaction of natural, human and cultural assets.

Norton (2004) views that geographers are often focused on human activities, with reference to people, their culture and physical environments. The traditional preoccupation of livelihood study in geography has been routed by the analysis of complex interlinked phenomenon among different places and people. They are considered as the differences on the natural, social, economic, cultural and political conditions (Smith, 1995).

These variations are often seen in the spatial distribution of resources and societies, which are being asserted in the changing environment. All these factors make variations in life quality in a particular place and society. Geographers tend to attempt to livelihood outlook at a spatial point of view and other scholars do not do so.

(vii) The Ecological Economics

The ecological economics is a new interdisciplinary field of study which integrates the scales of the human activities and natural environment. This theory presumes that human activities require adequate flows of income and materials within the wider economic systems. Daly suggests that sustainability depends on the more adaptable application of human-environment relations. His sustainable development model is based on the principles of economic and environmental interrelations. He acknowledges that technological innovations are likely to change in scaling of human activity without undermining the environment (Daly, 1990 cited in Grainger, 2005).

The environmental economics theory is based on neo-classical economics model which integrates the environmental resources and economic system. This theory is portrayed as an accumulation of human and man-made capital at expense of a reduction in natural capital by introducing the concept of use value, or utility, and emphasizing that price depends on supply and demand-what people are willing to pay (Grainger, 2005). According to this theory, each individual minimizes costs and maximizes profits as a result of perfect knowledge and ability to use such knowledge in a rational manner (Norton, 2004).

(viii) Mountain Development Theory

The mountain development is often stranding on the neo-liberal paradigm, along with demand-oriented market policy. Indeed, concerns are largely focused on the contextual realities of many mountain areas. By definition, mountain/hill slopes

have different climatic conditions at the top compared at the base, and will this have altitudinal zonation. The conditions of mountains have higher precipitation as well as lower temperatures which provides diversity of flora and fauna. They are key potential resources to pursue multiple livelihood strategies (Perret & Kirsten, 2011). Apart from natural differences in soils, climates, topographic variations in agricultural production are induced by differences in location of each region with respect to major urban areas and access to markets (Mosher, 1971). The diverse environments provide economic centrality and that can be equated with economic performance in the mountains. At the same time, they stress proximity to customers and suppliers and become supreme assets for producers. The most obvious advantage of centrality is access to markets for agro-products (Carter & Jones, 1989).

Allan (1986) reveals that distance from roads remains geographic isolation to take advantage from the native biota in the mountains. Its potential did not evolve largely in *situ* and only few species are dispersal in the markets. Increased accessibility to roads and market develops new altitudinal zonation with differential production potentialities. The lowland dwellers demand mountain products such as high-value crops, NTFPs, water and recreation amenities. Accessibility should have broadly beneficial effects on economic opportunities and economic aspects of livelihoods through exchange of their agricultural products in markets.

Bencherifa (1987) develops a sanctuary theory for deductive analysis of the structure of mountains and its production possibilities. Mountain area has now become very formidable barrier for development because of the limitations imposed by climates, topography, scarcity of arable land and drudgery for transportation. But its diverse environments provides ample of natural and cultural resources that are better endowed than the surrounding lowlands. These resources are known as comparative advantages of those physical spaces, where human settlement is feasible under a certain set of conditions. Bencherifa provides both theoretical and practical knowledge about how mountain dwellers have been integrating available resources (such as agriculture, animal husbandry, agro-forestry and aesthetic) to mould local livelihoods. The multiple resources use systems from which household can take better advantages whose ratio is higher than that of other products. It requires infrastructure development, technologies and appropriate policies and institutional environments.

Jodha (1992) says mountain development framework is often associated with the fragility, marginality, inaccessibility and poverty on the one hand; and diversity and niches on the other. According to him, agricultural resources appear to be rapidly shrinking in the mountains due to low per capita arable land. But few areas have been successful in transforming agriculture and economic conditions through mobilization of its niches. He provides both theoretical and methodological debates on mountain development by linking mountain specificities, their imperatives and conventional development approaches. He concludes that inaccessibility, fragility and marginality are considered constraints for development and resource characteristics of the bio-physical conditions (diversity and niches) which provide opportunities for local human adaptations.

Roheads (1997) and Stocking (2005) argue that mountain areas have extremely limited access to financial, physical and natural capital assets in comparison to social and human capital assets. As a result, people to overcome the difficulties for securing their livelihoods under changing environmental circumstances have to work hard owing to limited technology and unrecognized local knowledge. The government has given high priority to poverty reduction through agricultural sector and hill slopes geographical specificities provide new opportunities for integrated rural development models (Appendix, 2.2).

Ham (1998) examines that diverse nature of mountains provides a wide range of opportunities for the development in Himanchal Pradesh, India. Mountain dwellers have adopted diverse livelihood strategies from available local resources such as horticultural crops, off-season vegetables and dairy products. The successful priorities in recently growing opportunities were construction of roads, education, and agricultural research and extension. The accessibility to markets for these products became the engine of economic growth.

Watershed Approach

Watershed is a physical, economic and social system which has a wide ranging effect on the lives of the people. Every piece of land is a part of some watershed and people and land are focal points for all the watershed activities (Srivastava & Chundi, 1999). People and nature both part of a whole, thus it represents a model of interrelationship between human and nature. It provides

sustainable basis of food, fiber, fodder, fuel, timber by effective management of soil, water and vegetation. Watershed management is a unique approach for the improvement of livelihoods of the communities. It is coming up as an integrated approach for overall development of an area, in terms of socio-political and economic developments (Sarakar, 1999). Governmental organizations, NGOs and donor agencies are working hard for planning, implementation of watershed activities (Srivastava & Chundi, 1999). Watersheds are typically less densely populated because they cannot support any significant agricultural and sparse population makes institutional development and maintenance more difficult. The population in watershed area is often culturally and economically outside the national mainstream. Local institutional development alternatives are limited in such areas (Uphoff, 1987).

Watershed approach would make integrated analysis of human environment interactions. It is very difficult to analyse spatial interaction only from ecological scale. Then social science scale to divide global space into hierarchy of levels that starts with groupings of state, and region, district, locality (village) to the household. The distribution of individual spatial unit of each of these levels does not necessarily coincide with the distribution of natural capital. Thus, watershed follows to natural features elevation zones and some even have an ecological significance for sustainable development (Grainger, 2005).

2.2 Livelihood Studies in Nepal

There are a lot of scholars who have made studies on different types of livelihood activities in Nepal. They are mainly based on different types of resources, like land, livestock, fisheries, forest including NTFPs and water.

Land-based Activities

In Nepal, rural livelihoods are derived from immediate environmental resources. Basically, the inhabitants of hill slopes have followed the traditional systems of livelihoods over centuries. Their historical resource bases have been illustrated by various foreign scholars, travelers and missionaries. Kirkpatrick (1811), Hamilton (1819), Wright (1877) and Caplan (1970) have made boarder historical accounts about indigenous farming practices based on hoe, men and draught powers. Those studies have found that the local livelihood strategies in the hill slopes were

mainly comprised of diversified income sources, such as agriculture, animal husbandry, petty trading, cottage industry and migration. These activities largely determined not only physical environment but also cast-ethnicity and gender and changing roles of local organizations.

Caplan's (1970) study shows Limbus' customary landownership rights *(Kipat).* Land is considered as a principal source of their livelihoods. However, the Limbus has lost their access to land by the migration of non-Limbu or Hindu tribes after the unification of Nepal.

Land is being a vital resource from which majority of the people get their livelihoods from cereals, horticulture, associated with animal husbandry and forestry. The step followed by the Government of Nepal changed agrarian structure with the introduction of Land Acts since 1951. The first attempt was made in 1951 to break the traditional and feudal tenancy systems. In this context, Zaman (1973) evaluates land reforms in Nepal and his study reveals abolitions of tenure system, land ceiling, tenancy right-security, compensation to the landowners, and the allotment of the acquired land, provision of tenancy regulation, rent control, credit and saving and institutional setup were made to implement the Land Act Policies which brought significant changes, with the introduction of Land Act 1964.

With regards to land policies and landownership rights under different regimes, Regmi (1978) has made more comprehensive study on land tenure and taxation system in Nepal. His study points out emergence of various forms of landownership systems based on the theory of state landlordism and land grant policies. Birta, Jagir, Guthi and Kipat and Raikar systems were some popular land ownership practices in Nepal. Most of the ethnic groups of eastern Nepal including Rais and Limbus held their customary form of land rights by virtue of *Kipat* system, although the state gradually changed it into *Raikar* system. He concludes that the changing land tenure systems and land policies at various times had profound effect on the allocation of landholding rights (means) and production patters (ends). For example, Athapahariya is one of the real *Kipat* holders and was recognized as first settlers, particularly in the Tankhuwa Khola watershed. Dahal (1985) concludes that Athapahariyas' livelihood became more vulnerable as some households had lost land due to mortgages of Kipat land, and because of Land Reform Program in 1964 and Cadastral Survey in 1974/75.

Livelihood Diversification

The historical resource-base livelihoods have chiefly consisted of diversified activities. Basically, the inhabitants of the hill slopes and mountains have followed the traditional livelihood practices. In this perspective Bishop (1990) provides more comprehensive outlooks on livelihood strategy and seasonal rhythm in the western Himalayan regions of Nepal. His study is mainly based on the peasants' cultural-ecological systems and considered household as a basic economic unit. Bishop argues agrarian rural economy household generate diversified livelihood options, and is largely dependent on access to productive resources and exploitation of wild biota. Most of the agricultural activities are combined with animal husbandry, home-industry, trade and seasonal out-migration for work. In accordance with increasing population pressure, heterogeneous environmental conditions and varieties of socio-cultural and political factors have contributed to subsistence level of existence, which makes their livelihoods more vulnerable.

The local people have made the coping strategies with their changing environmental conditions on the one hand and their adaptive livelihood strategies on the other in the central and, eastern Mountain regions. They have undertaken highly specialized and combination of activities through wide range of choices: agriculture (crops, off-season vegetables and cash crop production), livestock raising, wage labor, remittance, services, shop-keepings and business. But these livelihoods strategies are varied from caste, ethnicity and their existing socio-cultural and economic condition of the society by rating different indicators (Thapa & Weber, 1990; Pudel, 2001; Subedi & Pandey, 2002; Koirala, 2006).

These livelihood activities are classified into three broad groups, such as primary (more than 65.7% in 2001), secondary and tertiary economic activities. They are largely affected by access to assets (in terms of landholding patterns and land fragmentation), production pattern, and employment and income opportunities (Pradhan & Pradhan, 2006).

In the study of a periurban area along the Kathmandu valley Rajbanshi (2010) reveals that livelihood diversifications are commonly undertaken by poor and marginal people to survive and improving living standards. It is mainly due to most people livelihoods depend on the natural resources and farming is one of the dominant

sectors. His study indicates livelihood diversification was largely varied from caste and ethnicity. They were affected by location resulting asset levels and existing institutional policies. With the periods of change, the most pressing need for the future is to improve skills for non-farm occupations, because contributions of non-farm incomes are very important for poor and marginal people.

Resources and Livelihoods

The variety of natural resources are distributed on the earth surface, and their spatial variation in quantities, types, access and uses have determined to people's livelihood strategies. The mountain watersheds can be credited for different types of resources involving land water, minerals, plants and aesthetic resources. The chain of farm-forest-livestock is the often quoted resource scenario for the broad spectrum of human-environmental interactions with reference to number of skilled manpower, knowledge and time frame. Under this situation the knowledge and technological skills to resource use can be determined by the demands of material needs. People eke out their necessities from the nature with the application of their skill and power (Poudel, 2001; Pradhan & Pardhan, 2006).

The diversification of agricultural livelihoods among the different communities is determined by the locational characteristics and natural factors. The relation of bio-physical variables and the traditional knowledge of the local people results in the selecting of lands for agriculture and forestry activities. The mountain environments are changing both in their natural and socioeconomic settings as well as the attitude and behavior of the communities (Koirala, 2006). However, livelihood strategies of Rai communities in Arun valley follow a specific sequence and differ from location to location. They have adopted various strategies to earn their livelihood due to gradually reduced land under *khoriyas*, using more public resources for self-consumption and transforming *Bari* (non-irrigated sloping terrace) into *Khet* (irrigated sloping terrace). This followed additional inputs in agriculture, adoption of multiple cropping and crop-diversification strategy under pressure (Subedi & Pandey, 2002).

Natural resources are as means of livelihood in the mountain region of Nepal, where farmers adopt a wide range of livelihood strategies for food security. To supplement their insufficient production and income from agriculture (as a way of

life) the local people have adopted Non-Timber Forest Products (NTFPs) collection activity, and it becomes as a means of livelihood. There exist a wide range of market links for NTFPs. The local NTFPs collectors have not derived high profit from their products due to highly disorganized marketing systems (Banskota & Pradhan, 2007).

The water resource makes spatial variation in livelihood strategies in terms of availability of assets and people's capability for exploiting environmental resources, such as agro-pastoral activities, tourism, foreign employment, and wage labors of the Modi Khola watershed area, western Nepal. Rijal (2006) concludes that water constitutes an important environmental resource, that is paramount for local livelihood by irrigation, drinking water and power generation and that has certainly impacts on local livelihoods both positively and negatively.

Community forestry

Deforestation is a serious problem in many areas of the Nepal hills. Communities were responsible for local forest management through their traditional organizations (Fisher, 1989; Gilmour, 1989). The government had taken ownership and control all over forest areas under Forestry Department. It regarded local management as inadequate. Then the rule was relaxed to permit private or community forest management through user groups (Uphoff, 1987). Community forestry is a common property resource in Nepal. Communities are involved in forest management by the initiation Panchayat Forest Management as well as Community Forest User Groups since 1978. The government of Nepal had handed over a total of about 0.7 million ha of state-owned forest areas to over 10,532 community forest user groups for development, and management with aiming to conserve forests, to provide benefits to the use groups for community development.

In Nepal, community forestry program is said to be successful. It is mainly due to some of the policies are regarded towards the participation of poor and disadvantage groups and proper management of financial resources of the user groups (Acharya, 1984; Pradhan & Pradhan, 2006). Thus, the community forestry sector has received various assistances from donor agencies including UUID, DFID, DANIDA and so on. Livelihood and Forestry Program (DFID) has initiated for the improvement of livelihood condition of the poor people under the framework of DFID Guidance sheet.

Impact of Modernization on the Livelihood

The local livelihoods are undergoing changing both positively and negatively. Increasing access to market, transport and communication and other service facilities have positive impacts and negative changes are associated with decrease of household incomes, out migration and reduction of existing job opportunities. In this context, Dahal (1985) and Khatiwada (1988) noticed that the local livelihood and rural economy are closer to peripheral markets in Dhankuta. Most of the people sell their local products in the weekly markets which takes place in a fixed location at Dhankuta bazaar. Generally, three types of activities occurred in this weekly *hat bazaar*: the sale of local products; buying the prepared goods and the sale of livestock and meat.

The hill-slope agriculture is characterized to be in subsistence levels over centuries. Local people deliver only surpluses to food markets and get lowest share in the benefits of expanding markets for the new agriculture of high-value activities. Virgo & Subba, (1990) argue that new technology has brought profound changes in socio-economic structures along Dhankuta district through its locational benefits from comparative advantages to increasing access to transportation and communications technology, markets and the social networks.

Modernization is the process and advent with the increasing access to transport and communication in different environment. Adhikari (2003) has analysed to both positive and negative impact of Cable Car in Manakamana. Its positive impact makes easy access to the growth of new economic centres, increase in institutional support on health and education. The negative impacts are decrease of household income, overflow of people, increase in conflicts and social evils, reduction in traditional jobs, and decrease in agro-livestock products. However, Cable Car provides combination of modern technology that improves the people's way of life and transformation of their traditional livelihoods as they have fruit and vegetable products, livestock products, tourism related jobs; petty trading, local cottage industries.

The local or indigenous livelihoods of Kumals have been undergoing several modifications in the changing circumstances in Pokhara Valley, Western Nepal. Bhurtel (2000) views the process of adaptation through the alternation in livelihood

strategy is due to the differing in socio-cultural, economic and physical environmental changes. But their changing situations have been reflected to insecurity and irreversible vulnerability. The social institutions have been shattered and there is apparently no basis on which they can regulate and make a sustainable use of the resources at their disposal. Helping hands from outsiders, indeed, have come across. The helpers have been too immature and hence ended up in raising the economic standards and the poor ones are simply on the opposite ends of a spectrum.

Livelihood changes can be considered as a result of development efforts in Nepal since 1990s. Adhikari (2008) focuses on some of the main present-day issues associated with the mobility, food security and environmental justice. The importance of people agency or the capabilities of the people take new opportunities for their survival through migration and the remittances. The integration of globalization increased flow of people and commodities, and information has made beneficial effects on household economy in the western hill slopes, Nepal. But their interdependency varied among social groups and geographical areas.

The rural livelihoods remained at the risk in fragile mountain areas of western Nepal, where farmers cope with food insecurity. Bohle & Adhikari (1998) found that more than fifty percent of households have not even been self-sufficient in food for six months in a year, and they coped with highly diverse, complex, and innovative livelihood strategies. Farmers have put-forward a general tendency that these strategies are oriented towards markets. It becomes clear that growing tendency towards external linkages offers new potentialities, but, at the same time, newly adopted strategies also have increased risks and vulnerability.

Micro-Enterprise and Livelihoods

Micro-enterprise is known as an economic unit engaged in the production and distribution of goods and services at household level. It is primarily of self-employed in nature and often operated by family members. It runs on little amount of capital investment in both fixed and mobile business centres. This type of enterprise is characterized by reliance on local resources, family ownership in operation, small scale, labour-intensive, adopted technology and based on minimum skills for operation (MEDEP, 2010). Micro-enterprise, therefore, is more suitable for poor communities to farm and non-farm trade-off building.

It plays a vital role in poverty reduction, where a significant proportion of the farming population resided in rural areas. It reinforces rural-urban linkages for social and economic development (Pradhan, 2003). The linkages are essential not only for utilization for local resources but also for the flow of goods and services, which provides fair income distribution opportunities for poor.

In this context, various scholars have made studies on livelihoods and technologies, like bee-keeping, ginger, Allo, Dhaka, Chyuri tree and water mill; empowerment and inclusion; and marketing and finance (MEDEP, 2010). However, development and promotion of micro-enterprises in Nepal has been hindered by constraining factors, like lack of easy access to micro-credit, lack of knowledge and skills, limited backward and forward linkages, lack of market chains and lack of access to market for selling the products. It is mainly due to the government agencies that are unable to promote this type of activities.

2.3 Livelihood based Policy and Programs of the Government of Nepal

2.3.1 Improving Livelihoods through Agriculture

The government of Nepal has always given agriculture priorities in the periodic plans. These plans have put agricultural sector at the centre to change standards of living for masses of Nepalese people. Their most obvious focus are based on advantage of economic performance, agriculture should bring proximity to producers and consumers through widespread use of better technologies and institutional changes. As a result, agricultural sector remains an outstanding asset for the rural people since 1950s.

Livelihood concept in Nepal can be related to the agricultural policies and programs, since 1950s. Agriculture plays a significant role in livelihood and accounts for the employment of more than 74 percent in rural areas. It contributes about 33.5 percent of GDP in 2009/10 (NPC, 2011). It was 65.0 percent in 1969 (Dhital, 1969). But the productivity in agricultural sector is very low. It is mainly due to unequal distribution of resources, climatic fluctuation, small size of landholding, traditional farming practices, lack of infrastructure especially road and irrigation and inefficient government support policies (MOF, 2010).

2.3.2 Government Policies

The spatial configurations of agro-based livelihoods have been undergoing many changes in Nepal. Implementation of planned economic development has been credited for this changes and transformations, since 1956. The government of Nepal has undertaken 10 major rural development strategies after 1950s to improve quality of life of rural people. These strategies can be summarized into three groups: area based, target based and social mobilization based. The area based strategies can be further classified into five strategies such as Tribhuvan Village Development Program, Panchayat Development Program, Remote Area Development Program, Regional intensive Development Program, and Integrated Rural Development Program. The target based strategy comprises Small-farmer Development Programs, Production credit for Rural Women, and Basic Needs Approach. And social mobilization based strategies consists of Decentralization Local Governance Support programs and Community Forestry (Pradhan, 1982; Pradhan, 2007).

The First Plan (1956–61) had also emphasized village development which aimed to cover one–third part of the country, such as: nucleus development, Dehat development, and Village development.

After the inception of Panchayat System in Nepal (1960) the rural development Program was substituted by a Panchayat Development Program (PDP). The existing administrative units were reorganized into 14 zones, 75 districts, and village and town panchayats. The Government of Nepal had promised to improve people's way of living through Land Reform Program (1964). The Land Act (1964) was aimed at land pulling from land ceiling, to provide secured tenancy rights, compulsory saving in cooperatives, and distribution of land for landless (Zaman, 1973). The decentralization of government service delivery systems was designed in Local Administration Act in 1965. This Act was aimed to improve local resource mobilization for economic development, leadership development and democratization of administration through local institutions (Pradhan, 1982).

The regional planning strategy was adopted in the Fourth Plan (1970–75). This model appeared to integrate local economic development into markets (nucleus). The growth pole provides a maximum prospect for radiating developmental ray towards the peripheral region and growth axis for inter-regional

economic integration among different regions. But urgent need in the growth pole model reduced regional disparity among ecological zones, remote areas and depressed areas. The second policy efforts addressed these disparities through remote area development programs (Gurung 1984). The government has undertaken Rural Development Program in the Fourth Plan (1970–75) on the recommendation of the Administrative Reform Commission of 1968.

The Fifth Plan (1975-80) had initiated first priority to agricultural sector, infrastructure (roads) development, local development through Panchayat System, increased 'people-centred' development strategy and Integrated Rural Development Projects. KHARDEP is one of the IRD approach launched in the Koshi Hill-slope Areas of eastern Nepal. It was aimed to improve people's livelihoods through encouraging results in fulfilling the basic needs of the rural people.

The Sixth Plan (1980-1985) incorporated a target group oriented development approach largely considering the aspect of popular participation in decision making. The IRD Approach launched in various parts of the country was indeed producing encouraging results in fulfilling the basic needs of the rural people. The Sixth Plan incorporated a target group oriented development approach largely considering the aspect of popular participation in decision making and meeting the basic needs of the rural areas in the overall development program of the district (Pradhan, 1982). The plan sought to institutionalize the existing participation of the people through local leadership. IRDPs have been suffered by several problems: in the area of coordination between different sectors; problems in diversity in IRDPs in terms of their context, investment, and management; problems in getting qualified technical manpower; problems in over expectation of the rural; fixation of priorities and setting of project targets by limiting the 'bottom up' process of planning. It indicates that this also has little impact on the improvement of the quality of life of the rural people (Pradhan 1982; Gurung 1984).

Koshi Hill Area Rural Development Project (KHARDEP)

KHARDEP started with the approval of the Dharan-Dhankuta road agreement between the Government of Nepal and Government of United Kingdom (British Overseas Development Administration) in 1976. The Program aimed to help the development with substantial effort made to promote the potential physical and human

resources. The Program had proposed socio-economic development in the command area of road. The Program objectives were: to strengthen local services; to build up local institutions; and to promote balanced socio-economic development of the Koshi-Hill-slope area. The implemented integrated activities are: production (to secure resources base production, improvement of the strong marketing facilities for farm and non-farm production, increase crop-livestock and forestry production, and develop rural industries); infrastructure development (road, education, drinking water); institutional development (development of agricultural extension service, Small Farmer Development Programme for the supply of farm and rural industries); and education and training programs (KHARDEP, 1982; GRM *et al*., 2012).

The Seventh Plan (1985-90) had identified seven basic needs- food, clothing, fuel wood, drinking water, basic health services and sanitation, primary and skill oriented education, and minimum rural transport facilities. Meantime, the service centre strategy was implemented as a policy measure for rural regional development planning with the aim to integrate urban centres and rural hinterlands, to stimulate rural economies, and to provide market-based service facilities for rural people. All these development efforts were based on the Decentralization Act; however, it was not compatible for planning and implementation of district level projects.

After restoration of multi-party system in 1990, the Eighth Plan (1992-97) focused on sustainable economic growth, poverty alleviation and reduction of regional imbalance. The plan set target of employment generation activities, physical infrastructure development, resettlements of poor, providing basic health services, education opportunities and safe drinking water. The plan had initiated the liberalization of economic policies. Economic reforms had been initiated by liberalized trade, export promotion; strengthening financial and capital markets, and private sector participation.

The Agriculture Perspective Plan (APP) in 1995 has put forward a long-term (1997-2017) and comprehensive policy document for agro-based livelihoods. The plan has recognized agriculture led growth strategy for poverty reduction and overall socio-economic changes in Nepal, because agriculture is the engine of economic growth in the rural economy and as the largest source of GNP. The plan has sought increasing agricultural productivity can be equated with technology changes. The

emerging new economic potential in the hill slopes can be stressed at the same time to have strong multiplier effects on other sectors of the economy. The plan has proposed seven components for agricultural development. Accelerating in agricultural growth in the hill slopes especially production of high-value commodity and agriculture intensification, for example, citrus, vegetables and vegetables seeds, apple, apiculture and sericulture. But it requires agricultural roads that will facilitate the commercialization of agriculture, supply of fertilizer, improved technology, and water control (APROSC/ Mellor, 1995).

The Ninth Plan (1997-2002) had initiated twenty year perspective plan based on target and development indicators for alleviating poverty. Poverty reduction from 42 to 10 by the year 2016/17 was main objective of this plan. The plan has focused on employment generation, human resource development, decentralization, agricultural development, food security and people's empowerment. However, overall macro-economic performance of this plan was not considered as a satisfactory.

The Tenth Plan (2002-2007) had incorporated three major policy efforts with regards to livelihood improvement. The focused programs were sustainable reduction in the poverty level in Nepal, to bring the marginalized sections of the population and backward regions into mainstream of development, and to make visible progress in reducing existing inequalities (NPC, 2002). A poverty reduction strategy plan (from 38 to 30 percent) was based on the rural economy covering: sustained high economic growth through agriculture, accelerating human development by effective delivery systems, like social services and economic infrastructure, social and economic inclusion of both poor, marginalize people and backward regions, and pursuing good governance. Increase in the human development indicators, like literacy, raising life-expectancy, reduce maternal mortality rate, increasing social and physical infrastructures and safe drinking water are targeted. The shift from subsistence to commercial agriculture had been increasing production and consumption of cash crops. However, during this plan period, agricultural production continued to be highly influenced by unfavorable weather conditions and other sectors also negatively impacted by the conflict (GRM *et al*., 2012).

The Eleventh Plan (2007-10) has focused on the reconstruction, rehabilitation and reintegration of physical and social infrastructures damaged by conflict. The plan has also prioritized employment-oriented programs for pro-poor, Dalit, women,

Janajati, Madheshi and broad-based economic growth. The promotion of governance, effective service delivery systems, investment in physical infrastructure, investment in social developments were additional priorities (NPC, 2010).

The Twelfth Plan (2010-13) is also based on the same vision of the previous plan. The plan has focused on improving the living standards through employment creation, reducing economic inequality and social exclusion. It promises to enable people to feel change in their livelihood and quality of life with 5.5 percentile economic growth.

The above reviewed concepts and theories can be divided into two broad types of livelihood studies in general: (i) those that identify constraints and opportunities and analyze causes of poverty, and (ii) those that measure impacts of interventions and recommendations for actions. The two prominent factors in the problems of agro-based livelihoods are: (a) hill slopes are less developed than Tarai either because of their resources or because they have resource constraints; and (b) there is also great inter-personal inequality or uneven development.

2.4 Research Gaps

The foregoing discussions provide valuable ideas and conceptual clarity about different aspects of livelihood. Several experiences and principles have influenced Chambers and Conway's idea and sustainable rural livelihood approach (1992). Existing attempts seem to fall into one of several categories. Their focuses are mainly on content-oriented, like 'people's way of living' and context, access to resources, livelihood strategies and existing institutional arrangement in order to achieve livelihood outcomes (Scoones, 1998; Ellis, 1998; Bebbington, 1999). Such analyses are rich in facts and information to draw attention to problems of resource and environment management since early 1990s. While increasing awareness of problems, they give little attention to fundamental research issues, questions and objectives upon the regions and sub-regions, each with its own distinctive geographical conditions and ecological characteristics. From this has emerged new concept of the livelihoods of different groups.

Indeed, the natural endowment is distributed very unevenly over the earth surface. Climate varies widely, topographical features add to the diversity of picture, a diversity that applies to both resources and constraints. The impact of diversity of

natural endowment and developmental activities are clearly reflected in the livelihoods of the communities. As a result, people face both opportunities and constraints to address their urgent needs in the resource poor areas (Holt-Jensen, 1996; de Haan & Zoomers, 2003). However, most of the perspective oriented efforts have been emphasizing access to capital assets. Each provides an in-depth treatment of a fairly narrow range of material needs, while little attention towards research issues.

The integrative-oriented attempts have made how people cope with changing environment. They have usually discussed an alternative hypothesis in relation to the comparative potential resources. Traditional production systems which are interact with the potential resources as well as the comparative options available for mountain communities (Bencherifa, 1988). A few explicitly consider the problems to be overcome in their research process due to lack of interdisciplinary approaches and knowledge substitution. Thus, differences of knowledge of resource in the same space would create spatial pattern of livelihoods that differ from place to place as well as community to community.

If an individual is to participate in an interdisciplinary principle, he must be able to define his own urgent needs and competence to address the livelihood issues. They are largely varied with growing population and access to assets in geographic space overtime. This is paralleled by the study of Zimmermann (1951) who articulates peoples' living conditions are determined by natural, human and cultural assets. It is still relevant. As Grainger (2005) states that a country becomes more developed if the household is described as a social unit rather than as a fixed spatial unit. At any point in time it occupies a particular territory, but the location of this territory can shift markedly, as household members change the location of their external activities to sustain livelihoods. In this way, most of the authors seem to be too silent regarding why livelihood opportunities are vary in a particular time and space.

This attempt relates to a principle of human geography to understand their relevance to the agro-based livelihoods of the communities in the hill-slopes of the Tankhuwa Khola watershed, east Nepal. The geographic consideration of this illustration is focused to the importance of three research theories, such as Sustainable Rural Livelihood Approach (Chambers & Conway, 1992), spatial scale and spatial interactions in sustainable development (Grainger, 2005) and local institutional

development (Uphoff, 1986). These perspectives were able to identify research issues, to evaluate evidences and to appraise arguments in geography. For this purpose, these principles are encouraged to assess resources and livelihoods, livelihoods and farm and non-farm activities and role of local organizations in livelihood activities in the changing environment overtime. Because of livelihood is an elusive concept, the meaning of which is very much dependent on place, its diversity makes spatial patterns in the livelihoods of the communities. The distribution patterns of individual spatial units do not necessarily coincide with the distribution of resources or capital. Thus, the study has chosen watershed to follow its significance in elevation zones.

CHAPTER III

RESEARCH METHODOLOGY

This chapter outlines the nature of the research process and explains how the operational questions are answered. By taking some basic considerations into conceptuality, reliability and validity issues in agro-based livelihood analysis, the intent starts with explaining the recursive procedures of the research evolved in different phases like research design, reconnaissance survey, and study area selection. This is followed by the methods of data collection and analysis theoretically and methodologically.

3.1 Research Design

The substantive disciplinary difference in research designs have been emerged between: theoretical and empirical conceptions. Theoretical research is concerned with developing, exploring or testing the theories. Theory is taken to be a set of explanatory concepts that are useful for explaining a particular phenomenon, situation or activity. These concepts offer certain ways of looking at the world and are essential in defining research. Empirical research refers to the collection of data for testing, where as the term empiricism refers to the school of thought just described, where facts are believed to speak for themselves and require little theoretical explanation (May, 1993 cited in Kitchin & Tate, 2000, P.7). This research process is concerned to how present study should go along the agro-based livelihoods of the communities and the problem statement of the study. It is referred to as the methodology of study (Harvey, 1969) and it is one of the most important aspects of research design in this study.

Methodology to Generate Data

The dictionary meaning of methodology is a set of methods, principles and rules for regulating a given discipline. Methodology is the systematic and theoretical analysis of the methods applied to a field of study. It typically encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques. Harvey (1969) argues that methodology without philosophy is thus meaningless (p.8). Meanwhile philosophy is the study of the principles underlying the organization of the various sciences and the conduct of scientific inquiry.

There are a number of philosophies suggested in research, such as deductive and inductive geographies involving competing connections of the human's place in the world (Peet, 1998). Deductive philosophy justifies scientific conclusion clearly recognized as a *priori* nature of much scientific knowledge. It may postulate a theory, that theory should have logical structure. It enables to deduce sets of hypothesis which gives an empirical interpretation. On the contrary, inductive philosophy is used place as partially ordered facts into different groups, categories. The generalization involved in classifying things into various classes that impose some degree of seemingly rational order upon the data (Harvey, 1969; Ritzer, 2000).

The substantive disciplinary differences that emerge between positivistic and humanistic geographies have been emerging in geographic research. These differ fundamentally from each other in a number of respects in relation to how knowledge and human action is mediated. It is essentially to construct epistemology, ontology and methodology (Appendix 3.1). Human geographers have been involved in such debates and as a result, there are number of school of thought on the best way to approach the relationships between society, space, place and environment (Kitchin & Tate, 2000).

This study has used both positivistic and humanistic methodologies to assess competing conceptions on the livelihoods of the communities in the hill slope area. Positivist geography looks at space, such as the Tankhuwa Khola watershed in general and Bhirgaun in particular. This study seeks the livelihood phenomenon with a notion of location as well as mere position in an abstract spatial extent of livelihood zones. It tries to theorize spatial patterns of agro-based livelihoods of the communities to the friction of distance (travel times, transport costs, dwelling place and locality). Hence, data can be generated from deductive process, such as field observation, sample size determination and household survey (Figure 3.1). The theory is deduced by a set of hypothesis and tested against sense-perception data. These hypotheses makes more confident which may fall in the validity of the theory provided, of course that test give positive or negative result. This having predictable effects on livelihood activities in the study area (less interaction with increasing distance). Peet (1998) argues that positivist geography describes one quantitative aspect of spatial relation and geographical science needed to start again by building theories which encompasses the wide range and experiential life in places (P.48).

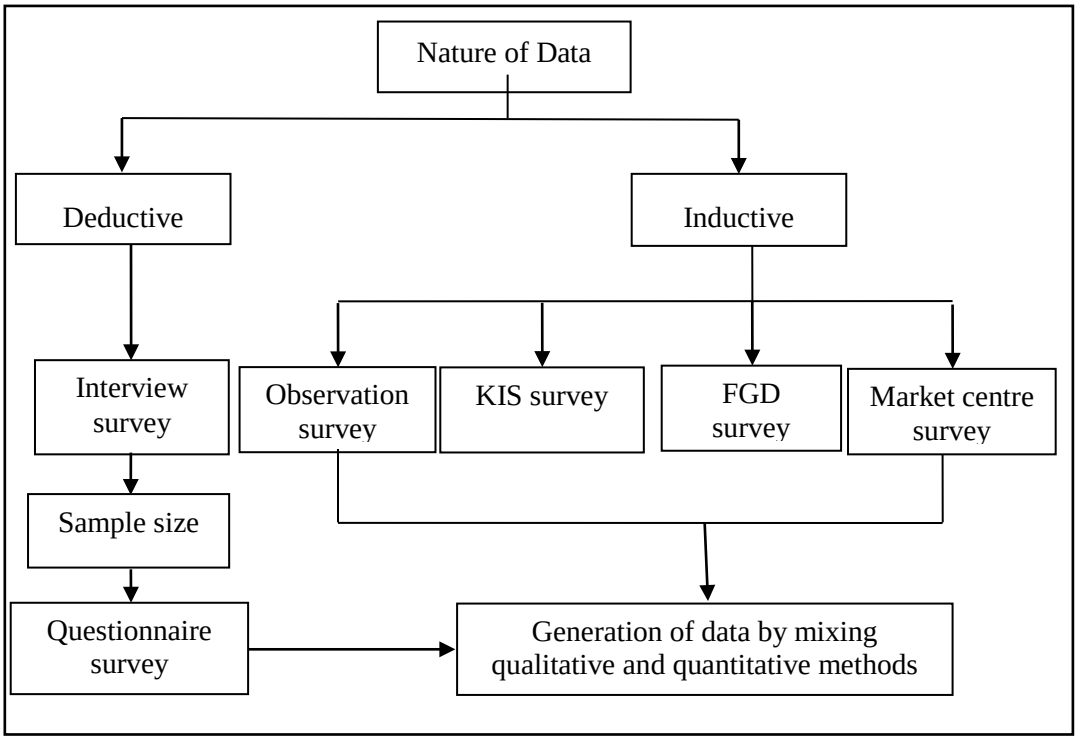
Critical theorists have also focused on the philosophical underpinnings of scientific inquiry, especially positivism. The criticism of positivism is related, at least in part to the criticism of economic determinism, because some of these who were determinist accepted part of positivist theory of knowledge. Positivism is depicted as accepting the idea that a single scientific method is applicable to all field of study. Positivism is opposed by the humanistic school on various grounds and focus on human activity in the centre (Harvey, 1968; Peet, 1998; Ritzer, 2000). In this study, humanistic philosophy has been applied to assess environmental aspects of Bhirgaun and it is regarded as a place. It is made up of distinctive geographical and ecological conditions or locales. The area can be classified into three elevation zones: upper, middle and lower hill slopes (Figure 3.2). It is assumed that every locale has developed its own livelihood pursuit. Under this environmental condition local communities have adopted diversified livelihood activities based on their own experiences. It may vary depending on place to place as well as community to community. Tuan (1976) looks at people relation with nature, their geographical behaviour as well as their feeling and ideas in regard to space and place.

Agro-based livelihoods require converting natural resources… into useful products through the application of human resources, which are made more productive by the use of capital- infrastructure, equipment etc. The activity of agriculture fall into three sets: preparing inputs, turning them into products, and putting outputs into best advantage. These activities needs to be support for agriculture in the form of policies and programs at different levels (Uphoff, 1986, pp.11-12). Thus, role of supporting institutions and their link in getting effective and broad-spread of agricultural development are also analysed.

In this study, inductive procedure is applied to collect data to interpret humanistic geography such as key informant survey (KIS), focus group discussion (FGD), participatory observation (PO) and in-depth interview to understand and find meaning of spatial variations of livelihoods in different elevation zones among different communities. It treats spatio-temporal perspective differently keeping place as the centre of life experience evoked in the humanists mind because Bhirgaun offers a range of potential resources and alternative livelihood options. Peet (1998) argues that humanists have used phenomenological tradition of place, space, environment and regions.

This study includes both positivism and humanistic methods to produce data, technique of data analysis and interpretation. The above stated methodology brings tendency of mixing of qualitative and quantitative methods (Figure 3.1) as it provides advantage to get comprehensive under-standing of the livelihood issues with their own strengths and weakness.

Figure 3.1: Nature and sources of data



The quantitative methods were used to generate data dealing with numbers while applies inductive process to draw conclusion (Subedi, 2009) as individuals differ in his/her experiences and understanding of his/her livelihood reality. Not really–quantitative also is used to draw objective conclusion, but rather qualitative information is used to triangulate or to verify quantitative findings. The choice of method in this study is largely dependent upon the purpose of research and theoretical stance of the research questions. They never are substitutes for one another. In this context, Subedi (2009) cited to (Ulin et al 2002) is that people differ in their experiences and understandings of reality; defined situation may not reflect assumptions made by the researcher; a social phenomenon cannot be understood out of its context; theory guides qualitative research and the result of it; exceptional cases

may yield insight into a problem or new leads for further inquiry; understanding of human behaviour emerges slowly and non-linearly.

3.2 Study Area Selection

The Tankhuwa Khola watershed consists of Tankhuwa and Bhirgaun VDCs and eastern slope of the Dhankuta Municipality (Fig 3.3). First, the watershed area was selected and then Bhirgaun VDC was taken for the detailed study of the livelihoods of the households to fulfill its objectives. The reasons of the selection of the study area were as follow:

First, the study area, i.e. Bhirgaun VDC is made up of completely hill slopes with elevations ranging from 300 to 2,150 masl and its north-south areal extent ranges from 6.6 km to 7.8 km. The whole watershed area consists of an intricate mix of upper hill-slope or *Lekh*, middle hill-slope or *Kachhad* and lower hill-slope or *Bensi*. On account of varied terrains, the climatic conditions also vary remarkably such as the *Lekh* is characterised by occasional winter snowfall, the *Kachhad* with no snow and mild temperature and the *Bensi* with warm summer. These climatic variations also provide a wide variety of natural resources such as forests, pasture and water, on which the livings of the small and marginal farm households are based.

Secondly, the study area is the homeland of indigenous communities such as Rai, Limbu, Magar and Tamang of eastern hills of Nepal. For generations they have been living on the available natural resources and have developed unique apprenticeship skills about the use, conserve and manage of their surrounding natural resources. They subsist mainly on the integrated agricultural system of combined agriculture-livestock-forestry activities. Migration of the local people to the Tarai and other parts of Nepal in search of lands, as well as to foreign countries for jobs has been taking place since long.

Thirdly, the diverse natural conditions and cultures of the ethnic groups offer a range of economic possibilities and niches. However, over the recent decades, the natural resources are being overexploited due to increasing pressure of population and in the recent years due to accessibility by roads. The main problem is its volatile geographical conditions and resultant physical and human constraints. In addition, its sloppy terrain imposes severe limitation to the scale of production on the one hand

and provision and use of infrastructural facilities to augment production efficiently on the other hand.

Lastly, various organizations, such as Pakhribas Agricultural Research Centre, National Citrus Research Centre, District Agriculture Office, KHARDEP, LFP, CEPREAD, CADP and NGOs have been playing roles in the local area development including the current study area in the fields of agriculture, livestock, forestry, education and health since the 1970s.

These different features offer an opportunity to investigate the change and improvement in the livelihoods of the communities of the study area.

3.3 Operational Definition

Livelihoods

According to the Webster's Revised Unabridged Dictionary (1913), the term 'livelihood' is referred to a means of life-substances. Moreover, it is not only the result of any single cause of geo-economic conditions but also of the ever-changing products of the activities because livelihoods of the individuals are often depended on their individual circumstances. The term here is also used as a means of economic activities undertaken by individuals or household members. Chambers (1987) has defined livelihood as a means of gaining a living with adequate stocks and flows of food and cash to meet basic needs. Local communities in the rural areas are usually used different types of resources to earn their living. Thus, livelihood can be described as a means of life-supporting activities (*jivannirbahako lagi garine kaam, rojgari ra pesa*).

Livelihood Activities

The term 'activity' is used to refer to the actions that the household members undertake for work on day-to-day basis for making a living individually or collectively. It includes any occupations that are performed by the application of physical or mental abilities, such as agriculture, petty trading, services, agro-processing and apprenticeship skill works and so on. They are also known as livelihood activities. They can be divided into two broad clusters of activities: farm and non-farm, where the term 'farm' refers to livelihood generated from crop and

livestock and their related activities and 'non-farm' refers to activity from rural wage or salary employment, self-employment and remittances.

Household

In this study area, all livelihood activities are done by the individuals of households. Household is often considered as a production unit and is a basic unit of livelihood analysis. Household members are defined including those who share the same kitchen pot under the same roof and those who send money and look after their relatives from remittances.

Well-being

The term 'well-being' or *Asal Jivan* refers to the process of the maximum realization of desired livelihood outcomes. It is a holistic view of life inherent in the multidimensional aspect of households' livelihoods as long for good life in economic as well as physical, social and political facets. Good-life is demonstrated as the integral value of family relationships, the various process of access, utilization and transformations of a given livelihood strategies.

Spatial and Temporal Pattern

The term 'spatial' refers to activities being taken at location and location may mean a place or a village or town, or an area such as district or zone or region or river basin and linear features such as roads or trails, rivers, whereas 'temporal' refers to those spatial activities being carried out over time. The livelihoods of different households are thus largely related to physical, biotic and cultural conditions on the earth surface. They are associated with the regional variations in resource availability and human skills to utilize them. These changes have taken place at varying rates in different communities while the temporal dimension represents the expansion of the production system through the application of capital and efficiencies such as their effort, knowledge agricultural inputs and technology over time.

3.4 Data Collection Methods and Tools

3.4.1 Primary Data collection

The data for this study comes from primary sources. This field survey was carried out during the months of April-September 2009. The data were collected by

using five different methods like field observation and personal interview with householder and market centre survey of deductive method; and inductive methods of key informant survey, focus group discussion and in-depth interview (Figure 3.1). Prior to the field survey, reconnaissance survey and some preparations were made. These included the preparation of survey tools: checklists and observation protocol-sheets. The questionnaire for household survey, checklist for FGD and KIS, observational protocol sheet, map and digital maps were used as survey tools (Appendix 3.3 to 3.6).

Preliminary works such as rapport building and one day questionnaires pilot-test survey were completed prior to field observation and interview.

A) Observation Survey

Observational survey was used to record existing observable phenomena and develop the ability to interpret what is happening and why. Observation was used to entail the systematic note-taking and recording of events, behaviors, and artifacts in a social setting. It is argued that, observation focuses upon people's behavior in terms of purposeful expressions in a deeper values and beliefs (Marshall and Rossman cited in Kitchin and Tate, 2000).

Doing the process, households' livelihood options were also observed by employing three procedures, such as formal frameworks of checklists, note-taking and participatory observation. Observational survey investigated household capabilities to cope with changing situation. It was measured in terms of access to assets especially in land, livestock and other common pool resources. Similarly, activities were observed in terms of involvement in farm and off-farm activities (Appendix 3.3). The observational procedure was carried out in major four steps:

First, it was used to record upstream and downstream (*Lek-bensi*) resource interaction processes such as household used cultivated land in different altitudes, distance between *Khet or Bari* from the village, availability of forest, water and other common property resources. Land slide, soil erosion, flood area, slope, deforested areas were also observed. Second, it was used to verify land use and land cover changes on the Toposheet map, cropping pattern, status of grazing area and use of new technology in farming. Third, it was used to roughly estimate distance between household and the service centres and markets their relevance to produce commercial

crops and milk in this region. Lastly, it was used to observe the role of Dharan-Dhankuta-Basantapur road (Koshi Highway) and its relevance to the livelihoods of different households because their livelihoods were assumed to largely relate to transformation in the agricultural sector.

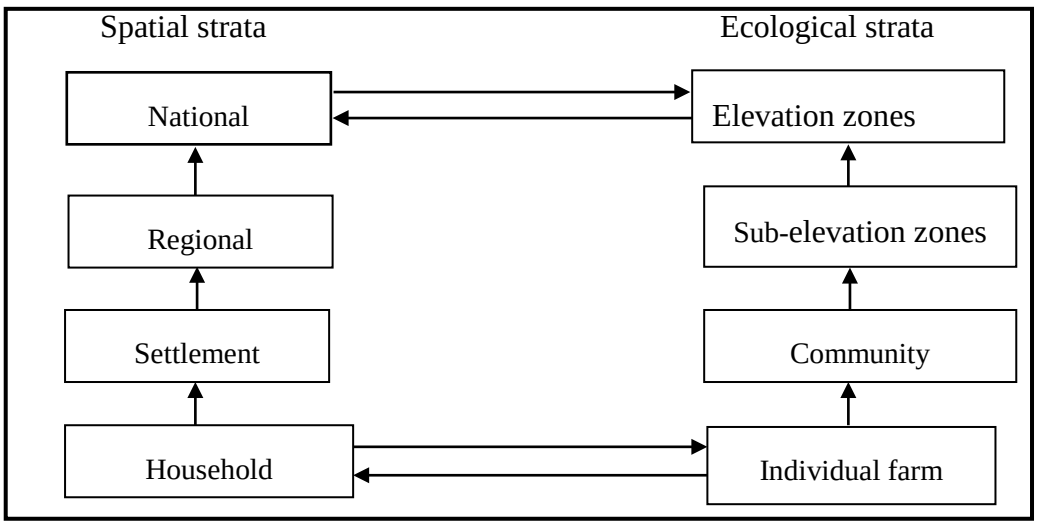
B) Interview

i) Sampling Methods and Sample Size

Interview survey was a major source of primary data. It was commonly used to express the household's experiences, opinions, aspirations and feelings. It is necessary to be aware of the sample household taken for personal interview, because households are considered as the production unit as well as unit of analysis. The sampling criteria have been developed for consideration of theoretical foundation of the research which sought individuals or different households' livelihood pursuit. For this purpose this study has taken four units of analysis such as elevation zones, settlements, wards (lower administrative unit) and communities.

These criterions created the conditions for household selection by using sampling frame. This study has used multistage sampling technique where two broad strata of sampling units were identified i.e. spatial and ecological strata (Figure 3.2). The ecological strata were further divided into three elevation zones (upper hill-slope, middle hill-slope and lower hill slope) each with its distinctive geographical conditions and ecological characteristic (vertical connections of human-nature relationship); and spatial strata were also divided into household level, settlement level, regional level and national level (horizontal connections of existing laws and policies).

Figure 3.2: A schematic mechanism for data generation



In addition, distance from the district headquarters, market centers and road heads were also considered. At the same time, spatial strata have also been carefully measured in terms of networks from individual household to national levels which are connected by the laws, policies and programs. The ecological strata were connected from individual farm to different elevation zones as is shown in Figure 3.2.

Livelihood improvement is the relationships between individuals and organizations that physical, economic, and social circumstances. The relationships are legitimated both horizontally among persons and institutions, and vertically between levels (Uphoff, 1986, p.137). The spatial association may provide on indication of casual links between particular human activities and livelihood outcomes. It is expressed the unique character of specific earth's surface. This specific attribute of a particular place inspire to differential livelihood outcomes. Spatial planning is thus viewed as a tool secure with intra or inter-regional equity in resource distribution, resource efficiency, social cohesion and improved access to essential facilities at different scales (Grainger, 2005, p. 51). Figure 3.2 shows the relationship between individual household and individual farm with spatial and temporal associations.

ii) Settlements and Sample Units

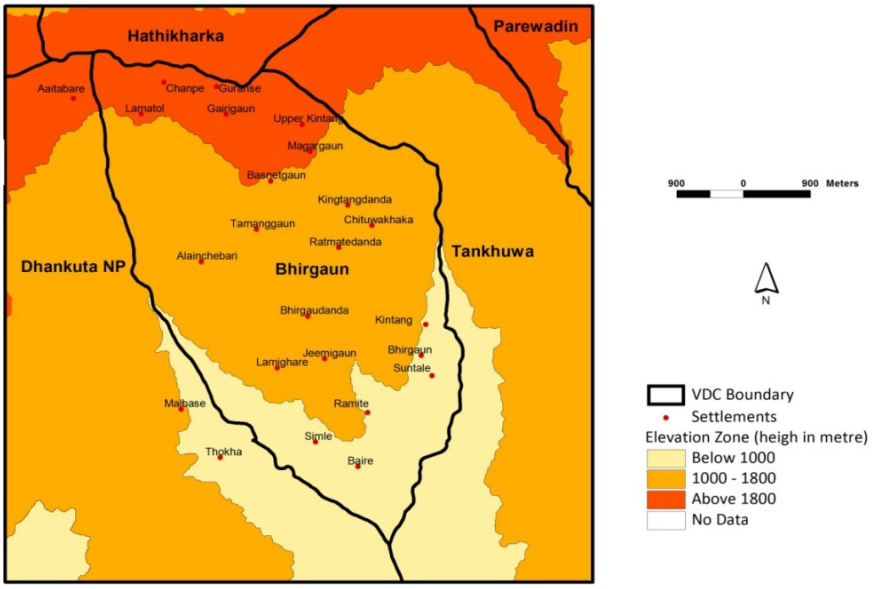
The ultimate source of geographic data is directly related to settlement of the study area. The reliability, quality, relevancy and adequacy of data always are examined by different units of settlement. In this purpose, twenty-one settlements of Bhirgaun VDC were identified with the help of topographical map and verified it by reconnaissance survey.

Table 3.1: Major settlement in the study area

Altitude (masl)	Name of the total settlement	Sample settlement
>1800 Upper hill	Chanpe, Gaireegaun, Guranse, Magargaun, Lamatol and Upper Kintang	Upper Kintang, Chanpe and Magargaun
1000-1800 Middle hill	Alaichebari, Basnetgaun, Bhirgaun-danda, Chituwakharka, Jeemigaun, Kintangdanda, Lamigara, Ratmate-danda and Tamanggaun	Bhirgaundanda, Ratmatedanda and Jeemigaun
< 1000 Lower hill	Baire, Bhirgaun, Kintang, Ramite, Simle, and Suntale	Baire, Ramite, Suntale
Total	21	9

Source: Toposheet Map/ Field study, 2009

Figure 3.3: Elevation zones and settlements



Source: Toposheet map, 1996 and field verification, 2009

Table 3.1 shows the distribution pattern of major settlements in the study area by elevation zones. For example, six major settlements are located in the upper hill-slope, eight in the middle hill-slope and five in the lower hill-slope (Figure 3.3). Table 3.2 shows distribution patterns of households and sampled households among different elevation zones of Bhirgaun because household is considered as the basic unit of analysis.

Table 3.2: Distribution pattern of sample households

Altitude masl	Elevation Zone	Household		
		Total	Sample HHs	Percent
>1800	Upper hill	267	59	22.1
1000-1800	Middle hill	357	84	23.5
< 1000	Lower hill	285	64	22.5
Total		909	207	22.8

Source: Field study, 2009

Out of the total settlements, Chanpe, Magargaun and Upper Kintang from upper hill-slope; Bhirgaundanda, Ratmatedanda and Jeemigaun from middle hill-slope; and Baire, Ramite and Suntale from lower hill-slope were purposively selected for detailed study by considering different dimensions, namely elevation zone, caste and ethnic groups, method of agricultural produce, distance from district headquarters

and road-heads. For example, Chanpe is located nearest point from the Koshi highway and farthest for the Magargaun in the upper hill-slope. Table 3.2 shows the number and percentage of the total households and sampled households.

Jeemigaun is homeland of Rai community and Ramite and Ratmatedanda is dominated by the Dalit communities. Table 3.3 shows that distribution patterns of total population and sample population by caste and ethnicity. Rai communities are figured the largest percentage share in both total and sampled population and it is inhabited in the middle and lower hill-slopes. Chhetry and Bahun are located middle and lower hill-slopes and figured 33.2 percent, Magar community was dominated in the upper hill-slope and it accounts 19 percent.

In addition, rain-fed terrace is more common in Chanpe, Magargaun, Upper Kintang, Bhirgaundanda, Ratmatedanda, Jeemigaun and Ramite; and irrigated terrace in Suntale, Baire and Lower Kintang. Thus, the study area is consisted of both traditional and new farming methods which have a qualitative impact in diversifying of the livelihoods.

Table 3.3: Population distribution by ethnic composition

Caste & ethnicity	Total population		Sample population	
	Population	Percentage	Population	Percentage
Rai	1610	30.3	363	31.4
Chhetry	1552	29.2	288	24.9
Magar	1008	19	234	20.2
Tamang	3357	6.7	85	7.4
Dalit	309	5.8	117	10.1
Bahun	212	4	35	3.0
Others	261	4.9		2.9
Total	4409		1156	

Source: Field study, 2009

While considering a sample size selection, different types of sampling procedure were applied wherever appropriate. Allowing for levels at which sample-frame input can be made effectiveness, such as if the selected items contain household size from 50-100, a rule of thumb method was used, and households were selected by using systematic random sampling method. If the selected household were below 50, all the households having farm population were considered for selection. In other case, households having

more than 100 then the sample size was determined by means of using standard sample size formula such as $n = \frac{z^2(pq)}{e^2}$ where, n = sample size, z = standard error associated with the chosen level of confidence (z = 1.96, which is 95 percent confidence limit), p = estimated percent in the population, q =100- p, e = acceptable sample error, which is 5 here; and standard errors. This is calculated by $e = \pm \frac{\sqrt{pxq}}{n}$ where, e = standard error ($\pm$), z = (1.96 at 95% confidence level), p = estimated percent in the population, q = 100-p, n = sample size population (to be obtained). These formulas gave sample size ranging from 20 to 25 percent. Thus, 207 households from the total (901) households were selected.

iii) Household Survey Using Questionnaire Tool

The household survey was carried out with household heads through using the semi-structured questionnaire method. Household is generally involved in production and marketing of agricultural produces, namely cereal crops, fruits and vegetables and rearing livestock. For questionnaire survey, sampled households were selected with covering different types of lands (owner cultivator or share copper) and size of land holding (small or large).

The interviews were carried out at the place of householder's own residence and some were also administered at the place of periodic markets and other agro-collection centers. In this consideration, head of the households (both male and women) were taken as respondents and in some cases, family members were also allowed to accompany to the respondents. The respondents consisted of varying features such as age, gender, ethnicity, and farm size. Since the respondents were often at their farm fields for agricultural activities during the summer season and day time, the interviews were carried out in the morning and evening time (before 7 AM and after 6 PM).

The combinations of households' information were grouped into different conditions. The socio-economic conditions of the households include access to land, size of holding, farming methods, occupation, source of income, household assets (land, livestock, house, and other storable assets), cropping patterns. The organizational information includes accessibility to markets for products, agricultural

extension services, and farm input supplies. The most advantages of household access to agricultural development include trade-off between farm and non-farm income opportunities and remittances were also taken in this consideration.

The questionnaire form was divided into seven sections. Section *A* covered general information like householder's residence, their age, sex, family size and educational status. Section *B* dealt with occupational structure; source of income, and access to household assets. Section *C* is concerned with farming activity such as size of land holding; nature of holding; land use pattern; cropping pattern; level of intensification, diversification and commercialization of farm products; marketing pattern of farm products and mode of transportation and communication. Section *D* consisted of farm-livestock-forestry linkages; off-farm and non-farm income activities; rural-urban linkages. Section *E* is related to indigenous knowledge system in agricultural resource management; impact of agricultural inputs: irrigation, HYV of seeds, chemical fertilizers, pesticides, and hybrid crops and animal breeding. Section *F* is concerned with the role of institutions in agricultural development: good governance; empowerment in local planning; networking-coordinating (infrastructure development in rural area, transport and communication and marketing facilities); service delivering systems (agricultural inputs, credit and subsidies facilities); and policy measures. Finally, section *G* consisted of overall problems of local development (Appendix, 3.4).

As it is necessary to concern with major constraints to obtain information about the area covered by different crops, per acreage productivity, net-income that is produced by households from different sources in rupees. Given these conditions information was collected by the calculation and generalization of respondent's views and existing commodity prices in the villages and markets.

C) Focus Group Discussion

Focus group discussion was a main source of qualitative data. This was used to qualitative data collection in different settlements. At least one focus group discussion was conducted at each sampled settlement (9 from all elevation zones) including participation of community based organizations (CBOs), Women, Dalits, and Janajatis. Six to nine participants were preferred for group discussion (Appendix, 3.5). These discussion were used to prepare well-being indicators in their context,

factors contributing to continuity and change in their livelihoods, each with its own indicators and problems and prospects for economic potentiality of the area.

D) Key Informant Survey

Key persons were also important source of qualitative data that often provides general historical accounts of this area. They included local elites, service provider entrepreneurs, teachers, social workers and government personnel. Three key persons were selected from each elevation zone. It was assumed that these elites have knowledge, power and sources of village level information because they were considered as influential persons for local development. Their supports have involved attention to the changes in the livelihoods of individual or different households. They also provide historical and biographical information of this area, since 1774, such as land policies, impact of abolition of Kipat system, Land Reform Program and Cadastral Survey. Their different views were important to the provision of listing major changing factors. They are related to a combination of factors, ranging from establishment of high schools, increasing accessibility to physical infrastructures (especially roads and irrigation facilities), private investment in Guranse tea estate and developmental activities of hydro-power station and extension of government administration service centres. These economic opportunities are playing significant role to the changes in the well-being in Bhirgaun (Appendix, 3.5).

In addition, one day VDC level meeting was organized with local government representatives, sampled households' representatives, public service provider institutions such as Agricultural Development Office Staff (DADO and junior agricultural assistance (JTA). Agricultural/Horticultural research personal, Veterinary, Agricultural Development Bank and other concerning stakeholders were also met to gather additional information for agricultural development.

Both FGD and KIS are useful to identify reality check about household livelihood conditions. Their views were synthesized to know significant changes in access to resources, social and cultural environment, livelihood and employment, nutrition and health and resource management and governance and politics.

E) Interviews with Market Center-based Entrepreneurs

Market centre is a focal point where producer-sellers and buyers meet. The consumers and producers were sources of information who gathered either daily or

periodic basis in agro-collection centers, small market centers and periodic market centers. Most of the households are considered as producer-sellers and buyers in the periodic markets. Those market centers create opportunities for commercial interaction among customers and producers. Buyers and sellers were accidentally selected for interviews. They informed that periodic markets and collection centres provide opportunities for commercial interaction for their surplus agricultural produce and including new crops. But the nature of terrain and distance from the roads impose severe limitation on their market participation.

The producer-sellers were asked question about nature and quantity of goods they sold in the market as well as their seasonal rhythm of trading and traveling distance. They were also asked as to what types of goods and services they bought from the same market.

One highly significant implication of this reasoning was that the shop keeper provides information about nature, types and volume of goods and services which flows to the rural areas. Most of the shop keepers were selected from Dhankuta, Hile, Jorpati and Guranse and they informed that most of farm households were demand for agricultural inputs and agro-vet packages, like fertilizers, HYV of seeds and pesticides. Other demands were spices, sugar, salt, mustard oils, and other goods and implements. Shop keeper often bought milk, eggs, vegetables, potatoes, rice (agro-products) from the producer-sellers.

These interviews gave information about changes in the scale and nature of agriculture and their relevance to the livelihoods of different households. But there was problem in obtaining information about actual households' incomes and the quantity sold in the markets.

3.4.2 Secondary Data Collection

Secondary data were acquired from different sources. These data sets provide general information about population, local socio-economic characteristics and local geographic contexts. Most of the secondary data were obtained from national and international publications, DDC, VDC records and topographic map as well as Google Earth Images. Review of books, journals and articles were also sources of secondary data. These tools were used to verify elevation zones, settlements, road networks; the extensive use of maps, photographs and their generalization into land

use and land cover change, land suitability for agriculture and location of non-farm activities.

3.5 Data Processing

The raw data gathered from various sources and survey methods were processed. SPSS software was used for data processing and producing various charts, tables, cross tables, and index and GIS was used for mapping.

3.6 Methods of Data Analysis

The study area is divided into three elevation zones by using two criteria: locational aspect of livelihood activities, such as upper, middle and lower hill-slopes in the first, and infrastructure facilities especially road and irrigation, institutional support services in the second. The present study is based on three objectives, to fulfill these objectives following methodologies were applied to gather data and analyse them. Descriptive, analytical methods are applied for data analysis. These classifications were persistently tested by cross checking and other forms of triangulation and since they are generated through different approaches and in different places, they provide a reasonable degree of rigorous study.

Chapter one and two are based on review of relevant literatures. Existing concepts, theories, empirical research works and government policies related to agriculture and livelihoods were reviewed. The data for Chapter four is derived from both review and secondary data. These data were obtained from national publication, DDC, VDC records and profiles. The analysis of Chapter is used descriptive and analytical methods. Descriptive statistics such as cross tables, mean and map and diagram are used to data analysis.

The first objective is analysed in the Chapter five. This research work has used mix methods of quantitative and qualitative data sources. The quantitative data were collected from field observation, household survey and topographic map. Questionnaire form was prepared for household survey and SPSS software was used to data processing (Annex 3.4). The study area is divided into three elevation zones, each with its own geographical conditions and ecological characteristics. This chapter is analysed with the help of table, cross tables, quintile distribution, and percentage and Pearson correlation coefficient. For example, the quintile distribution is used to

landholding size analysis and it can be classified richest, richer, rich, poor and poorest of the poor. Access to different types of services from households are measured in KM and the Pearson correlation coefficient at the 0.1 and 0.05 levels is applied to test hypothesis (H_o). Access to land and cluster of households are measured by landholding size. The degree of land use change between 1992 and 2010 is measured by a Pair Differences Test (PDT) at the 0.05 confidence level. Computer soft ware is used to both calculations.

Qualitative data were collected from participatory observation, focus group discussion and open questions with key persons. These data were analysed with narration, classification and categorization. For example, changes assets status is measured household category on the basis of five point scales of richest, richer, rich, poor and poorest of the poor and valued ranges from 5 to 1points respectively. Resource potential zone is analysed according to elevation zones each with its own characteristics.

The second objective is described in section six. This chapter is also based on mixture of qualitative and quantitative data. Quantitative data of major occupation, cropping pattern, agricultural input systems, creating agricultural environment and agricultural products and productivity and livestock were collected from questionnaire. This information were analysed by cross tables, quintile distribution and percentages and least square method is used to identify crop combination in the study area (Annex 6.2).

Qualitative information was collected from focus group discussion and open questions. Chi-square statistic is used to measure spatial pattern of livelihood endowment status (LES).

The third objective is analysed in Chapter seven. This chapter is also used both qualitative and quantitative methods. Different indicators, comparison and various statistical tools and indices were frequently used wherever feasible in the result, discussion and testing hypothesis. The analysis was made more effective with the help of cartographic technique. This technique included several graphs, diagrams and maps. An appropriate cartographic technique was applied in thematic map.

CHAPTER IV

DESCRIPTION OF THE STUDY AREA

This section describes the historical, physical, social and economic settings of the study area. This information helps to ascertain resources, their qualities and relative importance in the livelihood changes.

4.1 Historical Settings

The word 'Bhirgaun' is derived from Nepali word '*Bhir*' which denotes to the steep slope or precipice place. The word '*Bhirgaun*' was derived from Nepali word '*Bir*', denoting the bravest heroes of Rais (belongs to the Rai indigenous ethnic group) who first settled in this area. Bhirgaun is said to be the original homeland of the *Athapahariya Rais* where they have been living from the very beginning.

There is limited insightful knowledge and idea in the minds among them about their historical settings. Given that setting the efforts to search for dated documents is meaningless. They have no accurate idea of the age of this area, but they believe it is very old. A key Rai informant shared his idea and claimed that this is the place where their forefathers lived and spent their lives for generations, and are still embedded to this area. He further stated that their economic possibilities have been made possible, which are still continuing from clearance of forests by their efforts. This statement is an evidence of oral history that sought by village elders who lived there for their entire lives. There is a symbiotic relationship between environmental resources and livelihood of the inhabitants, which have been changed over time.

In the earlier times, when transport was slow, expensive and difficult, indigenous communities have to be spread inadequate to cope with a variety of needs. With increasing population numbers additional resources required to fulfill needs of their family. This has resulted into migration in search of opportunities for agricultural land in this area by the process of colonization, spread and competition.

The earliest man lived to the dependency of inhabitants on whatever amount and type of natural resources available through their crude knowledge and skills – this is what is called “determinism” philosophy of human and environment relationship. There is close relation between the agglomerations of indigenous communities around the arable land. Their settlements were directly related to the amount and type of

resources. It is argued that plentiful resources (flat and fertile land) support to agglomerated settlement while rugged terrain with stony soils for dispersed settlements. The isolated settlements over the hills of Nepal are a result of relief, geology, soils, climate and socio-economic factors. Several patches of isolated or fragmented cultivated land can be seen in the study area where indigenous communities of Rais, Magars and Tamangs usually living in the dispersed settlement unlike the Gurungs, the Magars, the Tamangs, the Sherpa, etc have been living in agglomeration form of settlement in the hills and mountains. As a result, whatever their size began to extent they had moved in search of food, water and land resources. Pradhan & Pradhan (2006) found that Chepang, Kusunda and Raute usually lived in the scattered settlements in the forest of the central-west hills where shifting cultivation can be seen in their living areas (p.60).

The study area has more complex and evolving land tenure systems. The main characteristic is the co-existence of different types of land rights. The key informant from Rai community told that their customary rights over land allocation and management were subjected by the de-facto hereditary chieftaincies or Subba in this area, before 1774. The ethnic of *Athapahariya* Rais and including Limbu had been belonging to a particular segmentary lineage of an extensive kinship networks and based on wealth position in the Tankhuwa Khola watershed (Khatiwada, 2012). This phase can be well thought-out as the phase of colonization. This system was loyal towards their chieftancy and temporal head of Das Limbuwan, to maintain local law and order, and to submit tax (Khatiwada, 2000; Kandangwa, 1993).

The expansion of Gorkha State in eastern Nepal had begun since 1774. The state had followed a policy of reconciliation of Limbuwan territory that had negotiated to new political setup. This process can be known as the phase of spread. This has resulted into growing complexity in traditional adaptive mechanisms of shifting cultivation and society. The patterns of livelihood had also become more complex either growing population pressure on limited resources or mass immigration in the expanded area. The immigrants had brought new levels of confidence, effort, skills and technology of maize, potato and paddy cultivation and irrigation to produce more than two crops in the same field.

The Gorkha state had initiated to develop new hierarchy of local governance system after 1774. The state had appointed local functionaries of ethic community which was parallel to the de-facto hereditary chieftancy of Subba of 60 Muri Mato in the Limbuwan territory. The people and their territory remain under supervision of Gaunda governor at Dhankuta (MOI, 1974; Dahal, 1985; Pradhan, 1991). The Rana government had placed their administrative centre including Appeal court, Kumarichauk, and Jangiadda in Dhankuta (Pradhan, 1991) and Bhirgaun has became hinterland of Dhankuta bazaar. From 1950 to 1960 there was no any administrative reformation was done in Nepal.

After the inspection of Panchayat Political System in 1961; the local organizations had been restructured into 14 zones and 75 districts and Dhankuta is one of them. In this process the area became a small Village Panchayat which was further divided into 9 wards. The wards remained as a lower level administrative unit, and traditional organizations have become less significant in the local politics and customary resource management practices. This is known as competition phase. People's day-to-day administrative functions were governed by the elected Pradhan Pancha and ward Chair Persons in Village Panchayat and each ward likewise.

The above discussion shows that Rais and Limbu communities are considered as the first settlers, who cleared the land and brought under cultivation, and held land under a common form of tenure which came to be known as Kipat. Kipat system was the main characteristic of customary land rights and linage traditional authority was responsible for land management and allocation. Under customary tenure, non-landowners can access land through a variety of secondary rights arrangements, ranging from sharecropping to tenancy to borrowing of land. Indeed it was widely practiced in ancient Mali, Nigeria and Tanzania (Bah, *et al*., 2006, p.58).

The state is the overall legitimated for all land within the national boundaries and has absolute authority over its allocation. This process has affected in the customary rights of Kipat with the inspection of Land Reform Act (1964) and new Cadastral Survey in 1974. Then land revenue collection was handed over to the Mal Office. This discussion can be compared to Caplan (1967) who reveals that the political status of Limbus was based on their rights over land when their authorities and said that 'the system of tenure is fused with and articulates the culture, they very is seen a bound up with the preservation of Kipat land' (p.9). The ethnic communities

and their village councils were distorted over its land allocation policy (Khatiwada, 2012).

4.2 Physical Settings

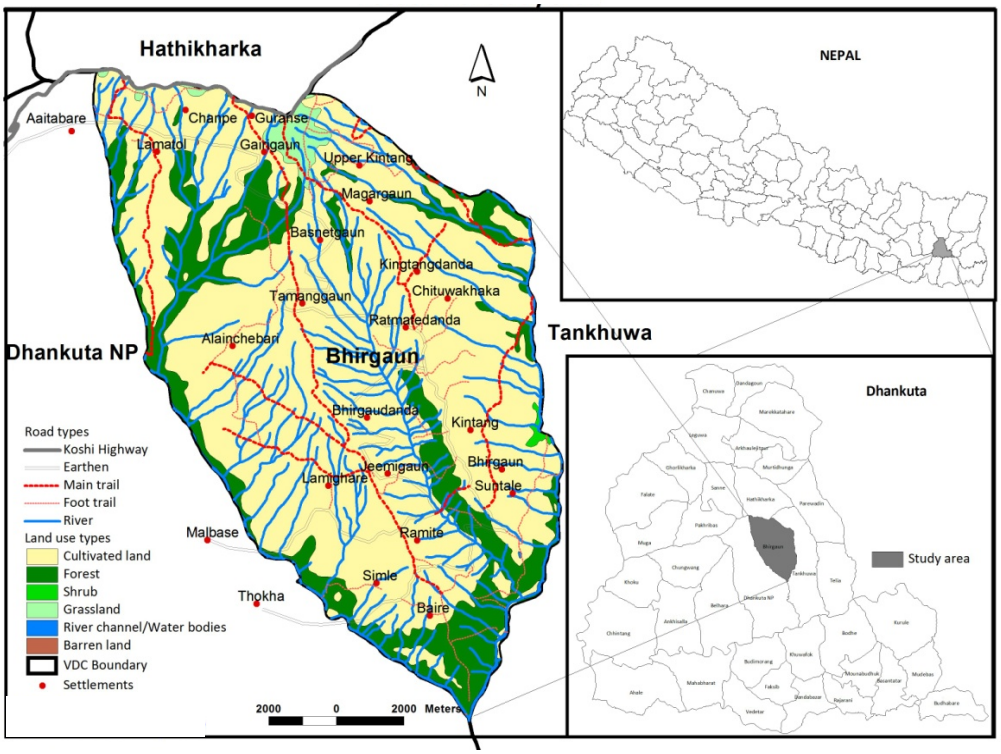
4.2.1 Topography

The present study area lies in Dhankuta district of eastern hill-slope of Nepal. It lies within 26°53'N to 27°19'N and 87°08'E to 87°33'E. It covers an area of 2,095.98 ha (20.9 sq. km) while it 79.1 sq.km for the whole watershed area. The area is situated in the southern slope of Milke-Tinjure Himalayan Range which stands unbending with the Indian sub-continents (MOI, 1974; Sharma, 1973). The area is composed by a low lying hill-slopes and narrow river valley or *Bensi*. It is located in the hill-slope region adjoining eastern part of Dhankuta bazaar and bordered by the Tankhuwa Khola (Tankhuwa VDC) to the east, Nibuwa Khola (Dhankuta Municipality) to the west, Guransedanda (HattikharkaVDC) to the north and the confluence of the Tankhuwa Khola and Nibuwa Khola to the south (Figure 4.1).

The physical feature of the area generally consists of two types of landforms: hill-slopes and river bensi. The hill-slope area making up more than 95 percent of the total area lies in southern sub-Himalayan range. This range steeply rises from the confluence of the Tankhuwa Khola and Nibuwa Khola (lower hill-slope) on the south and maximum elevation in Guransedanda (upper hill-slope) to the north with elevation ranging from 300 masl to as high as 2150 masl. It consists of metamorphic and sedimentary rocks with rugged topography. Its middle parts have composed by gentle slope with small Tars or flat upland terraces such as Suntale, Baire, Lower Kintang, and Schooldanda and so on. These areas are enriched the settlements and adds economic benefits to people's well-being of this area.

The river basin of the study area consists of narrow river valley with alluvial soil. These Bensi are enriched for cultivation and covered less than 5 percent of the total area. River Bens are confined to the sharp slope of the Tankhuwa Khola and the Nibuwa Khola. Space itself should not simply be regarded as a medium in which local livelihood is expressed. It is also important in its own contribution to the relationships between human and their physical and social environments or variations in physical accessibility to opportunities and amenities.

Figure 4.1: Location of study area



Source: Topographic map, 1996 and field verification, 2009

4.2.2 Drainage System

The drainage system of the study area is developed under the influence of the Tankhuwa Khola (*Tangowa* which refers to the head of river in the Rai dialects) watershed system. The southern slope of Milke-Tinjure range provides the sources to the Tankhuwa Khola drainage system (Sharma, 1978). It is originated in different physical setting and flowing towards south-east under the influence of Tamor drainage system. But the volume and level of water is very much relied on the monsoon rain. The Tankhuwa Khola flows throughout the year and its system consists of two sub-watershed systems in its upper part. For example, there are Tankhuwa Khola on the north-eastern system and Nibuwa Khola on the north-western system. When that reaches the foothill slopes of Banchare they meet together and collectively form the Tankhuwa Khola watershed system.

The government of Nepal had initiated Banchare Khola micro-hydro power station (340 KW) which utilizes water to generate electricity since 1971. But it is stopped now. Today, most of the water resources of Nibuwa Khola have been tapped

for drinking water purpose within Dhankuta municipality. Local people have also been using the water for irrigation in their agricultural land.

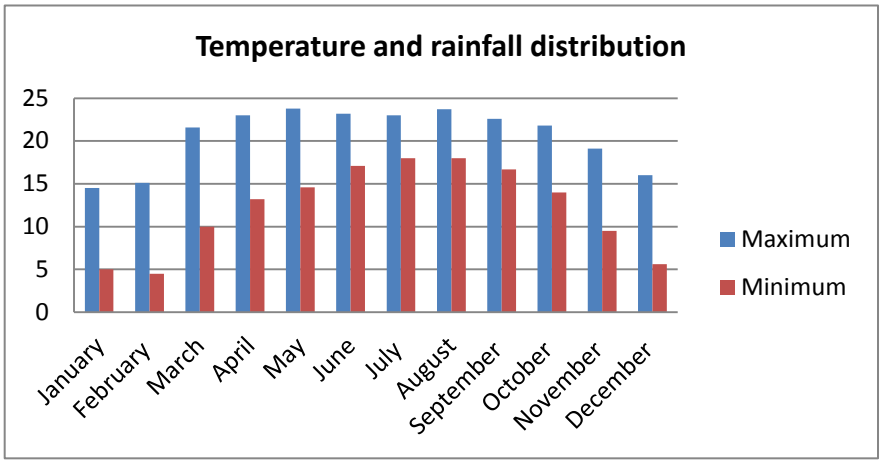
Besides rivers, other sources of water are also observed in this area. They are natural springs of Mul/Kuwa and artificial ponds which are used for irrigation, recreation and drinking purposes.

4.2.3 Climate

The study area lies generally in the warm temperate climatic zone although it's topographical extremes that produced vertical zonation of climatic region. The area has experienced three types of climatic regions. The tropical and sub-tropical climate prevails below 1000 masl which lies above 20°C in temperature regime. The warm temperate climate occur between 1000-2000 masl in which summer average temperature is above 20°C and it is 10°C in winter. Cool temperate climate which prevails over the higher hill-slope area with above 2000 masl where average summer temperature is below 20°C and it is 10°C in winter (Annex 4.1).

The climatic condition has produced four different seasons: the cold (October-March), the hot (March-June), the rainy (June-September). The mean air temperature rises during the pre-monsoon months (April-May) and riches its maximum in June (28.2°C) and declines during post-monsoon period (October–February) and minimum temperature (2.8°C) is recorded in January. Figure 4.2 shows that temperature and rainfall distribution by months (DDC, 2009) in the study area. The minimum ranges of climate which is suitable and healthier for human settlement and amenity.

Figure 4.2: Temperature and rainfall distribution



Source: DADO, Dhankuta, 2007

Rainfall distribution varies due to rain bearing winds that approaches from the south-east in the summer monsoon season. Heavier rainfall has taken place in the windward side of Mahabharata range while the rainfall sharply decreases on the leeward side. Maximum precipitation occurs in the month of July. The average annual precipitation in the area ranges between 256-1014 mm and the onset and retreat of the monsoon occur in the June and September respectively. Winter is generally dry, however, occasionally rainfall occurs by cyclones and thunderstorms (winter monsoon from westerly). Sometimes winter snowfall also occurs in Guranse area of upper hill-slope.

4.2.4 Natural Vegetation

Generally, mixed type of forest is found in the study area and it consists of the varieties of vegetation species which varies with increasing altitude. The vegetation belts can be grouped into three broad classes: tropical belt, sub-tropical belt and temperate belt.

The tropical type of forests are mostly confined to the river Bensi of lower hill-slope (below 1000 masl) with deciduous species such as sal (shorearobusta), jamuna (syzygium cumini), khayar (acacia catechu), karma (adina cordifolia) and other mixed species. The sub-tropical belt (1000-1800 masl) that lies in the middle hill-slope has deciduous and mixed forests. They shed their leaves in winter. The main species are as *Chilaune* (schima wallichi), *Uttis* (alnus nepalnesis), *Sallo* (pinus roxburgii) and bamboo varieties (gramineae family). Temperate zone (above 1800 masl) is in the upper hill-slope with evergreen coniferous or needle-shaped forest such as *Okhar* or walnut (juglans regia), *Thulo Katus* (lithocarpus pachyphylla), *Uttis* (alnus nepalnesis), *Chanp* (michelia champaca), *Laligurans* (rhododendron arboretum). In addition, there also are varieties of medical and herbal plants and trees found in different altitudes such as *Amala* (emblica officinalis), *Bel* (aegle marmelos), *Bojo, Barro, Harro, Gurjo, Nim* (azadiaacnta indica), *Ritho, Tulasi* (ocimum basilicum) etc.

Most of the households depend on the leaves and litters of the forest to feed animals in this area. Today, households have realized the importance of forest resources and they are practising combination of agro-forestry to sustain their local needs. But spatially uneven developmental activities are seeing in unequal distribution of economic opportunities for forest resources in the markets. For example, the most

advantages from forest products are seen in the upper and middle hill-slopes who export timbers, resins and forest products to the Tarai.

4.3 Social Settings

4.3.1 Population Size

While reviewing the literatures, it was found that the total population of this area was 4,846 in 2001 and it was 5,309 in 2009 (RDN-Nepal, 2010). The population is composed of the men and women and the record indicates that of male in 51.2 percent and that of women in 48.8 percent. According to CBS reports the annual population growth rate in this area was 0.94 percent and population density was 231.31 per sq. km in 2001. Indeed, it was 2.1 percent for overall Nepal in 2001 (CBS, 2001).

Table: 4.1: Population growth trend

Year	Number of household	Population size	Absolute change	Percentile change
1991	792	4413	-	-
2001	909	4846	433	9.81
2009*	974	5309	463	9.55

Source: CBS, 2001 and *RDN-Nepal, 2009

Table 4.1 shows that there was remarkable increase in the population in 1991-2001 census decades in this area. It will further increase if the current trend continues. The result indicates that 5.5 persons are the benchmark for average household size in this area, while it was 5.4 persons in Nepal and this figure with the NLSS 2003/04 was 4.9 persons per household for the hills of Nepal (CBS, 2004).

The overall sex ratio (number of males per 100 females) of this area is 104.9, while NLSS estimates the average sex ratio of the country to be 92 in 2003/04 (CBS, 2004). If comparison is made, sex ratio in the study area is significantly higher than national average in 2009. The growing attraction towards foreign employment for the youth male is one of the major causes of difference in sex ratio in this area. Age group is an important aspect for livelihood analysis. For the convenience, this study has classified five broad age groups. The result indicates that largest share of population is covered by 15-60 years age groups followed by children (<15 years), and elderly (Table 4.2). In this study, dependency ratio is defined as the number of people in

dependent age (0-14 years and 60 years and above) per hundred people in economically active age (15-59 years).

Table 4.2: Population distribution by age group

Age group	<5	5-10	10-15	15-60	>60	Total
Population	402	402	423	2365	324	5309
Percent	12.3	12.3	13.0	44.4	6.1	100

Source: RDN-Nepal, 2010

It can be argued that age group is scale for the identification of economically active population and dependent population. Generally, 15-60 years age group is considered as economically active population (Table 4.3).

Table 4.3: Economic characteristic of people

Status	Population	Percent
Economically active	3706	69.81
Economically inactive	681	12.83
Dependent	922	17.36
Total	5309	

Source: RDN-Nepal, 2010

It shows that dependency ratio of a household is high if their largest share is contributed by number of children and old age individuals. The overall dependency ratio in the study area is 77, while it was 84 in Nepal (CBS, 2004). The rate indicates that dependency ratio has direct bearing on the livelihood status more specifically well-being status of the households.

4.3.2 Ethnic/ Caste Composition

The basic elements of social composition include race as ethnicity/caste, language/mother tongue and religion/belief which tend to include all these three under the ethnicity. The study area is composed of the multi-ethnic settings. The result shows that the Janajati population constitutes the largest proportion of the total population (60.9%), while it was 60.0 percent in the hill-slope areas of Nepal (Gurung, 1996). The largest percentage of the total population is of the Rais (30.3%) followed by the Chhetri (29.3%), Magar (19.0%), Tamang (6.7%) Dalit (5.8%) and Bahun (4.0%) are respectively. The communities like Bhujel, Limbu and Sherpa are considered in others category which roughly accounted for 4.9 percent.

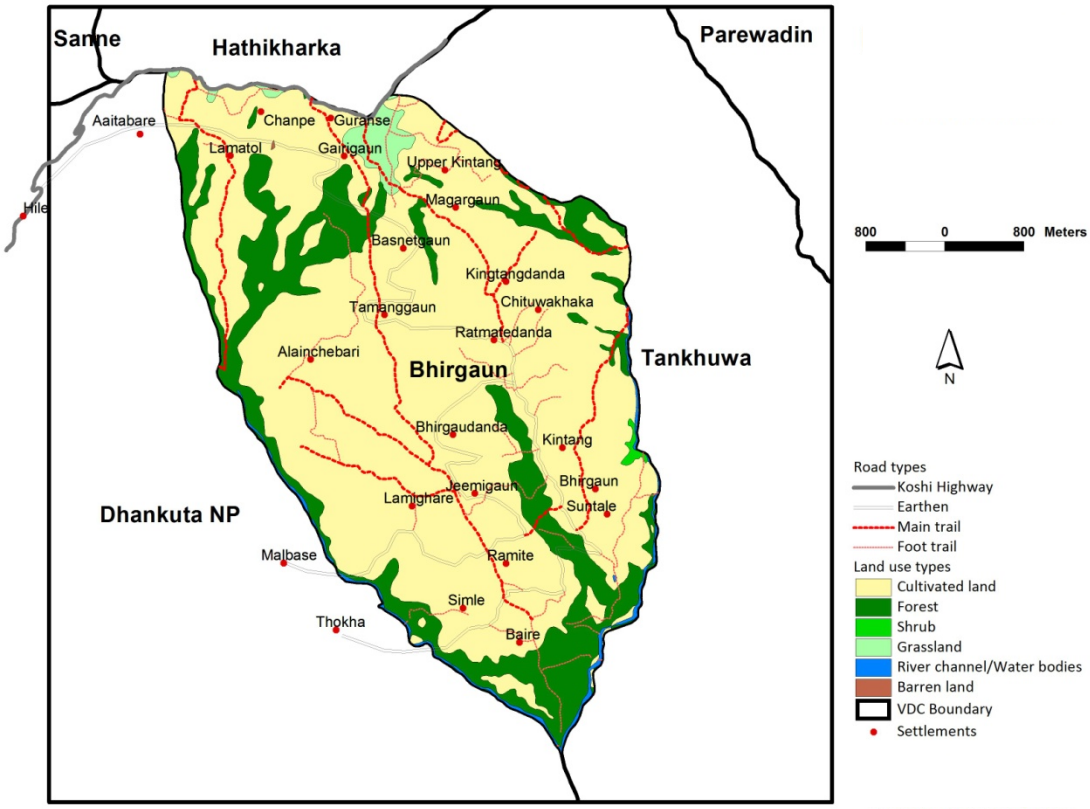
4.3.3 Land use and Settlement

The spatial and temporal dynamics of land use and settlement patterns are also important in livelihood analysis. They are largely related to the regional variations in resource base as well as biophysical, socioeconomic and environmental conditions of the area. The land use and land cover changes indicates that how local communities used both common property resources and privately owned land to fulfill immediate their needs. The analysis of Topographic Map (1996) show that different uses of land, such as cultivated land, forest, shrubs, grassland, river channel and water, barren and settlements (Figure 4.3). The local people have cleared natural forest which was converted into cultivation land in earlier times. Thus, deforestation is widespread phenomena in this area and it is estimated that hundreds of hectares of forest land losses because different groups used to move in search of food, water and favourable climate (Figure: 4.3).

The spatial pattern of settlements in this area has directly related to agricultural land where clearances of forest resources were plentiful. Indeed, the whole process of present clearing for new agricultural land is observed where majority of farm family lived there. Their settlements are located in their farm fields. Indeed, Wanmali (1985) found the secular patterns of human settlements in the medieval rural India.

The rapidity of the pace has changed in the livelihood patterns in the study location. This has resulted to human-environment interrelationship because regional variations in resource distributions are some of the fundamental causes of spatial variations in settlement patterns. They are largely varied depending on location and resource quality. Other factors like, access to physical facilities of road transportation, irrigation and markets are equally important. These factors create differential resource quality, land use and opportunities to the growth and development of human settlements.

Figure 4.3: Land use and settlements



Source: Topographic map, 1996 and field verification, 2009

4.3.4 Education

Education is one of the main human capitals and is the most important human development indicators in this area. Changes in the scale and nature of livelihoods of different groups are also related access to education because education makes individual differences in skills and abilities to utilize livelihood options. Access to education is also determined by households' wealth and social status. The result indicates that overall literacy rate in the study site is 74.4 percent (DDC, 2001). As there are remarkable differences in the male and female literacy rates, the same is in the literacy rates among different ethnic/caste groups. Literacy rate is the highest in Chhetri/Bahun (87%) and lowest in Dalit (63.4%). Literacy rates for other ethnic/caste groups are considerably lower than the average literacy rate. The result shows that the overwhelmingly of rural people have only access to primary education (35.1%) compared with the higher (bachelors and master) levels (1.8%).

4.3.5 Health Status

The livelihood of the communities is also affected access to health services because human health is also considered as a livelihood asset. Individual access to health services in the study area is very poor because health conditions are largely associated with the households' wealth and social status as well as caste and ethnicity. Individual aspect of education, gender, age and occupation are also important to health services access.

This study reveals that majority of households have still dependent on folk-medical treatments. They believed that local healer and their rudimentary medical service is more prevailed because government sponsored sub-health centre service is inadequate. This is mainly due to the limited support provided by sub-health service centre, their limited capacity to service delivery system, under-staffing and limited supply of medicine.

Access to safe drinking water supply is another health problem in this area. The main ailments are diarrhea, typhoid, and hookworm. Children and women unfortunately, remain the most affected from these diseases due to lack of awareness and lack of sanitation education.

4.4 Economic Settings

4.4.1 Occupation

The livelihood in the study area is derived from various environmental resources. Most of the households have fulfilled needs of their family either the utilization of land, labour and capitals or the migration. Agriculture is still the primary activity. Their agricultural produce is insufficient to fulfill their daily requirements as result household members are involved diverse livelihood activities. They are largely associated to primary, secondary and tertiary activities. The majority of the households have still adapted traditional livelihood mechanisms of agro-pastoralism, petty trading, cottage industry and migration and they vary depending on location, access to resources and distance from markets (Table 4.4).

Table 4.4: Household member involved in different occupation

Particular	Occupation					Total
	Agriculture	Trade	F employ	Service	Wage labour	
Total	4791	48	300	104	66	5309
Percent	90.2	0.9	5.7	2.0	1.2	100
Cumulative %	90.2	91.1	96.8	98.8	99.9	

Source: RDN-Nepal, 2010

Table 4.4 indicates that agricultural sector accounts for the largest percentage of the households' income and employment (90.2%) as compared to 65.7 percent in Nepal (CBS, 2002).

Table 4.5 shows that household members involved in different income sources. The result indicates that the largest percentage of income comes from the agricultural sector (35.0%). Typically agricultural income source comprises food crops, horticultural crops, spices and livestock and its products. This figure indicates that agricultural activities alone cannot yield sufficient employment and income for large and growing population. As a result, their family members are involved in a wide range of activities to supplement agricultural income. While the contribution of non-farm activities accounts only for 32.6 percent of the total household incomes.

Non-farm income source includes both off-farm and non-farm activities such as service, trade and commerce, wage labour and so on. The result indicates that the households yield average income of about Rs 77,900 per family while the key person reported that approximately Rs 77,300 per family is needed for yearly expenses.

Table 4.5: Household income sources (in 000 Rs)

Sources	Income	Percent	Sources	Income	Percent
Agriculture and livestock	26583	35.0	Wage labour	9412	12.4
Trade and commerce	2369	3.1	Others	1900	2.5
Services	11044	14.6	Total	75863	100
Foreign employment	24556	32.4			

Source: Field survey, 2009

The result gives an idea that majority of the households are still dependent on agriculture for their livelihoods. Hence, the overall return from agricultural sector has not been possible at desired level, despite the priority because of the adverse monsoon condition, lack of irrigation facility, lack of agricultural inputs of fertilizer, improved seeds, agricultural extension services and lack of agricultural roads (MOF, 2010).

Livestock is also important source of livelihoods, although livestock are also related to subsistence practice. Majority of the households kept different types of livestock such as cattle (31.5%), goats (48.8%), pig (10.0%), and buffalo (8.5%) sheep (1.1%). They are exclusively of local breeds and their productivity is too very low. Recently, the area annually produced 3,49,806 liters milk, 63,205 kg meat (goat and pig), 7,007 kg chicken, 83,654 pieces eggs and 386 kg honey. They are largely growing new sources of income in this area.

Several youths are going to overseas for employment due to very low employment opportunities in the area as well as in the country. It is observed that foreign employment is promoting the business for employment and income. Most of the people go to Gulf countries, Malaysia, India and overseas. The foreign employees are sending remarkable amount of remittances which ranges from 10,000 to 20,000 per month for the livelihood of their family members.

4.4.2 Food Security

Food security is one of the most important basic needs and rights of any individual. In this study, food security is considered to be the quantity of food produced by the households like rice, maize, millet, and so on for self-consumption and the household requirement. Households produced their incomes from both farm and non-farm activities. But each level has varying contribution to food sufficiency or deficiency. Food is most important to all households. The figure shows that 2,039 metric ton of the total food was produced in 2001. The result indicates that the area produced little surplus foods as compared to food-demand (2,000 metric ton).

Table 4.6: Food security situation (month)

Month	< 3	3-6	6-9	9-12	Saving	Total
HH	186	451	145	173	37	974
Percent	19.1	46.1	14.9	17.8	3.8	100

Source: RDN-Nepal, 2010

Table 4.6 shows the level of food security situation at household level. The result reveals that the largest percentage of the households (46.1%) have food security only for 3-6 months in a year and 19.1 percent households have food security for less than 3 months. The result indicates that more than 80 percent households face food deficiency problem, as compared to less than 20 percent. The food security situation

at the household level is relatively very poor compared to overall food production. District Agriculture Development Office estimates that demand for different food items are in varying quantities. For example, food requirement per capita is 201 KG (per annum), vegetable 300 gram per day, fruit 85 Gram per day (DDC, 2001). But it was estimated that around 120 kg/capita food was consumed annually in the hill-slopes. It is required over 200 kg of food-grains to meet basic needs of 2,340 calories annually (DFAMS, 1986).

4.5 Infrastructure Setting

The infrastructure facilities are analysed by both for the provision of physical infrastructure and social infrastructures. Physical infrastructure includes things such as roads, power supplies, communications, water supplies and sewage disposal systems. Other social infrastructure includes such things like school, health post, post office, village development offices, bank and so on.

4.5.1 Physical Infrastructure

The existing different provisions of physical facilities are drinking water (75.9%), electricity (50%), and communication services. Different means of communications make easy accesses from post office, telephone service, and CDMA lines and pre-paid, post-paid mobile sets. A large number of households stated that there is increasing accessibility to roads for the provision of health, education facilities and market for products.

The road is the first and most important basic infrastructure for the socio-economic change in an area. The poor physical infrastructure has far-reaching consequences of this area for a long. This is the main reason for agriculture to be isolation at local level. After the construction of Koshi-Highway and small-farm households have largely affected due to growing investment of agri-business activities in this area since 1990s. This has significantly changed in local livelihoods of the communities. DDC and VDC have designed to a full grid of agricultural roads from the Hile, Guranse and district headquarters.

4.5.2 Social Infrastructure

Social infrastructures include health clinic, schools and family planning services. The demands for social infrastructures are increasing, but some problems are

solved by village level sub-health post, post office and Village Development Office in the middle hill-slope (Schooldanda). Local hat-bazaar provides accessibility to markets for local exchange of goods and services (both vertical or manufactured and horizontal or farm products). Local farmers are both sellers (farm products) and buyers (non-farm and farm products) in the hat-bazaars. Given that growth Hile (Thursday), Dhankuta (Thursday), Jorpati (Sunday) and Sindhuwa (Wednesday) have been providing facilities for local exchange.

4.6 Human Development

Human development indices are changing very slowly, for example, life expectancy for the area was figured 64.9 in 2004 and it was 64.3 in 1998. Adult literacy rate was 58.6 percent in 2004 and it was 44.4 percent in 1998. The per capita income was Rs1102 in 2004 and it was Rs 1275 in 1998.

4.7 Changes in Livelihoods

The above discussion assesses how space influenced patterns of agro-based livelihood of the communities in the Tankhuwa Khola watershed, particularly in Bhirgaun VDC. Present study area is made up of very diverse geographical and ecological characteristics. This diversity is produced several constraints in the uneven distribution of natural resources (especially arable land and water) and developmental activities. Livelihood activity is not evenly developed within this area, because it's physical, biotic and cultural environments. As a result, the nature and extent of livelihood activity vary from place to place (elevation zones) and are constantly changing under the influence of economic, social and technological changes. Caplan has rightly assessed 'the Limbu made generous grants of land to accommodate the immigrant settlers . . . which meant those they were cultivating and living together' (p.7).

It is very difficult to measure livelihood change in this area. Generally, employment opportunities and per capita income are two main indicators used to measure well-being. In the study area, unemployment has been a major yardstick of spatial patterns of well-being. Remittances are a crucial component of households' income and a key element of the continued links between migrants and their home areas. Per capita income is probably best single indicator of its affluence, but also on a wide range of other economic and social indicators- education, health, housing conditions and social services (Knowled & Wareing, 1997, p. 282).

Lastly, the livelihoods of the communities are undergoing changing due to the causes of transport and marketing facilities. These factors brought changed and transformation in the agricultural sector. As a result, households soon realized the most advantage of new crops for market since 1990s. This is only possible with increasing access to physical facilities and efforts of governmental and NGOs as well as neighborhoods and media effect.

CHAPTER V

RESOURCES AND LIVELIHOODS

This section attempts to assess the different types of resources related to the livelihoods of the communities in the study area. It tries to answer the first research question 'in which and what extent do resources facilitate to spatial patterns of livelihoods?'

The attempt proceeds primarily from assessing resource availability in the study area. The livelihoods of the communities are usually dependent on their proximate environments. The environment embraces both physical and human dimensions. It provides resources on which all life depends. Others factors are also equally important to diversifying livelihood activities. They are individual effort, physical infrastructures of road, irrigation, financial capital and agricultural policies.

5.1 Status of Existing Resources

This study deals with the importance and use of locally available resources on which the households' livelihood is depended. The livelihoods of the communities is passed to recombine space with its resource base, space as that part of nature most involved in their livelihood activities. Bhirgaun is a natural foci for particularities of a place, and it is composed of hill-slopes, with complex physiographic feature, weak geological structure and sallow soil depth. Other features like altitudinal variation over short distance, patches of vegetation cover surrounding agricultural fields and scattered human settlements. The agricultural landscapes carved into hill terraces for agricultural production are adopted by local communities for agro-based livelihoods.

There is an ample of natural resources like land, water, forest, pasture and scenic beauty as well as human resource. These resources are important either in food production or in non-food production. Since, resources are assumed to be fully employed in diversification of the livelihood activities which are associated with the access of land, soil, water and forests. But there exist a wide range of spatial variations in resource distribution. It is a result of geographical conditions, resource availability, individual capability as well as socio-cultural aspects of the study area. If the area has potential comparative advantage in agriculture, thus it becomes a resource when local communities have perceived it is useful in some way with the

application of their skills. The inputs to the agro-based livelihoods are resources and assets. Therefore, this study has given explicit attention in the analysis of resources under the head of natural, physical, social, human and economic resources. They are also known as livelihood resources or capital assets and discussed as follows:

5.1.1 Natural Resources

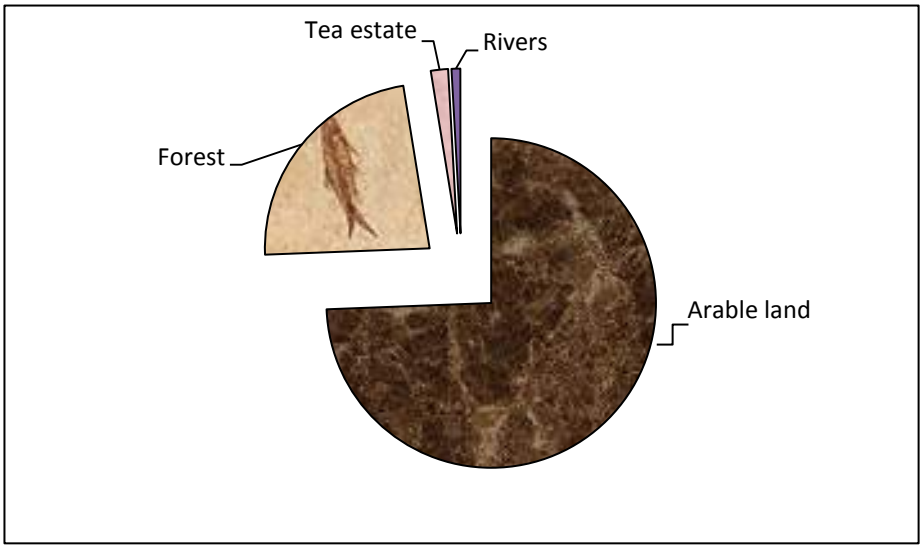
Natural resources are consisting of soil, arable land, water, forest, scenic and minerals. These are the basic resources for agro-based livelihoods of the communities. The livelihoods of individuals or different households in one of the remote village of Dhankuta district of eastern Nepal are still based on primary activities. The main activity is to trace the interaction of human so much of his environment. The important contributing factors for their activities are environmental resources. Thus, resources are important not only for local economies to support livelihoods of the communities but also as engines of socio-economic and cultural changes of this area.

The southern slope of Milke-Tinjure-Trans Himalayan range provides an ample of renewal resources and non-renewal natural resources. But the demands for these resources are increasing because of growing population size and increasing demand for food. The livelihoods of the communities in this study area are directly related to resources available. Among them, land is considered as a vital natural resource. But most complex and dynamic combinations of factors associated with land is geology, topography and physical characteristics of this locality. The extent of arable land in this area is seen inadequate to satisfy growing food production. Households' perception towards water, aesthetic and biological resources are also important. The available natural resources, namely forest, agriculture, water bodies and scenic beauty are associated with existing land use patterns. Their area and percentage are shown in Figure 5.1.

Figure 5.1 shows the distribution patterns of land based resources in the study area. The figure indicates that land use pattern in this area is largely affected by faulty method of land use practices. The main characteristics of land based resources are arable land (1559.20 ha), forest (483.12 ha), tea state (35.41 ha) and rivers (18.25 ha). Out of the total land (2095.35 ha), the result indicates that arable land has the largest percentage coverage (74.4%). It is followed by the forest (23.1%) in the second, tea

state in the third (1.7%) and lowest by the water bodies (0.8%) including river and ponds.

Figure 5.1: Land based resources



Source: Toposheet, Survey Department, 1992

The land is predominant natural resource because the demand for land resource is rapidly growing not only for food production, but also for agri-business, urbanization and diversifying of the livelihood activities. The degree of livelihood diversification can be related to the land available there which provides to the growth of alternative livelihood options.

(i) Land

Land is an integral component of the natural ecosystem in the study area. Here, land refers to the arable land and it is mostly being used for cultivation. Land is required for different livelihood strategies including agricultural intensification and diversifies a range of non-farm income earning activities. Earlier, the individuals or different households have more efficiently used small pieces of land which is sufficient for their daily needs and land scarcity was not considered a problem. While households have stated lack of land as a serious problem for agro-based livelihoods because of growing number of their family and some households have no access to land.

For successful livelihood, activities can be combined with the nature and quality of land in the study area. The land can be classified into two types namely Khet and Bari (Table 5.1).

Table 5.1: Distribution patterns of arable land by elevation zones

Type of arable land	Area by elevation zone (percent)			Total Area (ha)
	Upper hill	Middle hill	Lower hill	
Khet	5.8	36.1	58.1	87.4 (37.0)
Bari	40.0	34.9	25.1	149.0 (63.0)
Total	27.4	35.3	37.3	236.4

Source: Field survey, 2009

Table 5.1 shows the distribution patterns of different types of arable lands. For example, the largest percentage of the arable land has constituted by the Bari land (63.0%) while it was 37 percent for the Khet land. The regional distribution of Bari and Khet land among different elevation zones is also important for the agro-based livelihood analysis. The result indicates that the largest percentage of land has accounted by the Lower hill-slope (37.3%) followed by the middle hill-slope in the second (35.3%) and lowest by upper hill-slope (27.4%). Regional variation of Khet and Bari land distribution on each elevation zone is due to the influence of natural phenomena as well as the action of human societies. They are discussed as follows:

(a) Khet and Bari Land

Most of the households have carved different types of terraces in steep slope gradients to produce different crops. They often are known as Khet and Bari lands. The terms 'Khet' and 'Bari' can be distinguished between irrigated and unirrigated land. Here, the term 'Khet' refers to irrigated level terrace that can retain sufficient water to grow paddy. In the contrary, 'Bari' refers to unirrigated sloping terrace land where maize, millet and lentil can grow. In addition, there are also other types of land known as *Kharbari* (land allocated to grow thatching grass or *Khar*) and *Pakho* (*Pakho* can be used for different purposes including grazing of animals and growing poor quality crops) and '*Gharbari'* (kitchen garden), but their size and percentage were not considered in this study.

The distribution patterns of Bari and Khet lands are also vary among elevation zones (Table 5.1). For example, the largest percentage of Bari land is constituted by

the upper hill-slope (40.0%), followed by the middle hill-slope in the second (34.9%) and lowest by the lower hill-slope (25.1%). The largest percentage of the Khet land is found in the lower hill-slope (58.1%), followed by the middle hill-slope in the second (36.1%) and lowest in the upper hill-slope (5.8%).

The household responses are summarized about the amount and types of land that needed for livelihoods in the study area as follows:

> Since it is a hilly terrain, for fulfilling growing needs of our family (five members in average) as well as requirements of cash for other uses necessitate either 15 Ropanis of year-round irrigated Khet land or 20 Ropanis for Bari land. Both types of lands are being enabled to produce sufficient crops to meet day-to-day needs. Sometimes more than 20 Ropanis land could not adequate to produce enough foods due to poor soil quality.

This statement is useful basis to examine access to land, it is mainly due to land is economic base in this area. This has provided a significant source of income and employment over generations. But accesses to land vary depending on location, slope gradients and land quality. Because of land classification of Khet and Bari can be compared with 'Danahar' and 'Bhith' lands in used to the Tarai. It is based exclusively on the types of crops grown at the time of settlements. For example, paddy is grown in Danahar and jute, maize, lintel and other crops are in the Bhith (Regmi, 1978, p. 39).

Land Classification and Grading System

The FGD participants agreed with the standard grading systems of both Khet and Pakho-bari followed by the state on the basis of soil quality and irrigation facility. They have also developed key indicators for each type of classifications each with its own characteristic as compared to government classifications such as very good for Awal, good for Doyam, medium for Sim and poorest for Chahar (Annex 5.1). The main characteristics of these classifications are the productive capacity of soils to produce potential crop and grazing practices.

The result indicates that the Doyam Khet accounts for the largest percentage of Khet land (83.6%), followed by the Sim Khet in the second (9.4%) and lowest by the Awal Khet (6.1%). Compared to the Khet, Chahar Bari land accounts for the largest percentage (66.3%) followed by the Sim in the second (21.0%) and lowest by

the Awal. However, these classifications seem to be introduced in this area after Cadastral Survey in 1974. But it was widely practiced in Kathmandu valley and Tarai region much earlier. Regmi (1978) claimed that under the Cadastral Survey . . . an attempt has been made to achieve uniformity in the system of land classification in the Tarai, (p. 39). In addition, the same land becomes more productive in Suntale and Lower Kintang with increasing irrigation facility since 1990s.

(b) Irrigated and Non-Irrigated Land

Land has been traditionally classified on the basis of irrigation facilities or type of crops cultivated. Irrigation is affected land use and its relevance to the households' livelihoods. The arable land can also be divided on the basis of the availability of irrigation facility, both year-round and seasonal basis. The study reveals that about 43.3 percent of the total land is brought under irrigation. The percentage of the year-round irrigated land appears very low (26.6 %) as compared with the seasonal irrigated areas. The regional variations in the distribution patterns of irrigated land among elevation zones are also important. For example, the largest percentage of irrigated land is accounted in the lower hill-slope (50.1%) followed by the middle hill-slope in the second (38.0%) and lowest by the upper hill-slope (12.9%).

(c) Landholding Size

The landholding size is considered an important aspect of agro-based livelihoods of different households in the study area. The size of the unit of cultivation has probably been subject to understand livelihood status because the size of landholding depends on the pressure of family size. The prevalent landholding size is consisting small-scale farms. Of course, landholding size is changing rapidly in response to environmental limits, population pressure and urbanization process along the road corridors. The result indicates that the average landholding size per household was 1.2 ha with the smallest per capita land parcels (0.2 ha) in 2009.

The landholding size can be divided into five groups by quintile distributions such as very poor, poor, rich, richer and richest. This classification is based on Nepal Living Standard Survey 2004 (Table 5.2).

Table 5.2: Quintile distribution of landholding size (ha)

Elevation Zone	Landholding size class by household (percent)					Total
	<=0.4	0.4-0.7	0.7-1.1	1.1-1.7	>1.7	
Upper hill	28.8	15.3	15.3	22.0	18.6	27.4
Middle hill	28.6	21.4	20.2	11.9	17.9	35.3
Lower hill	10.9	18.8	25.0	21.9	23.4	137.3
Total	23.2	18.8	20.3	17.9	19.8	236.4

Note: 1.The figure 19.657178 Ropani of land = 1 ha.

Source: Household survey

Table 5.2 reveals that the average size of landholding distribution. For instance, about 23.2 percent very poor households have owned only 0.4 ha land. Followed by the 18.8 percent poor households have 0.4-0.7 ha and lowest by the 17.9 percent richer households who have 1.1-1.7 ha.

The regional variations in landholding distribution among elevation zone are also important. The result indicates that the largest percentage of the very poor households was constituted by the upper hill-slope (28.8%) who have less than o.4 ha, followed by the middle hill-slope in the second (28.6%) and lowest by the lower hill-slope (10.9%). Moreover, the largest percent of the richest households was contained by the lower hill-slope (23.4%) who has more than 1.7 ha. followed by the upper hill-slope (18.6%) in the second and lowest in the middle hill-slope (17.9%).

The quintile distribution indicates that about 42 percent of the total households who owned less than 40 percent of the total landholding. This study can be stated that less than 20 percent of the richest households have accounted for about two-fold of what the poorest households owned. The computed Pearson correlation coefficient value (0.406) shows that there is significant relationship between family size and landholding size at the 0.01 level.

The largest percentages (98.5%) of the households have owned access to land with comparison to the households who do not possess land (1.4%). The holding size ranges from 0.2 ha and more than 2 ha depending on location as well as socio-economic groups. Moreover, some households had been forced to sell land without adequate compensation due to the causes of Land Reform Act in 1964, Cadastral Survey in 1974/75 and development activities of hydropower project, army camp and

tea estate and road construction. This tendency has lost access to the agricultural land and their productive potential in the area.

Although, the average holding size (1.2 ha) in the study area is higher as compared to national average (0.8 ha) and even in India (1.4 ha) in 2000 (CBS, 2004; World Bank, 2008). In case of hilly region, quality of arable land is much more meaningful than the mere mean size of landholding. Higher average landholding size may be due to extensive Pakho or Bari land owned by the households. This is the main reason for the prevailing landholding size to be inadequate to food sufficiency and agricultural system, too at subsistence level. As a result, the livelihoods of the communities in this area are more hardship than surrounding lowlands. Bishop (1990) suggests that 1.04 ha was insufficient to fulfill household needs due to all land consisting of undulating terraced Pakho plots and the fragmented plots were located far from houses in Karnali zone (p.342).

(d) Land Ownerships

The study area has complex and evolving landownership systems. Access to land ownership rights is vital to the livelihoods of individuals or different households in the study area. The main characteristic of landholding is the co-existence of different types of land rights available there. They can be divided into three types: i) individually-owned, ii) government-owned, and iii) the common property. The individually-owned land was more important compared to other types of landownership. It is mainly due to households have key roles as producers, consumers as well as are important units of analysis for assessing agro-based livelihoods of the communities at higher levels. 'It may be more meaningful units for assessing human pressure on environment' (Grainger, 2005, p.57).

The most usual way of acquiring landownership in this area was privately owned land. The fragmentation of holding was also decreasing both historically and contemporarily. The ethnic of Rai communities (31.4%) had been obtaining their land ownership right through mixture of customary and statutory systems. But it was largely possessed by inheritance of customary rights, because their legacy of land right was treated into 'Kipat' system. An explanation of land based activities and their significance more commonly heard ties with the early presence of Rais in the study area. For this instance, the description of one Rai informant:

> This place was the homeland of the Athapahariya Rais. Land is being our primary basis of livelihood which is given us by the nature. We might use land with love and respect' because we used land for farming, gardening, pasture and forestry. Thus, land only has not signified our livelihood status but also symbolized both wealth status and social position within our society.

This statement indicates that Kipat as a form of communal tenure systems not only members of Rais community in the present study area but also more prominent of the Limbus of Dhankuta and Ilam in eastern Nepal (Regmi, 1978, p. 29). In addition, the socio-cultural groups of Bahun, Chhetry, Magar, Tamang and Dalits who belong to their landownership rights either as a mortgage of Raikar land or privately purchased from the ethnic of Rais. It was widely practiced in eastern hills of Nepal until the inspection of Land Reform Act in 1964 and Cadastral Survey in 1974. Caplan (1970) found that when the Land Reform came and Kipat became Raikar alongside the reform of the tenure system in Ilam district (p. 197).

Other important source for acquiring land ownership rights was parental property. The local communities have stated that the inherent of their parental property may be equally divided among their successor of every son, 35 years old-age unmarried daughter and parents are common phenomena in this area. In addition, some households have purchased land either by personal or by joint effort of their family which has increased access to land ownership rights.

Access to ownership mediated by a combination of factors, ranging from national policies in terms of land tenure system, resource characteristic, land ceiling and individual differences in wealth status are also important for fragmentation of landholding. These factors are more likely affected access to landownership and ultimately in diversifying of the livelihood activities. In this area, diversified livelihood activities are increasing since 1990s due to young generation does not fell sense of self-importance in land-based activities. They are involving in non-farm activities, primarily, foreign employment and seasonal migration.

Land Entitlement

Land entitlement is also very important in agro-based livelihood analysis because it indicates that access to resources within the households by gender and generational status. This study reveals that land entitlement of individual woman was

successfully involved in diversify livelihood activities within household as compared to those who have no access to land. It can be said that there is wide gap within the household for land entitlement distribution among men and women because land was inherited most commonly from the father's family. Table 5.3 shows the women's access to land entitlement rights in the study area.

Table 5.3: Women's land entitlement (percent)

Elevation Zone	Area (ha)			Total
	<0.25	0.25-0.51	>0.51	
Upper hill	-	12.5	-	5
Middle hill	44.4	25.0	66.7	40.0
Lower hill	55.6	62.5	33.3	55.0
Total	100	100	100	100

Source: Field survey, 2009

Table 5.3 shows the distribution of women's entitlement rights over land in the study area. The holding size consisted from less than 0.25 ha of land which accounted for the largest percentage of women entitlements (45%) followed by 0.25-0.51 ha in the second (40%). Among the elevation zones, the largest percentage of land entitlement accounted in the lower hill-slope (55.6%) followed by the middle hill-slope in the second (44.4%). The average holding possession of women's entitlement over land was so far lower (9.7%) than the percentage of men. Indeed; it was 8.1 percent in Nepal (CBS, 2004).

This study found that the distribution pattern of land entitlement has now changed, it in turn, vary depending on national policies of after death of husband the land rights belong to wife in the first, to provide 30 percent discount in land registration tax for women in the second, to divide the parental property equally among 35 years old-age unmarried daughter in the third, privately land purchased in the fourth and lastly, other socio-economic factors, like land as dowry for married daughter. This has resulted into increasing legitimacy over land entitlement rights for women in the recent pasts.

Land Tenure

Land tenure system is another important aspect for access to land. The main characteristic of land tenure system in the study area is complex and evolving process because it is existence in different types of rights, such as owned land as well as in-tenure and out-tenure system. This study reveals that the largest percentage of the holdings are

occupied by the privately owned land cultivator (98.5%), and about 33.3 percent households have both rented land and owned land. The majority of holdings have been belonging to in-tenure (94.2%), and only 6 percent for out of the tenure. The rental payment systems for land are more common either in the 'Kut' (66.7%) or in the 'Adhiya' (23.2%). There are some households followed both rental payment systems, however, their percentage is very lowest (10.1%). Here,' Kut' refers to the payment of land tax or rent either fixed quantity of produce for main crops or cash. 'Adhiya' refers to the half share of product for all crops dividing owner of half a part.

(e) Land Use Change

The land use pattern determined to the way of household living because land use planning may demarcate areas suitable for agriculture, agro-forestry, horticulture, forest and other uses. Likewise, land use adaptability in the study area is established by natural law which offers the only possible solution of soil and water conservation. But the land did not properly analysed in the study area, due to the lack of reliable data. Nobody having any more to say, the land use has become more fragmented and changed since 1990s. Land use in this area comprises of arable land, forest, water bodies, home garden and wasteland. Arable land refers to the cultivated land in sloppy terraces. Forest refers to all land having trees with crown cover as well as degraded forest and grazing land. Water bodies refer to all sources of water including river, pond and springs. The available data show that the largest percentage of area has covered (78.8%) by arable land in 1992 and compared with 74.4 percent in 2010 (Table 5.4). It is followed by forest cover during the same period of time with 18.4 percent in 1992 and 23.5 percent in 2010 (Figure 5.2).

Table 5.4: Land use change between 1992 and 2010 (ha)

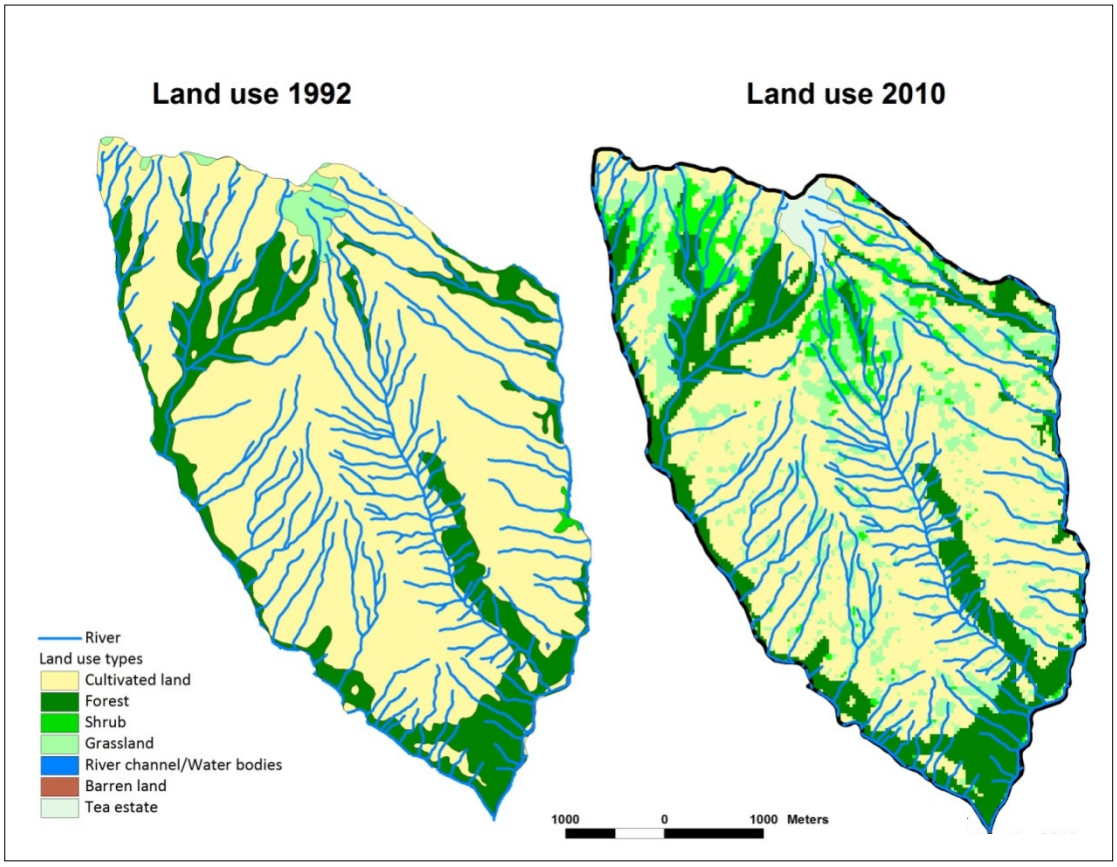
Land use	1992		2010		Change		Change Index	LC Index
	Area	Percent	Area	Percent	Area	Percent		
Arable land	1651.76	78.8	1559.20	74.4	- 92.56	- 4.4	5.4	0.33
Forest	386.20	18.4	483.12	23.1	+ 96.92	+ 4.6	5.7	1.48
Pasture	35.51	1.6	0	0	0	0	0	0
Bush	3.72	0.2	0	0	0	0	0	0
River	18.07	0.9	-	0	0	0	0	0
Landslide	0.19	0.01	-	0	0	0	0	0
Reservoir	0.18	0.01	-	0	0	0	0	0
Other	-	-	53.66	2.5	0	0	0	0
Total	2095.63	100	2095.35	100	-	-	-	-

Source: Topographic map, 1992 and Google Earth Image, 2010

The attention of this study involves to the changes in the land use from 1992 to 2010. This study reveals that the area was being used with the forest cover area which gained (+ 5.1%) in 2010 from arable land, bushes and landslide areas. The negative changes occurred in pasture land and it is positive change followed by the others like tea estate and high-value commodity production area from 1992 to 2010.

The changes index has indicated that it ranges from 5.4 percent for agriculture to 5.1 percent for forest land. The negative changes were seen in rain-fed cropping land, bush and land slide area into positive change in dense forest. In this study, a Paired Difference Test (PDT) is applied to measure degree of land use changes in the different elevation zones (Table 5.4 and Annex 5.2). The result indicates that there was no significant change in the proportions of these categories between 1992 and 2010 with a 95 percent confidence limit. There was considerable changes occurred within individual elevation zone, and low changeability in land use of the total area had observed over the 18 years period.

Figure 5.2: Land use change (1992-2010)



***Source*:** Topographic map, 1992 and field verification, 2009

The result indicates that negative changes are occurred in agricultural land and it is positive change in forest covered areas. This change is mainly due to the efforts

of community forest user groups for common property resource management that was individual household used for shifting (Khoriya). The user groups and army camp have decided to afforestation in waste and barren land, and traditional crops replaced by the multi-storey agro-forestry and high value cash crops, such as fruits, large cardamom, broom-grass and herbal plants.

Virgo and Subba (1994: 165) and Koirala (2006) found little change in overall distribution of agricultural lands, apart from a slight decline in the proportions of Khet land and minor increase in the intensity of cultivation of slopping terrace Bari land. Grazing land showed a decline in proportion over the 12 years period in Dhankuta district.

(f) Resource Management Practices

The households involved in different types of resource management practices over the centuries. They are considered as the right person for resource conservation, management and allocation. The local authorities for resource management practices are more likely to apply to community forest user groups and their relevance to livelihoods are thus related to formal and informal organizations. In addition, individual knowledge and experiences are also important to historical continuity among their successive generations. This knowledge has accumulated through long series of observation transmitted from generation to generations where their livelihoods have depended for long periods of time. For example, indigenous knowledge has been taking place in integrated agricultural systems in which agriculture-livestock-forestry.

In addition, they have ideas about climates and seasonal distribution patterns of rainfall, temperature in their locality. They can understand well the sowing and harvesting times for different crops and crop rotation is widely practice since long time. Land is periodically fallow or rested and planted with the species that help restore soil fertility both collectively and individually. Their agricultural resources management practices can be classified as follow: (a) terracing, and (b) manuring.

Its terrain is uneven where traditional terrace farming system has been taking place since over centuries. In the small portion of cultivated land on hill-slope have carved into handmade fields rising succession like gigantic flight of steps by employing own labour for several generations. This carving method represents a well-established indigenous engineering in this environment. Generally, maintenance work has been carried out on the terrace slopes after every crop harvest. It is observed that the percentage

of level terraces or Khet was manually constructed with comparison to rain-fed terraces of Bari land. Bari is often poorly constructed usually on the steeper slopes for planting of maize and millet while level or irrigated terrace for paddy. Local people have used different types of methods for terrace construction. Among them, collection of soil heaps, retaining-wall construction and bamboo lattice are widely practiced.

In the study area, soil nutrient and moisture management practice is being serious problem. It is mainly due to the nature of terrain imposes severe limitation on the scale of productive activities over centuries. However, local communities have developed well-established soil nutrients management practices such as crop-livestock-forest linkages. They have used wastage of animals such as cow-dung and compost in the fields and agricultural residue used to fodder for livestock. Their knowledge about compost is taking place since long time where they make soil more fertile by adding compost to increase moisture retention capacity. Most of the households used cow-shed compost which provides better quality of nutrients in the field. It is often prepared a mixture of animal dung (manure) and leaves and litters of vegetation.

The households used different amounts of compost in their agricultural fields. The amount ranging from 20 to 40 Dokos and with an average is about 11.1 quintals (44.1 Doko) per Ropani (Table 5.5).

The largest percentage of the households (55.1%) used more than 40 Dokos per Ropani, followed by the 20-40 Dokos in the second (40.6%). This figure was also applicable to all elevation zones while largest percentage of the households (63.1%) in the middle hill-slope was used ranging from 20 to 40 Doko per *Ropani*.

Table 5.5: Distribution of household used compost by (Doko/Ropani)

Classes of compost (Doko)	Distribution of household (percent) by elevation zone			Average
	Upper Hill	Middle hill	Lower hill	
< 20	5.1	5.9	1.6	4.3
20-40	35.6	63.1	15.6	40.6
>40	59.3	31.0	82.8	55.1
Total	59 (100)	84 (100)	64 (100)	207

Source: Household survey, 2009

The household have also made temporary farm-field shed (*Goth)* in winter season. It is commonly practiced in the rain-fed terraced (Bari). Meanwhile, better quality of manure was generally used in the seed beds of different crops, vegetables and potato farming. The mixture of dung and vegetation are decomposed into composts and used in Bari land. It is revealed that most of households have used very little amount of compost in the Khet because the rain water does add some soil nutrients. Recently, increasing greater has emphasized on the adequate supplies of manures and fertilizers on commercial crops, especially vegetables and potato, since 2000. Most of the households select good manures either compost or chicken-manure along with chemical fertilizers to grow two or more crops in year.

Access to Land by Households

The above discussion reveals that livelihoods of individuals or different households often have affected by access to land resources. This involves attention to the changes in the agro-based livelihoods in the study area is associated with access to assets such as land, water, education, skills and technology. In this context, household response and FGD discussion were being more useful to analyse access to resources, especially for land. This study used different values to measure various types of resource accesses, such as richer or poorest of the poor (based on Table 5.2). These values are applied to classify households into five clusters of richest, richer, rich, poor, and very poor. Generally these clusters are characterized to:

i) **Richest**: the richest households refer to who have sufficient land to produce enough food for more than one year. They have access to different types of assets such as buildings, cash and bank balance that retain them for good income and investment in more income-generating activities. Their children are attended in better schools and family members are involved in government jobs. The result indicates that 19.8 percent of the total household falls under this category.

ii) **Richer:** households refer to those household who have land sufficient to produce food for more than one year are known as richer households. They have regular saving because regular job and they do not feel any difficulty to meet monthly expenditure. They have increasing access to basic services available in local area. They have good housing conditions and their children are attended in better

schools for quality education and contained about 17.9 percent of the total households.

iii) **Rich**: the households refer to those households who have land only for food production for not more than 9-12 months is considered as rich households. They have no access to regular job and saving to maintain household expenses. About 20.3 percent households were constituted in this category.

iv) **Poor**: Poor refer to those households having food availability from their own production for not more than 4 to 9 months is considered poor. They have no saving and lack of basic access to basic services such as health, education and drinking water. Their children are often attended in local public schools and they lived in poor housing conditions. Their monthly income is not enough to meet their social expenditure. The result indicates that the percentage of the poor households was 18.8 percent.

v) **Very poo**r: Very poor refers to those households having food availability from their own production for not more than 4 months is considered very poor. They have no access to saving because lack of permanent employment. Most of the family members were involved in wage labours. Their living conditions are so poor due to lack of access to basic services. Their access to land is very nominal and poor housing conditions. The result indicates that the percentages of the very poor households were 23.2 percent.

The overall accesses to resource clusters indicate that the largest percentage of the households (42%) have very poor living conditions where only 38 percent households were seen into middle-income clusters. de Haan and Zoomers (2003) found that the poor people having a personal relationship with people at various locations due to their ability to cope with change and secure livelihoods (p. 360) while Chambers and Conway (1992) found that livelihood potentials of resource use have been habitually underestimated (p.23), and Scoones (1998) indicates that combinations of resources (capitals) are required for different livelihood strategies, but these, in turn, vary depending on situations (p.9). Moreover, a specific focus on agro-based livelihoods and change related to land-based activities of the communities in mountain areas, which traditionally contributed to environmental resources. Jodha (2000) finds that these changes relate to resource

base, production flows and resource use practices and options in the Hindu-Kush Himalaya regions (p.542).

ii) Water Resources

Next to the land, access to water is also important to agro-based livelihood in this area because all living things require water for their survival. Tankhuwa Khola and Nibuwa Khola are basic sources of water which covered about 18.25 ha (0.9%) of the total land. In the study area, the largest volume of water (83.5%) obtained from the river with comparison to spring and pond (11%). The key informants from the Rai community told that 'water might be used in different situation that paid attention from their civilizations at the bank of the Tankhuwa Khola watershed. The watershed ecosystems have provided soils and irrigation to sustain their livelihoods.' Each and every person used water in different ways, such as domestic (cooking, cleaning, drinking), irrigation, scenic and hydropower generation. They are as follows:

(a) Drinking Water

The drinking water is one of the most important domestic uses of water. Increasing demand for drinking water has been rapidly because of growing population numbers. The local people have always dreamed about regular supply of safe drinking water. They can obtain drinking water from two major sources: (i) local sources of *Kuwa* and Khola, and (ii) piped water. The largest percentage of the drinking water (74.0%) was supplied from pipe water system with comparison to local sources (26%). While *Dhungedhara* was widely used for drinking water before the development of the piped water delivery system. But most of the households have compelled to lack of regular supplies of safe drinking water (63.0%) as compared to regular supply (37%) because they have 30 minutes foot distance in fetching drinking water. It is consuming travel-time to fetch drinking water and ultimately affected to agro-based livelihoods of the communities.

(b) Irrigation

Irrigation is another use of water in the study site. The main characteristic of irrigation is the use of different types of indigenous engineering. They have made canal-based (*Kulo*) irrigation systems from Tankhuwa Khola and Nibuwa Khola by the efforts of local communities. The irrigation system has been accelerated to crop intensification and diversification in the same field. This has resulted into to grow

more agricultural products and surplus produce for marketing. The process of commercialization in the agricultural sector has been increasing in Suntale and Baire because of irrigation. This involves the changes in the agro-based livelihoods of different households especially in middle and lower hill-slopes. Irrigation is more important to increase the level of agricultural production including value-added cash crops. Vegetables, potatoes, onion, beans, tomatoes and garlic are now being the cash crops in the study area. The result indicates that only 43.3 percent land was brought under irrigation network in 2009 where the percentage of the all-year-irrigated land is very low (26.6%).

This discussion has helped to understand that increasing access to irrigation facility has brought major changes and transformations in the agricultural sector. The provision of irrigation often has given priority since 1990s either by the local government or sectoral irrigation programmes which has contributed to produce more crops in the same field in Suntale, Baire, Lamigara and Kintang. Regmi (1978) has also found that arrangements of irrigation facilities so that Pakho land becomes suitable for the cultivation of paddy' (p. 38) and Subedi and Pandey (2002) suggest that Bari change into Khet where local community grows multiple crops and produce much valued cereals such as paddy in Arun alley (p.166).

Moreover, Pradhan and Pradhan (2006) found that two traditional irrigation systems, such as terrace farming and earth made channels diverted from local streams are popular methods for irrigating fields in rural areas. They refer to Sharma (1995) total water requirement for irrigation in the cultivated area is estimated 67 billion m^3, which makes up of 30 percent of the total water potential in Nepal (p.117).

(c) Other Uses

Water resource offers a range of economic possibilities such as aesthetic, tourism and religious values. The overwhelmingly majority of householders preferred water for religious purpose. They worship God and Goddess in rivers, such as Kholabhawani puja of the Rai community. Water can be used for aesthetic purpose because the area flourishing a lot of waterfalls and potholes which support to the growth of internal tourism and picnic spots. To visit river, pond and spring is considered aesthetic uses to obtain pleasure for urban people. Indeed, the largest volume of water is still used for domestic purposes, like bathing, cleaning, drinking and cooking.

While water is vital element in the village economies, the household will depend upon a variety of income generating activities. But it was stated by informant that the government of Nepal had initiated Banchare Khola micro-hydro power station (340KW) in 1971 and Municipal Drinking Water Projects were some of the problems for marketing niche. Thus, the government should have changed in the existing laws and policies with the provision of ILO Article 169. One of the key informants from the middle hill-slope has stated that the Municipal government has used largest volume of water of Nibuwa Khola. It is imposed to severe limitation in the agricultural activities and irrigation facility. Thus, the government should provide attention towards the economic possibility and marketing niche of water resources to change livelihood conditions in this area.

(iii) Forest Resources

Forest resources constitute an extremely valuable endowment for household income-generation. For example, timber, resin, non-timber forest products, particularly medicinal, herbs and plants have great potential for high-value production. But there is a lack of reliable information about forest and forest covered area. The land use and land cover map shows that the forest has covered about 23.1 percent of the total area of the study area.

While forest is a vital resource in the village economies, household members were involved upon a variety of livelihood activities relating to collecting, gathering and exporting forest products. There are different types of forests found in the study site (it is stated in Chapter 4.2.4). Although the species of Sallo *(Pinus roxburghii),* Uttis *(Alnus nepalensis)* and Khair *(acacia catechu)* have greater economic value for marketing. In addition to economic value, forest as sources of ecological safeguarding and home of God and Goddess over centuries.

The contributions of forest resources into household livelihoods as follows: (i) it increased household income which supports to changes in well-being (ii) it reduced vulnerability, and (iii) sustainable use of forest resources in agricultural land. However, local communities have used forest resources for different purposes such as domestic purpose, pest management, and agro-forestry.

(a) Domestic Uses

The majority of households realized that forest is a primary source of timber, thatching-grass, firewood, fodder, litter; charcoal and wild food species. When agriculture is a vital element in the village economies then forest resource can be considered as a source of fodder and soil-nutrient cycles. The overwhelmingly majority of households did not produce forest products for market, although access to forest is essentials in their diversified livelihood strategies, such as agriculture-livestock-forest. The commercial importance of forest resources, such as timber, resin and medicinal plants are increasing day-by-day in accessible area. It provides both income-generating opportunities hand and environmental degradation.

(b) Pest Management

Pest management deals with the immediate relationship between human societies and plants. Its importance has been realized mainly with respect to continuity and economic uses of plants among the rural communities. The study site is considered as homeland of ethnics of Rai community and the area composes with its vast forest and herbal plant resources. Different plant species of Neem *(Azadirachta indica),* Marigold *(Tagetes erecta),* Timur *(Zanthoxylum armatum)* Titepati *(Artemisia vulgacies),* Asuro *(Adhqutoda vasica),* Bakainu *(Melia azedarch),* tobacco *(Nicotina tobacum),* ginger *(Zingiber officinale)* and turmeric powders *(Curcuma longa),* garlic, chilly *(the red pepper),* sugar, ganja *(Cannabis sativa)* continue to provide pest management practices in this area. The indigenous pest management systems have been developed for several centuries together with folk medicine. These traditional systems are based on plants, ash, animals' urine and cow dung to protect field crops, seeds and vegetables. These indigenous practices continually play a significant role largely in human and animal health, and crop care systems where modern medicine and pesticides are not easily available. Indigenous systems followed by several generations were harvesting crops at the fortnight of the dark moon period; selection of good bunches of crops, mixing of ash with seeds. These are some example for pest and diseases control in the study site. But their indigenous

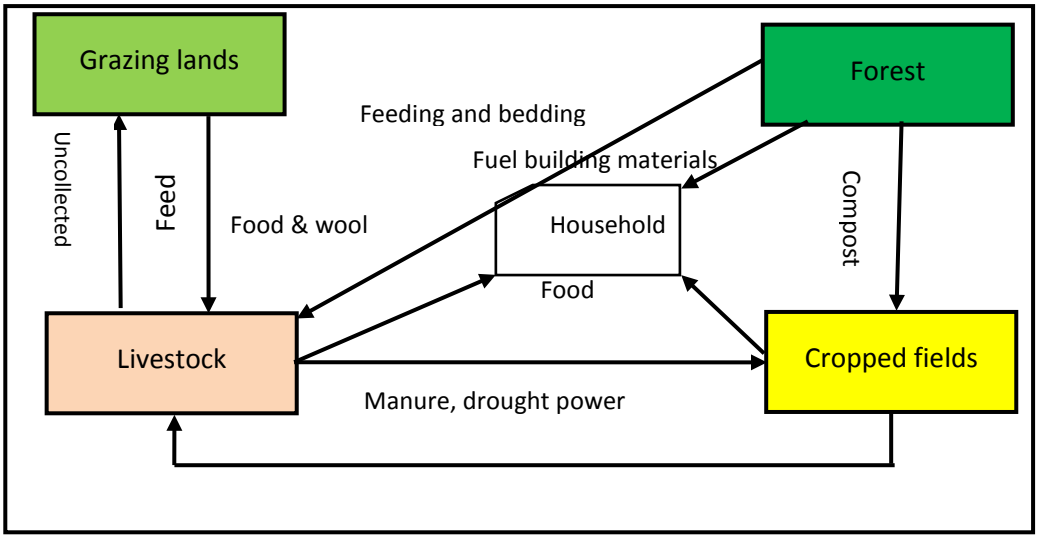
knowledge of pest management was not widely recognized in outside, this is the main reason for their knowledge to be at local level.

(c) Community Forestry

The local communities have developed integrated resource use system in this area since long time. Agro-forestry is a well-established traditional practice taking place in rain-fed terraces. For example, in between terraces on the slopes in the agricultural fields a numbers of trees are planted for each household in the village. Furthermore, numerous types of wild bushes, grasses and herbs are also planted in the same areas. The narration of one informant from Chanpe, upper hill-slope told that forest is still an important source of fodders, foods, fire wood, medicine and timber in their village. Earlier this was the place of barren due to the causes of overgrazing. But this system has now changed when the Chapeheet Community Forest User Group was established. They are recognized as an example of successful community forest user group for forest resource management. This study has revealed that there are multi-storied cropping system taking place either large cardamom or broom-grass or herbal plants lies under Uttis *(Alnus nepalensis)* trees, where there are plants and trees of different sizes and heights. The regenerated agro-forestry has been taking place in soil-nutrient cycle and its value added effects are seen in fodders supply and agricultural produce. This has resulted into integration of crop- livestock-forest which was better likelihood of this area (Figure 5.3).

Figure 5.3 shows how households have underpinned their livelihoods from agro-forestry in Chapeheet Community Forest. This involves attention to the relationship between forest resources and membership households. Thus, a household living is placed at the centre and then access to resources in the side. It is observed that most of the membership households have used integrated system of agro-forestry in which forest uses the fuel, timber and thatching-grass for house, and fodder for livestock, agricultural residue feeds the livestock, and animal waste for manure.

Figure 5.3: Crop-livestock-forest integration



Source: LRMP (1986) adopted from Pearce *et al*., 1990: 179

This type of integrated agro-forestry system has not only demonstrated human adaptation in the hill-slope environments, but also prevalent in better exploitation of natural resources in this area. This has resulted into commercialization of various crop-livestock-forest products and many of them take a decision to produce for the market since 1990s. However, most of the households are reliant on the natural resource base alter to some extent to maintain productivity. Scoones (1998) links indicators of resource depletion to both the temporal dynamics of resilience and livelihood needs (p. 7).

vi) **Recreation and Scenic Resources**

The recreation and scenic economy is newly emerging as livelihood resource in the study area. It includes time spent with family and friends, reading and participating or watching scene has become a major part of tourism industry. Recreational activities include tourism, an industry that generated more income as compared to other activities. It provides employment and livelihood options for local communities. The study location has various potential resources for tourism development as follows:

i) good climatic conditions (usually summer warm and winter cold);

ii) attractive scenery, like view-point of eastern Himalaya ranges from Guransedanda;

iii) historical and cultural heritage of the Rai communities, such as Mang or deity-place and folk-cultural house;

iv) amenities for activities as water-falls, swimming, caves, hydro-electricity power house, river and shrine (Madhuganga); and

v) increasing access to travel by motors in general, travel time decreases from major urban area outside the hill-slopes (like Dharan) with increasing distances.

Its bio-physical features and socio-cultural conditions provide potential scenic resources to promote tourism industry. However, it would require some policies towards investments in road, hotels and renovation of cultural heritages. Moreover, there is a need to generate greater awareness about the value of cultural and recreational resources. The policy approach to tourism followed by the trekking tourism, resort tourism, cultural tourism and pilgrimage tourism. With respect to tourism development initiation in this area, there is no policy perspective on place-specific tourism activities. Indeed, Tourism Department, Government of Nepal has initiated a research on the potentiality of cultural tourism development in Jeemigaun.

5.1.2 Human Resources

Human resource is knowledge. Human resource provides knowledge, productive labour and physical strengths. It is considered that Human resources are the mother of other resources. Human effort, knowledge and skills are closely associated with the development of human civilization. It makes spatial variation in individual capability to shaping livelihood opportunities and to turn resources in the useful products. Thus, this chapter deals human resources in terms of size and quality of gainful population, education and entrepreneurship skills under the following headings:

(i) Gainful Population

Human population is the main inhabitant in the study location. This study examines relationships between population, their activities and the environment because numbers, densities, qualities of the population provides the essential background for agro-based livelihood analysis. It has taken the progressive change in viewpoint of logical extreme, and postulates that in spatial patterns of agro-based livelihoods is concerned with the problem of the uneven distribution of population in

the study area. Population distribution provides a spine for village-level characteristics of natural resources and carrying capacity. Because human population in the study area can be interpreted as the maximum resource user which can be sustained their livelihoods in a given time and space. Thus, the main characteristics of human population fall into three groups because they are affecting to the livelihoods in this area. They are: absolute numbers, physical characteristics: age and sex, social characteristics: family, households, literacy, and ethnic groups, economic characteristics: occupation, income; and population dynamics: migration and change.

These characteristics are discussed in chapter 4.3.1, and are important to understand intra-household dynamics of genders, generations and socio-cultural transformations. Livelihood diversifications are basically determined by the age and sex composition of the area.

The population size comprises with the numbers of male and female population, although their numbers are changing at varying rates, it, in turn, depending on time and space. The village level characteristics especially population density and resources are important aspect in this analysis. These factors are closely associated with socio-economic conditions and settlement pattern in this area. The spatial distribution of population is found very spars, due to its location, access to natural resources, transport and markets. The spatial patterns of uneven developmental activities are also important to population distribution. Table 5.6 reveals the spatial patterns of population distribution in the study area.

Table 5.6: Population distributions by elevation zone

Sex	Population by elevation zone (percent)						Total	
	Upper hill		Middle hill		Lower hill			
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Male	188	16.3	235	20.3	195	16.9	618	53.5
Female	148	12.8	214	18.5	176	15.2	538	46.5
Total	336	29.1	449	38.8	371	32.1	1156	100

Source: Field survey, 2009

Table 5.6 illustrates that population composition and their distribution patterns by elevation zones. For example, the total population in the sampled household was 1156 persons. Indeed, it was 5309 persons in the whole area in 2009 (RDN-Nepal, 2010). The population comprises by the male (53.5%) and female (46.5%). The regional distribution of population is another important aspect of this analysis. The figure indicates that middle

hill-slope has accounted the largest percentage of population (38.8%) followed by the lower hill-slope in the second (32.1%) and lowest in the upper hill-slope (29.1%).

The sex ratio is an important aspect of population composition in the study site. The contrasting roles of the two sexes in household economy as well as in society are observed. It is interesting to agro-based livelihoods because certain works are based on gender selective. Sex ratio is calculated as the number of males per 100 or 1000 females. It plays a significant role in the intra-household dynamics of access to assets and individual differences in livelihood diversifications. For example, the gender-selective effects of many of the overseas jobs which received remittances are still dominated by men with comparison to women. But men and women are involved in the agricultural fields while thatching and ploughing are selected by men and transplanting for women.

The number of male per 100 females is about 114.9 while it was 99.8 for Nepal in 3002 (CBS, 2004). This difference is related by a combination of factors, such as desire for male children, female infanticide and male birth exceed female birth affected sex ratio in this area.

Table 5.7: Population distribution by age group

Elevation Zone	Age group (percent)					Total
	<5	5-10	10-15	15-60	>60	
Upper hill	2.2	2.9	4.5	17.9	1.6	29.1
Middle hill	2.8	2.7	4.2	25.3	3.8	38.8
Lower hill	3.4	2.8	3.1	20.0	2.8	32.1
Total	8.4	8.4	11.8	63.2	8.2	1156

Source: Field survey, 2009

Table 5.7 shows the distribution patterns of population by age groups. The study of age composition or age distribution has often neglected in livelihood analysis. However, age-structure is relevance to socio-economic activities in the one hand and affect to political participation in community on the other. Age structure is directly influenced by three variables, such as fertility, mortality and migration; although social and economic conditions are also important in shaping age-distribution.

Economic composition of population has indirectly influenced in the livelihoods of different households. Here, economically active population is considered as the population of working age, the working population and the employed population in

diversified livelihood activities. The proportion of economically active population may be expressed age-specifically such as >14- 60 years age-groups. For this purpose, dependency ratio is used to measure to identify the numbers of economically active population and dependent ones. It is calculated by adding the number of children and aged people of <14 and + 60 years age groups and dividing by the number of adults of 15-59 age-groups.

The dependency ratio in the study area is 77 which is lower than national average (84) for Nepal (CBS, 2004). It can be said that the dependent population of children and old age individuals has accounted 36.8 percent and it was 63.2 percent for economically active population (Table 5.7). The area is consisting by the largest number of dependent members, thus their relevance in the well-being status is not so good, because most of the livelihood activities depend on manual labour.

Resources are properties which satisfy human needs but population and resource ratio are often influenced to livelihoods in the study area. This situation rhymes with Hooson cited in Clark (1972) 'the distribution of population acts as a master-thread, capable of weaving into coherent pattern in the context of regional geography' (pp.1-2).

Caste and Ethnicity

Human being is a single species and they are inter-breed. Many physical characteristics such as skin colour, hair structure and colour, and blood-groups are some of the recognizable criteria for racial classification. The study of ethnic diversity within the village economies is very important because the area is home of indigenous communities. The area comprises by different ethnic communities, like Rai, Magar, Tamang, Chhetry, Bahun and Dalit (Table 5.8).

Table 5.8: Population distribution by caste and ethnicity

Caste	Population by elevation zone						Total	
	Upper hill		Middle hill		Lower hill			
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Bahun	4	0.3	11	1.0	20	1.7	35	3.0
Chhetri	3	0.3	92	8.0	193	16.7	288	24.9
Dalit	0	0	91	7.9	26	2.2	117	10.1
Magar	202	17.5	32	2.8	0	0	234	20.2
Rai	72	6.2	173	15.0	118	10.2	363	31.4
Tamang	49	4.2	36	3.1	0	0	85	7.4
Other	6	0.5	0	0	9	0.8	15	2.9
Total	336	29.1	449	38.8	371	32.1	1156	100

Source: Field survey, 2009

For example, the largest percentage (63.0%) of population was accounted by Janajati population and it was 60 percent in the hills of Nepal (Gurung, 1996). It is followed by the Bahun and Chhetri in the second (27.9%) and Dalits like artisan castes: Damai, Kami and Sarki in the third (Table 5.8). Among the elevation zones, the largest percentage of the population in the upper hill-slope was constituted by Magar (17.5%) followed by Rai and Tamang (6.2 and 4.2% respectively), and Chhetry/Bahun in the upper hill slope. On other hand, Rais are native people in the middle hill-slope (15%), followed by Chhetry/Bahun and Magar respectively in this area.

Distribution of caste and ethnicity are also creating social distance among different communities in the study area. It is mainly due to the caste-selective livelihood activities are still more commonly subjected in the study area. Caste and ethnicity also makes individual differences and ability to involve in different livelihood opportunities. For example, Dalit communities are generally involving in tailoring, cobbling and ironwork while Bahun in worshiping.

(ii) Educational Status

Individual capability is a key part of the livelihood analysis. Education has no simple correlation with capability because most of the household members stated that education enabling and enhancing their capability. Education adds individual effort, knowledge, new ideas and use of technology. The educated farmer knows to produce various crops which are demand in the market. Thus, education is a vital knowledge resource. Investment in education can help to increase household economies as well as access to more remunerative works. This study found that most of the educated person has participated in diversified livelihood options which are more profitable than illiterate ones, like new agricultural activities, skilled jobs and self-employed entrepreneurial skills.

This study reveals that the literacy rate in the study area was 79.9 percent. However, there were some problems seem to be appeared gender disparities in the literacy rate between man and women, it was 67.7 percent with comparison to 92.1 percent for men. Table 5.9 reveals the regional distribution of educational status in the study area.

Table 5.9: Educational status of family members by elevation zone

Elevation zone	Number of people by level (percent)						Total *
	Illiterate	Primary	Secondary	Inter	Bachelors	Others	
Upper hill	16.4	36.6	31.3	8.3	1.8	5.6	29.1
Middle hill	24.3	34.5	24.3	10.0	1.8	5.1	38.8
Lower hill	18.3	34.5	27.2	8.6	1.9	9.4	32.1
Total	20.1	35.1	27.2	9.1	1.8	6.7	

*Note: * Total refers population size (%)*

Source: Field survey, 2009

Table 5.9 shows the distribution patterns of level-wise educational status across the elevation zones. For example, access to primary level education is still more common phenomena in this area which has accounted the largest percentage of people (35.1%) followed by the secondary level in the second (27.2%) and intermediate in the third (9.1%). It is observed that about 80 percent people are literate, despite overwhelmingly have only access to primary and secondary level education (62.3%). This has resulted into lack of higher qualification to compete professional occupation because of NLSS 2003/04 has reported that there is positive relationships between academic progress and household well-being status (CBS, 2004).

One informant from Rai community of Jeemigaun who describes the importance of education between Rai and Bahun communities:

> Our much attention has not paid towards the importance of education with comparison to Bahun community in the same location. It is mainly due to agriculture which is the main source of our livelihood and which is at subsistence level. The small piece of land is inadequate to food sufficiency because of growing needs of our family. Food security has taken place first priority in our community rather than education and farm input. Now we recognized that investment in education is important to all productive works either in agriculture or better remunerative works.

This statement has proved the importance of education within this village to involve in diversifying livelihood activities. The figure 79.9 percent was so much higher than national figure (54.1%) in 2003 (CBS, 2004). It is mainly due to various supports which have provided by both governmental and non-governmental organizations to increase literacy rate in this area. In addition, increasing income from

remittance and cash crops has also paid attention toward a priority in education in this area. It is found that most of the households have invested heavily in educating all their children and they hoped qualifying to compete successfully for a skilled job.

(iii) Entrepreneurship Skills

Entrepreneurial skill increased human knowledge and effort to produce different types of goods and services. The household who have entrepreneur skills provide sufficient income for a livelihood, consequently they obliged to work as a skilled activities to supplement their meager income from farming. The process of skill-oriented education, vocational training, and apprenticeship processes has been accelerated by parent invested heavily in education. Another factor is that some of the Dalit and Bahun households were qualifying in apprenticeship skills of tailoring, cobbling and blacksmith, (Dhami/ Jhankri) and priest (Puja). Thus, apprenticeship skill here deals with the immediate relationship between human societies and their traditional resource use practices. Its importance has been realized mainly with respect of various socio-economic uses of human knowledge in societies for several centuries. This involves attention to the historical continuity or a broad knowledge of the caste-base behaviour. This skill has accumulated through long series of observation transmitted from generation to generation. But the area has often become in poor in entrepreneur skills despite lack of formal qualification, lack of qualifying in skilled occupation, poor educational planning and lack of infrastructure facility (Table 5.10).

Table 5.10: Entrepreneurship skill

Type s	BS	BP	C	CO	CI	TA	TE	OT	Total
Total	3	3	15	2	7	9	19	3	58
Percent	5.2	5.2	25.8	3.4	12.1	15.5	27.6	5.2	100

Note: The parenthesis such as BS stands for Blacksmith, BP for Beauty-parlor, C for Carpenter, CO for Cobbler, CI for cottage industry, TA for tailoring, TE for teaching and OT for others.

Source: Field survey, 2009

Table 5.10 shows the percentage of the households involved into different skilled occupation. The result indicates that the largest percentage of the households members were engaged in different skill oriented livelihood activities such as 27.6 percent for the teaching followed by the carpenter (25.8%) which accounts 5.02 per 100 populations.

(iii) Wage Labour

The overwhelmingly of majority households have often done their agricultural works by using own family members where 81percent people depends on farming. Excluding child, disable, and aged all household members are involved in agricultural works. They are always busy from April to December in the fields. Moreover, poor households have comprised only a small farm fields which provided insufficient income for a livelihood. Consequently, those households were obliged to work as a causal labourer either in agricultural fields or in non-farm activities to supplement their meager income from agriculture. The result indicates that the proportion of causal labourer is 5.6 percent of the total working people in this area.

In peak agricultural season, majority of households used different types of helping hands from outside. Meanwhile, they often used agricultural labour forces: Khetala. The household who used causal labourer by the payment of daily wages either in cash or kind is known as Khetala. In other words, a man was obliged to work as a causal labourer outside own fields either cash or kind is known as Khetala. Parma, the reciprocal labour exchange system among the community is more common phenomena in this area over centuries. Parma is more gender-selective labour exchange system because gender-discriminating worker needs in ploughing, weeding, thatching and transplanting.

The result depicts that Khetala has constituted the highest percentage, as compared to Parma, although about 50.2 percent households have practiced both Khetala and Parma. The labourer hiring time was consisting by 52.5 percent households for less than three times in a year with comparison to 48.2 percent households for more than three times.

The average amount of wage rate payment in this area for causal labour was often insufficient to earn livelihood. This figure masks, however, substantial variations as shown with the nature of works, gender-selectivity and peak agricultural season. Overwhelmingly of majority causal labourer received wages either in the cash or in kinds. The wage rate ranging from Rs 50 to Rs 60 in 2009, and the result has indicated that about 49.8 percent of the households were paid daily wage in cash for hired labour and 35.7 percent received in kinds. It was observed that the highest proportions of women labourer (84.2%) are involved in the agricultural sector with

comparison to men (69.4%). This process has changed now because of growing labour intensive agricultural activities such as tea estate, vegetable cultivation, high-value cash crops and livestock. This type of commercial agriculture has been increasing demand for causal labourer followed by the higher wages.

5.1.3 Social Resource

Social resource includes institutions, market, kinship and networks. Individual perceptions of past experiences, future expectations, individual personality, emotion and bodily instincts are linked into larger societies and cultures. They are considered as a social asset because they often mediate access to material assets. They are equally important in livelihood analysis because society includes both material culture and non-material cultures and continue to play a significant role in the diversified livelihood activities over the centuries.

This study used social resource and social capital/assets interchangeably. In terms of agro-based livelihoods it includes social relations between individuals as a member of socio-cultural groups. He/she involved in various community development works and organizational networks. Community development has taken account in social resource for the reason that society has to be involved on sustainable livelihood activities. Thus, social change is important in a wider sense, as individuals' needs networks of trust, mutual cooperation and accountability linking wider society and different lifestyles.

Kinship is important in rural economies and it has both natural and biological bases. Kinship works only through the meanings of people attach to them. The kinship system employed for the ordering of social relationships in livelihood generation. The study location has consisted by different social groups, namely Rai, Tamang and Magar, Chhetry and Bahun. They are inhabited in this area and using different types of resources. Due to its peculiar environment, topography, socio-economic conditions are created several barriers although they are organized into own their kinship system. But their cultural barriers are more notable than physical ones. But this process has changed now because of increasing social interaction between different socio-cultural groups. The livelihoods of different groups are thus largely related to transformations in the social sectors because livelihoods vary depending on location, household wealth status and social hierarchy of the society. This study

discusses how social asset is affected in the livelihoods of different groups because household members are involved in different types of community based organizations (CBOs). The role of community-based organizations is discussed in Chapter 7.

Gender Relations

Gender determines entitlements to land, household income, political participation, education, employment opportunities and so on. Household members are divided into male and female. These characteristics are considered as gender relations between and within households. This involves attention to the changes in the livelihoods of individual family member because most of the livelihood options are privileged by gender-selective activities. Culture is seen as a key factor in the construction of gender differences in this area. It is seen in the differences on the land ownership distribution because most usual way of acquiring land was through inheritance and commonly from fathers. One of the woman informant told that:

> In our village, most of the women are involved in domestic works of child caring, cooking, fetching water and so on. A remarkable difference between men and women was education because parents discriminately invested in educating their male children by the hope of qualifying more competitive occupation *(Jagir)* with comparison to girl. Men were well aware that their highly professional non-farm occupation than women who adherents domestic works despite lack of formal qualification and skilled occupation.

In this study, household heads and land entitlement are used to spatial analysis of gender specific relation in the households' livelihoods. For the first, the land entitlement affected by access to resources and it is playing vital role in livelihood within household due to legitimacy of property rights. It is discussed in Chapter 5.1.1 (land ownership) in detail.

The household head is a key person because he/she makes very influential decisions on buying and selling resources. His/her legacy is still playing a vital role not only household, but also in the society. The result shows that the percentage of women-headed households is very lowest (11.3%) as compared to men (88.7) and it was 19.6 percent for Nepal in 2003 (CBS, 2004). This figure may also vary depending on elevation zones as well as caste and ethnicity (Table 5.11).

Table 5.11: Household-head

Elevation Zone	Sex distribution in household-head				Total
	Male	Percent	Women	Percent	
Upper hill	55	93.2	4	6.7	59
Middle hill	67	80.7	16	19.3	83
Lower hill	60	92.3	5	7.7	65
Total	180	88.7	24	11.3	207

Source: Field survey, 2009

Table 5.11 shows gender relations in household which indicates the percentage of women headed household is lowest (11.3%) as compared to men. This figure is consisted for all elevation zones but middle hill-slope is higher (19.3%) than upper hill-slope (6.7%) and lower hill-slope (7.7%).

The maldistribution of gender relations are also observed within and between households. Aged women and girls are to be neglected in several houses because existing social norms are favoured to men, although it was more superior in ethnic communities. The process has also resulted into differential participation in skilled and qualified occupations. Thus, women are largely involved in the agricultural sector while men are also outside jobs for remittances.

5.1.4 Physical Resources

Physical resource has been playing significant roles in the village economies. It is also known as material resources as well as physical asset or capital in livelihood analysis. It includes housing conditions, household goods and implements, agricultural tools, and facilities of transport and communication, health service, water supply, irrigation and electricity. These resources provide basic services to agricultural and non-agricultural enterprises (transportation and communication); natural resource management (irrigation, water supply and drainage); and human resource development (schools and health post). The local communities are benefited from physical resources directly or indirectly because an adequate physical resource is prerequisite for accelerated economic growth. Most of the physical facilities are located in Bhirgaundanda. By the nature, they can be classified into two groups: basic social facilities (health, education and institutional services) and physical or economic facilities. They are discussed as follows:

(i) Basic Utility Services

In the study area, basic utility services include a wide range of facilities that enabling rural people to undertake economic activities and improving living conditions. The available basic utility services in this area are housing conditions, health services, households' goods and implements. This study attempts to access of electricity, toilets, housing conditions and immunization facilities for this consideration. They are discussed as follows:

(a) Houses

The house is defined as a co-residential dwelling unit and it is a fragmented entity. In the study area, the houses are used variously, such as cooking, sleeping, storing, and socio-cultural functions. It provides facilities to performing economic, socio-cultural and religious activities. In addition, houses are generally considered as a symbol of wealth and social status in this area. The study reveals that most of the houses are poorly constructed, in terms of room, ventilation and sanitation. The result indicates that the largest percentage of households (60%) do not have access to room, sanitation and ventilation. Moreover, overwhelmingly of the houses are constructed by locally available materials, such as stone, mud, earthen, forest in the walls and usually used thatching grasses and mineral in the roofs.

The houses can be divided into three different types: hut (Chhapro), Kachcha and Pakka houses. Here, 'hut' refers to poorly constructed house usually made by bamboo and thatching grass. It accounts about 12.6 percent of the total houses. The house made by stone, unripe bricks, mud and thatching grass is known as 'Kachcha' and it accounts to 39.0 percent houses. The house made by stone, ripe brick, cement and CI sheet roofs or RCC is known as 'Pakka' house and it accounts 48.4 percent (5.12). This type of classification is widely practiced in the house types of Dhimals' communities, such as *Gilaveka Sa* (made by mud), *Tharancha Sa* (one storey wooden-pillar), *Changa Sa* and *Pakka Sa* (two storey wooden pillar) in Morang and Jhapa districts of eastern Tarai (Khatiwada, 2012).

Table 5.12: House type

Types of house	Percent	Types of roof	Percent	Types of storey	Percent
Pakka	48.4	Thatching	49.0	One	32.7
Kachcha	39.0	Tin	50.6	Two	52.3
Hut	12.6	Concrete	0.4	Three +	15.0
Total	100		100		100

Source: Field survey, 2009

Most of the householders have also made other hut out houses or shed (*Ghoth*), pen, coop and pig-sty along the house. These attachments are more common phenomena in the Limbu community of eastern Nepal. The figure indicates that about 89 percent households have made different types of sheds. But only 15 percent households have access to kitchen room.

Household living conditions can also be measured by access to toilet facilities. Toilet facility often reflects the standard of living is either poor or privilege. The result indicates that the percentage of the availability of private toilet is very poor. The majority of households (77%) have access to temporary toilet facility, while about 33 percent households have used open spaces. Overwhelmingly of majority households were affected by health related problems and diseases because of lack of proper sanitary facilities.

(b) Health

Good health is also resource. The livelihoods conditions of the communities are associated to physical fitness, access to health services and enough to eat. Health and physical competence are also important due to health handicapped find skills and niches which assure adequate livelihood options. Illness of family members during agricultural peak season makes livelihood vulnerability. The provision of health facility has also made individual differences in age, gender, education and ethnicity. The result indicates that the spatial patterns of access to health among the less privileged members of society such as Rai, Magar, Tamang and Dalits are very poor with comparison to Chhetry Bahun. Household responses can be summarized about health problems are that these in turn, may depending on physical environment, socio-cultural factors and access to housing conditions. Most of the health related problems

were associated with physical disable, illness and unnatural death. Thus, poor health conditions are some of the causes of risk and vulnerability in the agro-based livelihoods of different households.

In the study area, majority of households were depending on traditional health care system. Their health care system is a part of folk-medicine where local healers or Dhami/Jhankri were largely involved in health care and folk medicines. The result points out that largest percentage of people (44%) were still dependent on local healers as compared to medicine (56%). In addition, about 42.9 percent women and 42.7 percent child have received full courses of immunization. It is a basic indicator of health services in rural Nepal. Malnutrition is another major problem in this area; it is mainly due to lack of food security, vitamin A, protein and other dietary elements.

(c) Household Goods and Implements

A household is considered as a producer and consumer of different types of goods and services. They have basic physiological needs of food and drinks. Moreover, they need different goods and implements, in the long-run which affects production and activity patterns, such as radio, TV, mobile/telephones. These implements provide information and knowledge on resource conversion into useful products and market price fluctuations. Access to different information channels contact with the outer world which support to demand for different types of goods and implements. The result indicates that the percentage of mobile or telephone sets owners were 65.5 percent, followed by the radio owner in the second (57.0%), TV owner in the third (43.6%) and lowest by computer owner (0.1%). This study revealed that most of the households have used traditional tools such as hoes, spades and wooden plough. The result is significant that all householders have owned the rudimentary farm equipments-like a wooden plough (*halo*), an iron hoe (*Kodalo*) and bamboo basket (*Doko*).

(ii) Access to the Services

Livelihood change is a process which is associated with various developmental activities. It is the result to transformations in the economic, demographic, socio-cultural and environmental sectors. Each factor influences the other resulting in the form of livelihood change. This is a common phenomenon throughout the history of mankind in this area. However, poor access to provision of services has far-reaching consequences for livelihood change, and in long-run affects

patterns of primary, secondary and tertiary activities. Households are often affected by different types of services both horizontally and vertically because vertical services are associated with hierarchical orders and existing law and orders. Although, much earlier than 1950s due to there was no provision of extension services both historically and contemporarily.

This has resulted into historical isolation from access to services as the area known as the one of the most backward villages of eastern hill-slopes. This situation has changed with increasing investment in developmental activities as 1960s while it was accelerated since 1990s. The state extension services become increasingly and it is also the result of local effort, knowledge of agricultural inputs and innovation diffusion. The process of developmental activities has been taking place with the establishment of high school, VDC office and hydropower station. Other extension services are policy towards basic needs, irrigation projects, extension of road transportation and farm-base research and developmental activities of Pakhribas Agricultural Centre (PAC) and National Citrus Research Center of Dhankuta.

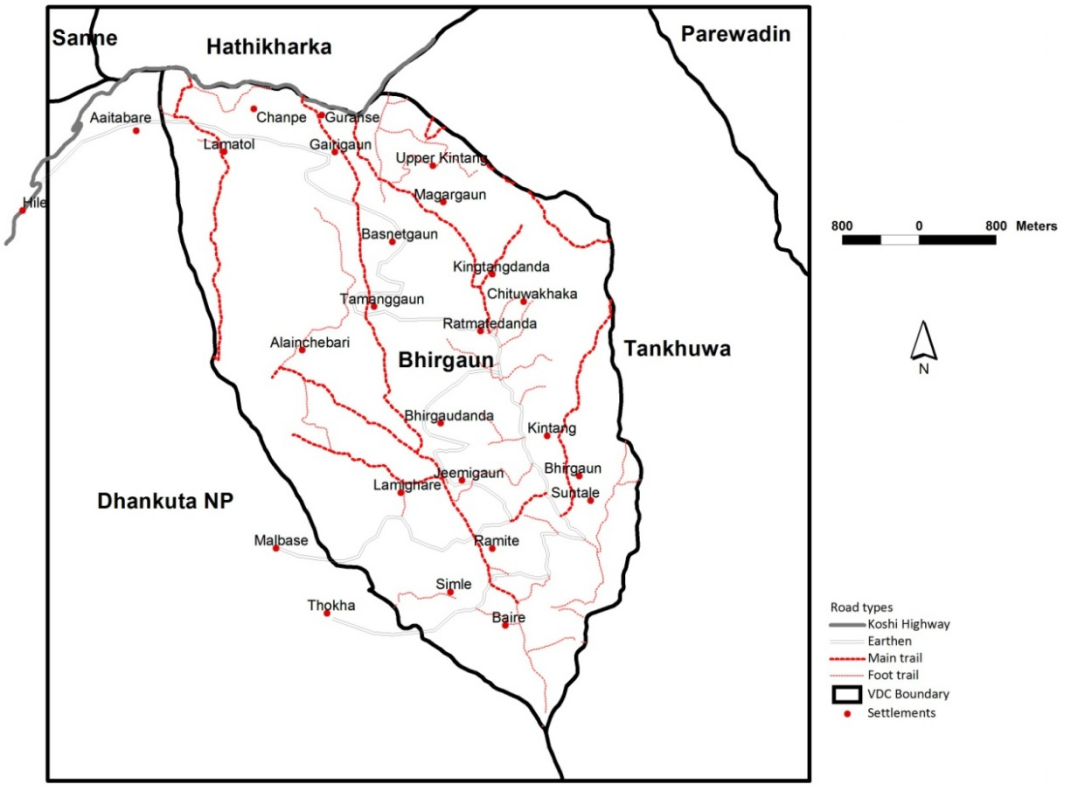
The state extension services are related to regular supply of drinking water, electricity and primary health. However, the area has lack of some basic public services like banking, hospital, veterinary service, police station, higher education and markets because of limited thresholds.

The demands for different types of services are varying depending on location in terms of distance from households and services because the location of particular service is place specific. Annex 5.3 reveals that spatial distribution of services from households. For example, the distance for primary school ranges from 0.5 KM (10.7%) to 5 Km while the largest percentage of households (47.3%) were travelled for 1 KM distance and followed by 2 KM in the second (40.1%) in ordered to achieve services, followed by the far from service centre in the second (25.3%) and lowest from the near (23.6%). The households travelled for access to health post, post office, VDC office and high school ranges from 1KM to 8 KM with 12.1 and 5.8 percent respectively while other travels were 6 KM for 30 percent and 4 KM for 20.8 percent. The access of Bank, market, police station, veterinary services range from 1 KM to 15

KM with 6.7 and 26.1 percent respectively. It is followed by the 10 KM for 24.6 percent and 8 KM for 17.4 percent.

Access to road service (Figure 5.4) is another important aspect for agro-based livelihoods in this area where households travelled for nearest road heads range from 1 KM to 15 KM with 9.2 and 15 percent respectively while largest percentage of the households travelled 8 KM (21.7%), followed by the 10 KM in the third (13%).

Figure 5.4: Road Networks



***Source*:** Toposheet map, 1992 and field verification, 2009

District headquarters is another important service provider center for higher order goods and services. These services increase to households' livelihood performance directly or indirectly. The result indicates that the distance range from 8 Km to 26 KM with 11.6% and 15.5% respectively and followed by the 15 KM in the second (15%) and lowest by the 23 KM (13.1%). The existing roads and their lengths in the study area are as follow:

Type of roads	Targeted area
Blacktop	Hile-Guranse to Jorpati (5 KM) sector of Koshi-highway
Earthen (track opening)	1. Dhankuta-Malbase-Madhuganga(10 KM) 2. Dhankuta-Thoka-Suntale (15 KM) 3. Hile-Chanpe-Madhuganga-Suntale(15 KM) 4. Proposed Guranse-Upper Kintang- Madhuganga-Suntale (10 KM)

To test first hypothesis, this study is used to Pearson correlation coefficients as follow.

Null hypothesis $H_{0:\mu_1=\mu_2}$ There is no differences between the access to access to services and livelihood opportunities.

Research hypothesis $H_{1:\mu_1>\mu_2}$ The effect on distance makes differential in the livelihood options and access to services.

Significant level 0.05 levels (2-tailed test)

Interpretation

The computed value indicates that the sample variance are equal to the 0.05 significant level, and the calculation of t using the calculated value of is -.030 for police station, veterinary and market, -0.34 for road heads and -.055 for district headquarters. The value is 0.161 for health post, VDC office, post office and .056 for primary schools. The result rejects the null hypothesis and supports to research hypothesis ($H_{\circ}$) that is the effect on distance makes differential in livelihood options in this area is significant (Annex 5.4).

5.1.5 Economic Resources

Agro-based livelihoods basically require economic resources to take advantage of technological opportunities. It includes mobilizing and managing the money and material inputs through cash, bank balance, debtors, inventory of goods, prepaid expenses, accrued income and others (credit, store, jewelry, cattle, land etc). Agriculture requires converting different resources into useful products. The sum of economic resources yields to sustainable stocks and flows of resources in productive sectors. These combinations are always equal to capital (income) and liabilities (expenditure) and also known as livelihood equation.

Economic resource is more complicated than other resources due to resource management, rural infrastructure development, agricultural input supply, development

and dissemination of appropriate technologies, and human resources development. These activities fall into three sets: agricultural inputs supply, turning them into products and putting outputs. But distribution patterns of economic resources vary depending on the nature and quality of place. The livelihood changes need more financial resources to utilize potential comparative livelihood opportunities.

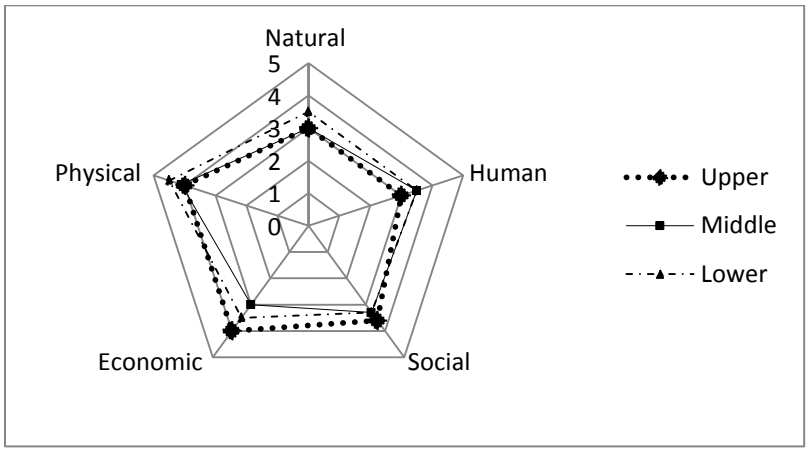
Changes in Resource Status

This discussion shows that individual households and group of communities have used different types of resources. Their resource accesses are measured in landholding size, education, health, physical infrastructures and social networks. This study suggests that access to resources make differential livelihood strategies. Household members are combined a variety of resource or capital assets range from natural, physical, social, financial and human capitals as stated by Scoones (1998). Resource distribution patterns and accesses are major causal factors for spatial variations in livelihoods of the communities. It is a result of geographical environment, regional economy and socio-cultural conditions of this area. The result indicates that economically success households have combined a variety of resources. They engage in diversify livelihood options while poor households often were economically non-diversified due to the causes of small holding size (Table 5.2).

On the basis of household responses, this study has made different semantic scales to identify changes in their resource status. If considering a simple delineation of households into richest, richer, rich, poor and very poor, it is possible to suggest that each was found differential resource access. The value is based on five point scale at 5, 4, 3, 2, and 1 respectively. Then, each indicator constituted an individual household asset cluster and sub-cluster. Individual assets cluster index was then calculated an average from its entire individual asset for getting overall asset status score (Figure 5.5) and it is illustrated in spider diagram.

Figure 5. 5 reveals changing access to asset status in the study area and it is depicted in spider diagram. The result indicates that access to physical asset has comprised a good condition with 4.1 average score. It is followed by the economic assets in the second (3.5) and least by the natural assets (3.2).

Figure 5.5: Changes in asset status



Source: Field survey, 2009

Among the elevation zone, the largest score in physical assets reveals in lower hill-slope (4.5) and it was 4.1 and 4.0 for upper and middle hill-slopes respectively. It is followed by the economic asset in the second for upper hill-slope (4.0) and 3.5 and 3.0 for lower and middle hill-slopes. Similarly, largest score reveals in social assets in upper hill-slope as compared to the middle and lower hill-slopes (3.5) and human (3.5) for middle and lower hill-slope and it was lowest in upper hill-slope (3.0).

It can be said that households' physical assets highly changed with comparison to economic asset because livelihood diversification requires flows of money and input supply. For example, the richest households have involved in diversify livelihood options with aiming resource accumulation, while the poor households who have only a survival strategy.

5.2 Spatial Analysis of Potential Resources

The spatial patterns of agro-based livelihoods of the communities can be analysed with the village level characteristics. It includes resource base and its quality, population size, and basic physical infrastructure. The study area is made by its distinctive environmental characteristics and niches to support agro-based livelihoods. It is particular from surrounding lowlands. The livelihoods of communities have transformed through histories with the application of knowledge, skills, power and technologies. As a result, the area has developed a long history of human-nature interaction. Human-nature relations are determined by the vertical

connections. It means local communities are dependent upon natural resources. This is known as philosophy of environmental determinism. Indeed, the geographical difference in livelihood patterns is reflected on place specific characteristic, uneven resource distribution and developmental activities.

But already by the beginning of 1990s they were looking for general laws governing their adaptation to this environment. The completion of the Koshi-Highway (Dharan-Basantapur) in 1990s linked the area to the broader town of Dharan, Itahari and Biratnagar in the Tarai follow a different logic than that of environmental determinism. The horizontal connections of Agricultural Perspective Plan: APP (1995), state agricultural policies, market forces and increasing demand for hill-specific products became more important for rural development than the local connection between human and nature. These changes led to spatial structures of economic activities. This type of change is closely related to the spread and adoption of new ideas in both agriculture and non-agricultural sectors. The accessibility of road transportation has significantly related to the rate of technological changes in agricultural sectors. Koshi-Highway is a good example of major changes in traditional semi-subsistence agricultural economy into comparative advantages of high-value commercial crops. It is not meant to suggest some simple 'natural determinism', but this point indicates that the desire to economic effort of local communities to 'choose' what natural conditions render new livelihood substances.

5.2.1 Comparative Potential Resources

Natural suitability or niche provides potential resources for the livelihood change of the communities in this area. Deriving these accesses reflect the three patterns of the resource potentialities.

(i) The geographical conditions offer a range of economic possibilities which made an ample use of livelihood opportunities in this area. About 35 percent households have generated alternative forms of livelihood opportunities through agricultural intensification, diversification and multiple cropping (that is, the reliance on more than one harvest per agriculture year), livestock, agro-forestry, and agro-pastoralism;

(ii) An adequate physical infrastructure is a prerequisite for the pace of changes in economic opportunities. The expansion of Koshi-Highway provides wider dynamics of highland-lowland economic linkages. Local communities involved in the potential production and exchange opportunities and some households have enable to change their life-style through flows of resources, products and services; and

(iii) Besides differences in accessibility, there is quite a variation in the pace of change along the elevation zones. For example, more facilities and infrastructural assets command more livelihood opportunities in the upper hill-slope with comparison to the middle and lower hill-slopes.

The above discussion shows that local communities have changed their livelihood activities through change in production method, correction in production at the wrong place and time. All these efforts require a range of comparative potential resources to grow more food put them to the right place and rhythmic response to the seasons. These resources can be considered supreme assets for livelihood changes of the communities. Table 5.13 reveals the multiple responses of households about comparative potential resources in the study area. These resources offer economic opportunities for livelihood improvement and local development.

Table 5.13: Potential resources (order) n=207

Types of crops	Responses		Types of crops	Responses	
	Number	Percent		Number	Percent
Vegetables	156	76.1	Broom	55	26.8
Livestock	152	74.1	Paddy	38	18.5
Potatoes	129	62.9	Tea	25	12.2
Fruit	100	48.8	Other	31	15.1
Large cardamom	55	26.8	Total	741	

Source: Field survey, 2009

The result indicates that the potentialities of vegetables has accounted for the largest percentage (76.1%) followed by the livestock in the second (74.1%) and lowest by the tea (12.2%). The percentage of potato was 62.9 and others like fruits,

large cardamom, broom and paddy were respectively lower. Ginger, turmeric, ground-nuts and NTFPs are considered in the 'other' category. The households who are involved in the commercial farming they can get better income and employment opportunities than traditional crops.

The study reveals that resource varies in their origin, form and function based on its geographical conditions. Thus, livelihood activities of the communities may vary according to their economic potential resources and their capacity to adopt diversified livelihood options. Wilbank (1972) suggests that road transport accessibility affect developmental process especially adoption of new crops in northern India (p. 427). Jodha (2000) argues that these changes related to resource base, production flows, resource use practices and options (p.542). Bencherifa (1994) discusses the demography of mountains in relation to the resources in which traditional production systems interact with the comparative potential resources and options in the western High Atlas and its surrounding lowlands (p.312). Choe & Pradhan (2010) found that hill and mountain regions have started to limited fruits and herbal products, which flow back to markets on the plain in Nepal (p.24).

5.2.2 Resource Potential Zone

At the local level, the spatial variations between elevation zones as well as individual settlements can be identified. The study area can be divided into three different comparative potential resource zones over a short distance, such as upper, middle and lower elevation zones. Each zone with its own distinctive livelihood characteristics related to the sparse patches of vegetation cover with agricultural fields and scattered human settlements. It is known as livelihood zones, although it was well developed history of interaction between human-environment. The vertical zonation is dependent upon local natural resources, where mixture of livelihood activities could be achieved by breaking its subsistence production systems (Figure 5.6 and 5.7).

Upper Elevation Zone (UEZ)

This zone is located above 1800 masl and locally known as *Lek.* Earlier, UEZ was isolated from the centre of economic development and the lifestyle was mainly based on agro-pastoralism. The local livelihoods were thus largely related to upstream-downstream (*Lek-Bensi*) resource exchange of barter systems. But this context has now changed because of extension of road access and regular marketing

systems. This has extended the fame of this area not only within the region. It is renowned as a highly potential area for high-value products.

Figure: 5.6 Contemporary livelihood zones (LZs) in Bhirgaun

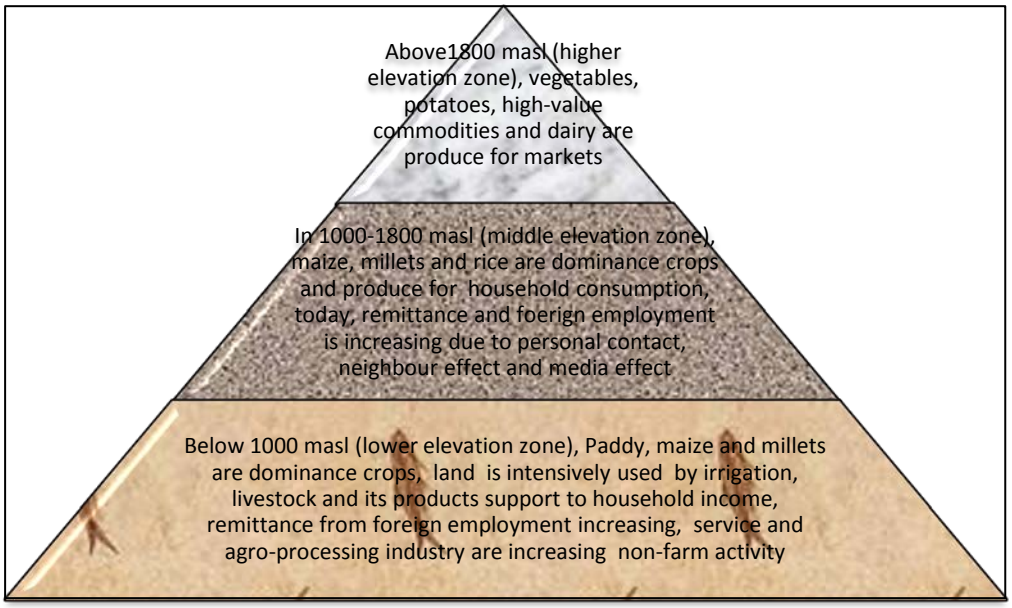
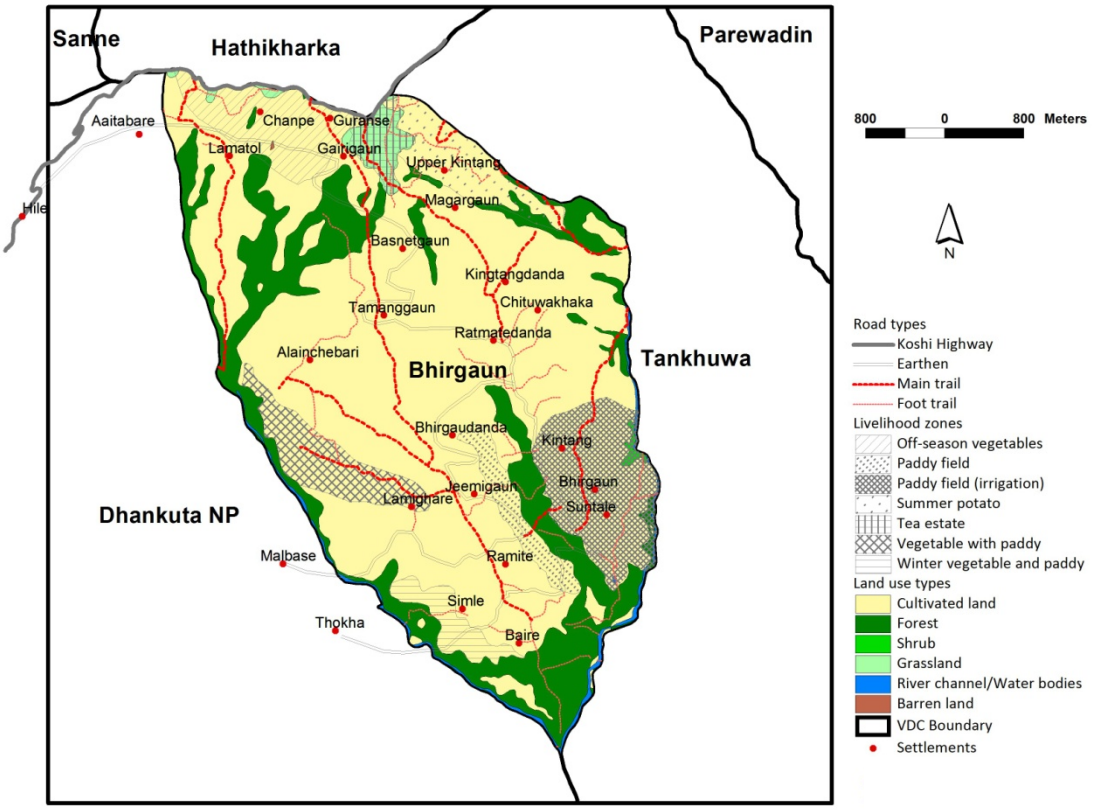


Figure 5.7: Livelihood zones



***Source*:** Topographic map, 1992 and field verification, 2009

They are getting high price day-by-day due to growing demand in the market since 1990. Off-season vegetables, large cardamom, broom-grasses, milk and NTFPs are those advantageous products in a small-scale. So, it is the major reason, the people are not able to get enough benefit.

Middle Elevation Zone (MEZ)

The middle elevation zone is locally known as *Kachhad* and it is located in between 1000-1800 masl. The local people claimed that the area is said to have the first human settlement due to the fertile soil. The internal village livelihood has based on diversified subsistence economic activities before road construction (1990s). Owing to good quality of land overwhelming majority of people could produce paddy, maize and temperate fruits. Due to dense population (settlement), VDCs, schools, government service centers and other social services were established in this zone much earlier. One of key informant has expressed that this zone has been selling and exchanging its food crops with upper and lower hill-slopes for a long time.

But since 1990, significant changes have happened in subsistence type of farming. About 20 percent of the total productions are being sold in local market and only 15 households involved in commercial vegetable farming. The majority of households have reported that lack of effective development efforts in the area have hampered livelihood improvement due to increasing distance from road transportation.

Lower Elevation Zone (LEZ)

The lower elevation zone is located below 1000 masl and is locally known as *Bensi*. Majority of household in this area have been growing the crop since long, but due to the fluctuation in monsoon, there is no certainty of production. According to them," if the heavy rainfall occurs, then the production would be better in quality and quantity and vice versa". It’s the way how farmers think. After the establishment of hydroelectricity project in 1971 and three irrigation projects in 1990 the farmers' lifestyle has changed. The result indicates that more than 60 percent of land is used for three crops in a year following intensive farming method. In addition, livestock and its products have made supplements to households’ income. Nowadays, nearly 20 percent of the household sell high quality husking-rice in the local hat-bazaar. But before 1970, it was not so told one of the key informants as follow:

At that time there were only three buffaloes in this village. For getting 1 pathi dhan (about 4 kg unhusked rice), we had to go for a day long journey. But now we have been selling high quality paddy in the same field and every household has buffalo. I think the hydropower project and irrigation scheme were the most important developmental activities in this area.

From the above discussion, three elevation zones have made up of different livelihood zones, and each zone represents both semi-subsistence and modern methods used by households in agricultural sector. Thus, Table 5.14 has made a comparative study of livelihood zones in the study area.

Table 5.14: Comparative analysis of livelihood zones

Upper hill-slope	Middle hill slope	Lower hill-slope
• High agro-ecological potential, moderate soil, higher rainfall, domination of rain-fed terraces with small and fragmented holdings • Close to the roads and market accesses and poorly developed irrigation facility • Most households sell every year off-season vegetables, potatoes, high-value crops and milk and livestock • Actively participation in groups, networking and market chains • Fewer labour constraints and improved agriculture creates job opportunities • The overall resource conditions demonstrated that the area has well-resource potential for immediate agricultural growth	• High agro-ecological potential, moderate soil, fluctuation of monsoon, more than 80% land consists of the rain-fed terraced available with small and fragmented holdings • Far from the access to markets with poorly connected by road transportation and poorly developed irrigation facility • Most households sell surplus products, livestock and its products in local hat-bazaars • Poor participation in groups, networking and markets • Labour shortage fulfilled from both higher wages and reciprocal exchange systems • The overall resource conditions demonstrated that the area has well-resource potential for future agricultural growth	• High agro-ecological potential, deeper soil, fluctuation of monsoon and irrigated terraced land with small and fragmented holdings • Far from the access to markets poorly connected by road transportation and well irrigation facility in Suntale and Baire • Most households sell every year husked rice, livestock and its products in local hat-bazaars • Moderate participation in groups, networking and market • Labour shortage fulfilled from both higher wages and reciprocal exchange systems • The overall resource conditions demonstrated that the area has well-resource potential for immediate agricultural growth with improving access to roads and markets.

Source: Field survey, 2009

From the above discussion this study found that each livelihood zone is much better endowed for diversity of resources than surrounding lowlands for human settlements. It is assumed that several disadvantages in eastern hills, whenever a larger population is found to settle there over the centuries. Bencherifa (1994) suggests that mountain areas, however, disadvantages in resource base, but 'if a population concentrated in one area (here, a mountain), then the resources available necessary make this concentration possible' in the Moroccan mountains (p.310). This is known as Sanctuary theory, which provides alternative uses of mountain resources. Local communities use four basic forms of resource intensification in High Atlas Mountains of Morocco: multiple-cropping, cultural promiscuous, association of cattle raising and altitudinal differences of biotype (Bencherifa, 1994, p. 312; Pradhan & Pradhan, 2006, p. 58).

But Jodha (2000) argues that human interventions, ranging from infrastructure and institutions to technological and human capabilities require shaping the pace and patterning in harnessing opportunities in HKH regions (p.549). In addition, Kreutzmann (2000) suggests that increasing accessibility is the key to the process of livelihood changes which brought urbanization and mobility in mountain areas (p.485), and Choe & Pradhan (2010) focus on marketing networks for production activities (p.25).

These conclusions are supported by the present study in order to livelihoods of the communities in relation to comparative potential resources, although distance is such a constraint to harnessing these opportunities. Capital is usually made by man through hard work, thus the government should have made institutional support policies towards increasing access to physical infrastructures of irrigation, road and marketing facilities and human capability. They are typical forms of capital assets.

CHAPTER VI

LIVELIHOODS AND FARM AND NON-FARM ACTIVITIES

This chapter describes the role of agricultural sector of the livelihoods of communities in the study area. It tries to answer the second research question: how have the existing livelihood strategies trade-off of livelihoods between farm and non-farm activities? In so doing, household involved in agricultural sector made ample use of their opportunities to generate off-farm income by trade-off between farm and non-farm activities.

In present study, livelihood activity is used to refer to the actions that household' member undertake in their day-to-day basis making a living. They are involved in diversifying of the livelihood activities with the application of their abilities, knowledge and skills. These activities are largely related to production, distribution and consumption of goods and services. They are collectively known as livelihood activities. All livelihood activities have spatio-temporal dimensions because they link resources to the physical and cultural environments in which people live. These activities are often nurtures and culturally tied to the natural environment around them. These activities can be divided into two groups: agricultural and non-agricultural sectors. They are discussed as follows:

6.1 Agriculture Activities

Households have key roles as producers and consumers. They may be more meaningful units of for assessing human pressures on environment. The number of households may continue to grow food and raw materials and it demand for their family needs. In the study area, where agriculture is still predominantly, the household is an important spatial unit, because a significant proportion of the agricultural population. Agriculture is the main source of livelihood on which majority of the households are dependent. Agriculture is therefore one of the most important economic activities and it is a way of living. Agriculture is playing a vital role in the households' economies, although it is still at subsistence level. The majority of households whatever they produced are consumed by the families and a little

surplus over the consumption is being used for marketing. The household members are also involved in various other activities related to agriculture.

Agricultural activities require converting resources into useful products through the application of human resources, which are made more productive by the use of capital- infrastructure, equipments and cash. But the natures of terrain as well as crucial infrastructure facilities impose sever limitation to the agricultural activities. Agricultural activity comprises three different sets: preparing inputs turn them into products through labour and management efforts, and putting outputs. The individuals or households are directly involved in production activities at lower level. Agricultural activity is more complicated than other activity and it is vary from place to place and community to community (Table 6.1).

Table 6.1: Household livelihood activity

Activity	Household by elevation zone (percent)			Total
	Upper hill	Middle hill	Lower hill	
Farm	87.2	74.4	82.5	80.7
Non-farm	12.8	25.6	17.5	19.3
Total	29.1	38.8	32.1	1156

Source: Field survey, 2009

The result as shown in Table 6.1 indicates that about 81 percent of the economically active population was directly or indirectly involved in the agricultural sector. This can be compared to about 66 percent for the country as a whole (CBS, 2002). The higher percentage than the national average is mainly due to the lack of alternative economic opportunities and limited capacity of the households to carry out new income-generating activities in the study area. There is not so much variation in the distribution of agricultural population by elevation zones in the study area that varies from 87.2 percent in the upper hill-slope, through 74.4 percent in the middle hill-slope and increased to 82.5 percent in the lower hill-slope (Table 6.1). This also indicates not so much variation in the nature, scale and scope of agricultural opportunities among the elevation zones.

The percentage of agricultural population was also varied among different caste and ethnicity. For example, Tamang community constituted the largest

percentage of total population (84.7%) involved in agricultural activity, followed by the Magar (83.3%) and the lowest proportion of the Dalits in the agricultural sector (52.1%). The traditional occupational jobs such as tailoring, blacksmith, and cobbler; the latter activities are indeed the principal bread earning jobs for them. This is not peculiar to this study area only, which is common elsewhere in other hill areas of the country.

This study is used to location quotient value to measure degree of agricultural households which explains that if the calculated value is greater than 1, more household is involved in the agricultural sector. The computed location quotient value (0.96) is tending towards to 1, and then the majority of the households are involved in the agricultural sector (Annex 6.1).

To test first hypothesis, this study is used to Pearson correlation coefficients as follow.

Null hypothesis $H_{0: \mu_1 = \mu_2}$	There is no differences between the agricultural and non-agricultural livelihood activities in household income and employment.
Research hypothesis $H_{1: \mu_1 > \mu_2}$	Improved agriculture brings about changes in livelihoods of the communities.
Significant level	0.05 levels (2-tailed test)
Interpretation	

The computed value indicates that the sample variances are equal to the 0.01 significant levels and the calculation of t using the calculated value of is -1.000 for both respondent and non-respondent. The result rejects the null hypothesis ($H_{\circ}$) and supports to research hypothesis (H_1) that is improved agriculture brings about changes in livelihoods of the communities. Correlation is significant at the 0.01 level (Annex 6.2).

The transformation of agriculture is a pathway for trade-off building in this area. But the small portion of cultivated land was shrinking as a consequence of unrelenting demographic pressure and subdivision of holdings due to lack of alternative employment opportunities. The limited size of arable land has supported the livelihoods of the communities in this area. As a result, agricultural income source is insufficient, thus, the importance of non-farm income is increasingly. The percentage share of non-

farm livelihood activities accounts 19.3 percent in total employment. One of the Magar key informants told that:

> We have small pieces of land. We have lack of educational qualification to involve in diversified livelihood activities and skill-oriented jobs. As a result our livelihood was based on agriculture, animal husbandry, agro-forestry, petty trading and remittances side by side. Earlier, we were dependent on *Lekh-Bensi* crop exchange systems for many agricultural produce, but now whatever we produce sold in the market and foodstuff is bought from the same markets since 1990s.

The above statement indicates that agricultural production is carried on by individuals or households at lower level. Households being the most common locus of production activity that is related to diversified livelihood opportunities.

6.1.1 Agricultural Production Environment

The agricultural production system and their relevance to the livelihoods of the communities are affected by the geo-economic, socio-cultural and political conditions of the area. The local physical conditions, such as terrain, relief, geology, soil and climate imposed sever limitation on arable land. Social and economic factors like national agricultural policies (such as land ownership, holding size, land tenure systems); village-level characteristics (such as population density, natural resources); individual differences (efforts, skills and knowledge) and use of technologies are also important. Other factors further shrinking arable land because introduction of new human settlements, urbanization, infrastructure development and investment in agribusiness. Holt-Jensen (1996) summarizes these factors into vertical connections of human-environment interactions and horizontal connections of existing laws, policy and marketing channels (p.819). Government policies can help to reach large numbers of small producers in scattered and remote location.

Soils

Soils are often regarded as a factor of production. It is the essential material upon which all agricultural activities are based. It contains different minerals and other substances which are necessary for plant growth. The suitability of any soil for agriculture depends upon soil composition, texture and depth. In the study area, variation in agricultural activities depends upon soil characteristics and the soils can be divided into four groups, such as red soils, black soils, sandy soils and mixed soils. Majority of the

households have reported that black soil is more productive than other types of soils. According to them, the soils of Bhirgaundanda, Ramite, Ratmatedanda and Baire are unfertile due to the sandy nature of soils with shallow depth. In addition, loamy soils of Suntale and Lower Kintang are considered more fertile. Most of the household may be maintained soil fertility by fallowing, crop rotation and the application of manure or fertilizers in the arable land.

Climate

Suitable climatic conditions especially temperature and precipitations are essential for successful germination of seeds and plant growth. The study area is made up of different climatic regions, each with its own distinctive temperature and humidity conditions. The climatic condition consists by the temperate humid in the middle hill-slope, temperate warm in the lower hill-slope and winter cool and frost in the upper hill-slope. The maximum temperature occurs in June (28.2°C) and minimum temperature (2.8°C) is recorded in January. Knowled and Wareing (1994) estimate that most plant need a minimum temperature of 5-7° C, the average number of days per year with temperatures above this threshold level provides the length of the available growing season (p.122). The average annual precipitation in the area ranges between 256-1014 mm from the monsoon. More than 85 percent of rainfall in this area occurs in summer season (June to September). The mean annual rainfall and temperature conditions may be different depending on altitude and aspect of slopes, such as Chanpe and Upper Kintang of the upper hill-slope receives largest amount of rainfall than middle and lower hill-slopes. The provision of irrigation is essential due to uncertain monsoon conditions.

Relief

Three elements of relief- altitude, aspect and gradient- influence patterns of agricultural activity. The effects of altitude are chiefly expressed through climatic modifications, notable the decrease win temperature with increased height. Thus, the vertical limits of crops which have a steep gradient down from the upper hill-slope to the lower river basins. The length of growing season increases in upper hill-slope from about 200 days and decreases in the middle and lower hill-slopes. The vertical distribution of agricultural activity has shown that number and types of crops diminish with altitude. Nowadays, introduction of short growing crop species favoured the cultivation of

seasonal and off-season vegetables in the upper hill-slope and cereal crops in the middle and lower hill-slopes.

In the study area, south-facing slope receives more rains and longer periods of sunshine than north-facing slope. The sunny slopes are used for commercial agricultural activity than shady slopes. The gradient of slopes imposes an important control on the type of agriculture and method of cultivation in this area. The steep hill-slope gradients greatly restrict the use of heavy machinery. The local communities have developed terracing system to allow steep hill-slope to be brought under cultivation of different crops.

Social and economic factors

Social and economic factors are less significant in determining the type and methods of farm production and spatial patterns of agro-based livelihoods of the communities. Land holding size, land tenure systems, infrastructure development, transport and communication, agricultural support policies (marketing, labour, capital, credit facilities and extension services) are also important. They are discussed in Chapter 5.

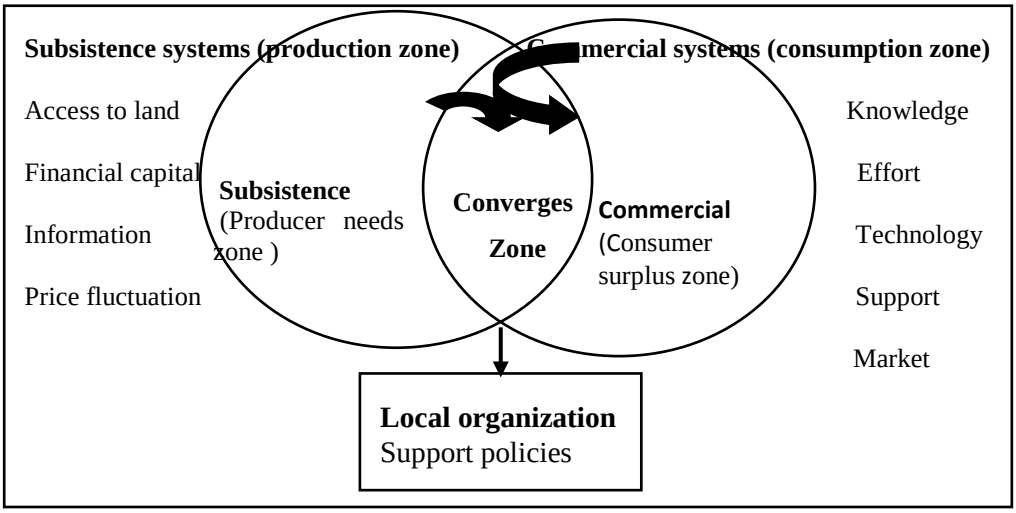
Agricultural Typology

The term agricultural typology refers to different forms of agricultural practices. Some households produce all types of crops and rearing of animal and someone for new commercial crops. Agricultural typology can be determined by social, economic and organizational or technical characteristics of the study area. Social characteristics of agriculture refer to the person producing the agricultural commodities for different purposes. Economic characteristics refer to the investment of capital, labour, inputs for production. Organizational or technical characteristics refer to the method of production. It seeks to how the local community utilizing the natural resources- land, water, soil and climate in performing economic activities.

Given these characteristics, the study area comprises a hilly terrain with the synclinal structure, steep and undulating slopes. This environment provides distinctive elevation zones and each comprises with its own agricultural systems. Generally, the land remains under cultivation throughout the year. Most of the households have practiced crop, livestock and agro-forestry followed by the rudimentary methods and manual labour. As a result, the yield per hectare is very low while households were

satisfied within this limited agricultural produce due to limited family needs. This type of agricultural system has been gradual changing with improving accessibility of transport networks and mobility since 1990s. Most of the households produce comparative potential high-value crops for the markets, such as fruits, vegetables, potatoes, large cardamom, tea and dairy. This process has produced spatial distribution of subsistence and commercial agricultural systems (Figure 6.1).

Figure 6.1: Spatial convergence between traditional and commercial farming



Source: Field Survey, 2009

Figure 6.1 shows the existing typology of agro-based livelihoods of the communities in the study area. The figure provides knowledge about two converging factors of subsistence and commercial agricultural systems. In spatial term they can be divided into two zones namely production zone for subsistence agricultural system and consumption zone for commercial agricultural system.

In the subsistence system (production zone), the spatial variations between elevation zones can be identified (chapter 5.2). Each elevation zone provides its own agricultural resource base to support different types of agricultural systems depending on climate, topography and soil quality. Further, socio-economic parameters like amount of arable land, irrigation and transportation facilities, financial capital, and information on market and prices are also important. In this type of agriculture, the use of irrigation and fertilizer is relatively low, and per hectare production is also low. The majority of households are still involved in subsistence crops in the Jeemigaun, Bhirgaundanda and Ramite of middle hill-slope. Irrigation facility has offered a range

of economic possibilities for Suntale, Baire, Lower Kintang and Guragain tole, where more than one crop is grown in the same field in a year.

The commercial system (consumption zone) is made by an ample use of opportunities to generate income from commercial crops. The farm produce is of great importance in the households' economy through crop diversification. Road transport facility has been linking agricultural producer (farm-households) to buyers (consumers). In this area, road construction converted traditional agro-pastoral land on the upper hill-slope into vast commercial crop producing area. Farmlands soon linked together by Koshi-Highway which greatly reduced the time and cost of transporting agricultural produce in the Upper Kintang, Chanpe, Guranse and Basnetgaun of the upper hill-slope. Thus, 35 percent households have started production of new crops. The largest number of households involved in commercial farming in the upper hill-slope, but this figure was scant in the middle hill-slope and lower hill-slopes (10 and 15 households respectively). These changes are followed by the farmer's trial and error methods and own experiment. Pakhribas Agricultural Research Centre, District Agricultural Office and (I)NGOs' efforts, media and neighborhood effects are also important to diffuse agricultural innovation. New crops become supreme assets for the growth and development of livelihood diversifications.

The study area exploits its economic opportunities and niches link with Tarai to the south and mountain to the north. It provides alternative economic opportunities to change the livelihoods of the communities in this area. Clark (1990) finds that same ecological opportunities are suitable for a human occupation in the mountain regions of Ethiopia and East Africa (p.4) and Bencherifa (1988) discussed the demography of the mountains in relation to the comparative potential resources in the Morocco (p.312). It requires a combination of policy efforts such as agricultural subsidies, credit facilities, extension support services, transport facilities, organized market prices and agricultural research and development.

6.1. 2 Agricultural Production Systems

Agricultural production system in the study area is determined by village-level characteristics. This involves population size and amounts, and types of arable land and irrigation facility. Since it is undulating terrain, it's severely constraints are soil erosion and declining of soil fertility. In this situation, local communities have

developed integrated agricultural systems of crop rotation, crop combination, land periodically fallowing, and cycle of agricultural waste feed the animals and animal waste for fertilizer. This is one of the most popular indigenous knowledge that helps restore soil fertility adding to soil moisture capacity.

Cropping System

Crop production is most important agricultural activity in the study area. They are often known as cropping system. Here, cropping system refers to the system of the cultivation of crops. This includes the practices of tillage, manuring and irrigation. Cropping system in the study area has undergone an evolutionary process. For a long, intensive subsistence farming was widely practiced. Commercialization of crop in this area is a recent phenomenon. Some households are producing commercial crop like potato, fruits, vegetable, tea, large cardamom and broom-grass although the largest percentages of the households have been growing native crop species. These crop varieties are mostly used for food, fiber, fodder, fuel and raw materials. They were familiar with these varieties because of hardiness, drought resistance and resilience in local conditions as compared to hybrid varieties. The household report insisted that the area has still been growing more than 40 different crops in a year.

The result indicates that the largest percentage of the cultivated land (70.3%) is covered by staple food crops while it was 70.5 percent in the watershed area (RDN-Nepal, 2010). The gross weight of yearly production of principal food crop indicates that the percentage of paddy, maize, millet, and potato has taken place. In addition, buckwheat, wheat, sorghum, and pulses, mustard oil seeds and vegetables are also produced. These crops can be classified into two groups: food and cash crops.

A. Food crops

(i) Staple Food Crops

Table 6.2 shows major crop production in the study area and paddy, maize, and millets are considered staple food crops. These crops account for the largest percentage (41.0%) of the total crop production. Moreover, paddy accounts for the largest percentage of the food crops (52.1%) followed by maize in the second (28.0%) and lowest for millet (16.5%).

Table 6.2: Major crop production by elevation zone

Crops	Production by Elevation zone (in Quintals)				
	Upper hill	Middle hill	Lower hill	Total	Percent
Paddy	43.4	435.7	970.5	1449.6	52.1
Maize	171.7	328.0	278.8	778.5	28.0
Millet	96.0	203.1	158.8	457.9	16.5
Lentil	11.0	16.0	13.5	40.5	1.4
Mustard	6.8	3.7	21.5	32.0	1.1
Others	5.3	7.6	11.2	24.1	0.9
Total	334.2	994.1	1454.3	2782.6	

Source: Field survey, 2009

The regional distribution of crop production among the elevation zones is also important. The largest percentage of crops grown in lower hill-slopes (52%), it is followed by the middle hill-slope in the second (36%) and lowest by the upper hill-slope (12%). In addition, percent calculation by elevation zone gives clearer picture about the relative importance of individual crops. For example– maize is relatively more important in the upper hill-slope (53.0%), while paddy in both lower (66.7%) and middle (40%) hill-slopes. This is due to climatic factors (temperature), slope, access to physical infrastructure and irrigation facility. The result reveals that more than 83 percent households who have not access to paddy field in the upper hill-slope. This figure consists of all crop productions among the elevation zones. Households also produce minor crops, such as wheat, buckwheat, ground-nuts and sorghum in different altitudes and they are taken in the 'others' category.

(ii) Pulses

The black-grams, arar, musuro, pigeon-pea and soybeans are also produced in this area. They are considered as legume crops. Most of these produce are consumed locally with little surplus for the market. The percentage of pulses was accounted only 1.4 percent of the total crop production (Table 6.2) and it yields only 2.7 percent of the total income. The regional distribution of pulses may also vary depending on elevation zones. The result indicates that the largest percentage of the pulse production (39.5%) is accounted by the middle hill-slope, followed by the lower hill-slope in the second (33.3%) and lowest in the upper hill-slope (27.2 %).

(iii) Oilseed

The households produce different types of oilseed crops in the study area. Among them, Indian rape, nigar (Philunge), sunflower, sesame and yellow serson are considered major oilseed varieties. Earlier, most of the households were sufficient to meet their mustard oil needs, but the demand for mustard oil is growing because the production of mustard oilseeds which is at subsistence level. The result indicates that the oilseeds production is accounted lowest percentage of the total crop production (1.1%) and its contribution in the total income is accounted only 1.3 percent (Table 6.2). Among the elevation zones, the largest percentage of the oil seeds production accounts by the lower hill-slope (67.2%) followed by the upper hill-slope (21.2%) in the second.

B. Introduction of Commercial Crops

Commercial crop has been playing an important role in households' incomes in the study area over the centuries. Earlier, potato, paddy and millet were considered as cash crops. Recently, some households have introduced new crops, namely vegetables, potato, fruits and agro-forestry. They know the value of the different agricultural foodstuffs and many of them have initiated to produce new crop which is greater demand in the market in the upper hill-slope. In addition, middle and lower hill-slopes export to chilly, beans, cauliflower and ginger, ground-nut, onion and tomato. Introduction of new crops has certainly affected to the livelihoods in the different households as compared to surrounding lowland. This study reveals that two types of crops namely high-value cash crops and horticultural (fruit and vegetables) crops are producing commercially (Table 6.3).

(i) High-Value Cash Crops

The study area has produced different types of high-value cash crops. They are large cardamom, tobacco, chilly, gingers, ground-nuts, tea and broom-grasses. These crops are also known as commercial crops. Table 6.3 shows that the percentage of high-value cash crop production area is very limited with comparison to staple food crops. The result indicates that the area was produced only 476.2 quintals of high-value cash crops in 2008/09.

Table 6.3: Cash crop production

Crops	Production by Elevation zone (Quintals)				
	Upper hill	Middle hill	Lower hill	Total	Percent
Tea	406	-	-	406	85.3
L cardamom	11.8	3.9	-	15.7	3.3
Broom	21.5	12.3	1	34.8	7.3
Others	5.0	10.2	4.5	19.7	4.1
Total	444.3	26.4	5.5	476.2	
Percent	93.3	5.5	1.2	100	

Source: Field survey, 2009

Among the different types of high-value cash crops, the largest percentage was constituted by the tea (85.3%), followed by broom-grass in the second (7.3%) and lowest by large cardamom (3.3%). Altogether cash crops yields about Rs 1487500 (12.3%) of the total income. The regional distribution of high-value cash may vary depending on elevation zones. For example, the largest percentage of the total high-value crop was constituted (93.3%) by the upper-hill-slope, followed by the middle hill-slope in the second (5.5%). It is mainly due to increasing access to road transportation various agro-enterprises under corporate organization and management have raised investment in the production, processing and selling of commercial crops especially large cardamom, tea and dairy in the upper hill-slope. Guranse tea estate can be taken an example which involves in both production and processing of tea plants.

(ii) Potato

The potato is playing an important role in cash crop. More than 80 percent household grow potato both for domestic consumption and for markets. Potato requires suitable temperature condition for the successful germination and growing plants. The average threshold temperature provides a suitable growing season in winter in the middle and lower hill-slopes and summer in the upper hill-slope. The result shows that percentage of potato production was 238 quintals (Rs 285600) which brought 2.3 percent of the total income. This calculation was made up of potatoes sold in the market.

(iii) Fruits and Vegetables

Different types of vegetables and fruits are grown in the study area with small patches of fruits orchards. The household have grown different types of fruit crop species in their home garden. With the initiation of National Citrus Research Centre at Paripatle, Dhankuta and District Agriculture Office, now farmers know the importance of fruits and many of them have initiated to produce orange in the middle hill-slopes. The result indicates that more than 80 percent households produce fruits in their home garden by the over generations and it was 48 percent for the country in 1991/92 (CBS, 1996). The fruits and vegetables production areas have covered about 38.3 ha (16.2%), while it was 120.1 ha (14.3%) in this region. The percentage of vegetable production area was accounted the largest area (15.8%) with comparison to fruit production area (0.4%).

The study area has produced different types of fruits where more than 70 percent area was occupied by the temperate fruits followed by citrus. Orange, lemon, sweet-orange, are considered common citrus fruits. Apple, pear, peach, plum, apricot, walnut are grown in the upper hill-slope; mango, litchi, banana, pomegranates, pineapple, jackfruits, custard apple are grown in the lower hill-slope. The total production of fruits in 2008/09 was 257.1 quintals and its value about Rs 514200 (4.2%) of the total income. This calculation was made up of fruits sold in the market.

Vegetables- the local climatic condition of the study area is suitable for flourishing a wide variety of vegetable crops. The area was recorded as the largest producer of vegetables for markets. Recently, growing demand for hill-specific vegetables outside the area has impressively changed both in area under vegetable production and quantity of vegetable produce since 1990s. The common vegetables of the area are beans, cabbage, cauliflower, chilly, carrot, pigeon pea, potato, radish, cucumber, bitter-grad, tomatoes and green leafy vegetables. This study has taken six major vegetables which are grown in different seasons at different elevation zone for the detailed discussion.

The result indicates that the total production of the vegetable crops was 2684 quintals in 2009. It covers about 37.3 ha of the total cultivated land and earns about Rs 4311000 (35%) of the total income (Table 6.4). This calculation was also made up of vegetables sold in the market. Table 6.4 shows the percentage of different

vegetable crops, where cabbage was accounted the largest percentage of vegetables (52.7%) followed by green-leaf (30.3%), cauliflower (6.2%) and by garlic and onion. But these indices, in turn, may vary depending on elevation zones because each elevation zone has its own diverse natural conditions and different ecological characteristics. For example, the highest percentages of vegetables (86.8 %) are grown in the upper hill-slope, followed by middle hill-slope (7.2%) and the lower hill-slope (6.2%).

Table 6.4: Vegetable productions by elevation zone

Crops	Production by Elevation zone (quintals)				
	Upper hill	Middle hill	Lower hill	Total	Percent
Cabbage	1379	25	10	1414	52.7
Cauliflower	59	57	51	167	6.2
Radish	94	10	7	111	4.1
Garlic	28	61	10	99	3.7
Green-leaf	750	15	48	813	30.3
Onion	2	10	25	37	1.4
Others	17	11	15	43	1.6
Total	2329	189	166	2684	
Percent	86.8	7.0	6.2	100	

Source: Field survey, 2009

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Three factors are prominent to the cultivation of commercial crops, such as the extension of Koshi-Highway, government and non-governmental efforts and farmers' own watch others making a good profit and soon adopted the practice. Many of them institutions and agencies involved in dissemination of commercial crops were of KHARDEP, DADO and CEPREAD. Increasing accessibility of road transportation has further reduced travel-time distance and households to take a decision to produce what crop as potentials in the market. But the result reveals that about 15 percent households travelled more than 15 KM distance from the farm to nearest roads and only 9.2 percent households placed near the road head location (1 KM).

The changes in agricultural production system in the present study supports to the studies of Virgo and Subba (1994) and Koirala (2006) in Dhankuta district and mountain agriculture in the Hindu-Kush Himalayan regions. Partap (2003) suggests that subsistence farming can be transformed into viable commercial farming through harnessing the appropriate niche potentials in Himanchal Pradesh, India where mountain people have succeeded in improving food security and livelihoods by diversifying from crops to fruit farming (p.11). Ya (2003) argue that cultivation of cash plants has proven to be a useful way of increasing rural income. But people look outside to learn potential cash crops, while ignoring potential cash crops that are native to the region (p.31).

6.1.3 Income from Crop Production

The majority of the households have derived their income from paddy, maize, millets, and cash crops. However, the yield as per hectare is considerably very low with comparison to the productivity of Tarai region. The productivity of the paddy in the study area was 39.9 quintals/ha. It was 32 quintals/ha for Dhankuta district in 2005/06 (DADO, 2006), and 27.2 quintals for Nepal in 2008/09 (MOF, 20010). This figure was also consistent for the productivity of all crops (Table 6.5). This variability depends on a number of factors: the soil fertility, irrigation facility, use of fertilizers, adoption of new varieties of seeds and access to market.

Table 6.5 also reveals the total incomes derived from different crops. This figure is calculated from existing prices of (both in the village and market places) the particular product. For example, local price for paddy was Rs. 1625/quintal, Rs.1950 and Rs. 2600 per quintal for maize and millet respectively in 2009. Table 6.5 shows

the percentage of income from individual food crop. The result indicates that the highest percentage of income (41.0%) was obtained from the food crops, followed by the vegetables (35.3%) and cash crops (12.3%). Percentage of income from other crops is very negligible.

Table 6.5: Major crop production (quintal)

Crops	Area (ha)	Production	Productivity/ha	Income (Rs)	Percent
Vegetable	37.3	2684	71.9	4311000	35.0
Paddy	63.6	1449.6	39.7	2355541.1	19.0
Maize	90.4	778.5	8.6	1518075.0	12.3
Cash crops	3.4	456.5	71.5	1487500.0	12.1
Millet	17.8	457.9	25.7	1190510.2	9.7
Fruits	1	257.1	48.0	514200.0	4.2
Lentil	3.5	40.5	10.4	329054.3	2.7
Potato	6.4	238.0	37.2	285600.0	2.3
Mustard	2.5	32.0	10.8	207994.8	1.6
Others	10.5	86.8	-	130200.0	1.1
Total	236.4	6480.9	-	12329675.0	

Source: Field survey, 2009

It is observed that the productivity of maize was lower (8.6 quintals/ha) than the average district productivity (26 quintals/ha) because *Bari* or *Pakho* lands are usually used for the production of maize and millet. In addition, agricultural works are largely dependent on household members, child and women. For this instance, DADO told that farmers still have given least priority in agricultural inputs with comparison to food, education and health, despite lack of investment in agriculture.

But some changes are noticed in the agricultural productivity and agricultural incomes in the study area. The maize grower households are involving in market-oriented new crops in the upper hill-slope and the Bari lands was converted to Khet lands in Lower Kintang, Suntale and western side of Baire. It is mainly due to increasing access to infrastructure facilities especially transportation, irrigation, HYV of seeds, agricultural inputs and markets. Now most of the households know that income-generation from vegetables is five times greater than millet and maize. Therefore, some households take a decision to produce fruits and vegetables in the study area. However, the concept of distance decay is noticed in the adoption of

commercial crops. It refers to the decrement in market-oriented cash crop with increasing distance.

6.1.4 Agricultural Production Inputs

The application of chemical fertilizers, high yielding variety of seeds and pesticides led to substantial increase in agricultural production system. This section starts with a brief overview of agricultural production inputs.

(i) Chemical Fertilizers

Most of the households used to chemical fertilizers to maintain soil nutrient. The introduction of fertilizers in the study area took place very rapidly since 1970s while it was beginning in 1952s in Nepal. One of the vegetable grower key informants told that introduction of HYV of seeds of potato and vegetables needed heavy doses of chemical fertilizers along with chicken or animal manure. The result indicates that about 98.5 percent of the total households have used 17436 kg (174.36 quintals) of fertilizers. The average fertilizer consumption rate in this area was about 82.23 kg per household in a year.

Table 6.6 shows that the cumulative percentage of fertilizer user households, which reveals that more than 50 percent smallholder households, has used only 25 percent of the total fertilizers. However, 15.4 percent households used less than 35 kg fertilizers and about 9.8 percent household used the largest quantity (25.0%) of fertilizers.

Table 6.6: Amount of fertilizer used by households (percent)

Class of fertilizer (kg)	Household distribution by elevation zone			Total
	Upper hill	Middle hill	Lower hill	
< 50	43.1	69.5	40.0	52.7
50-100	37.9	15.9	27.7	25.9
100-150	3.4	8.5	23.1	11.7
>150	15.5	6.1	9.2	9.8
Percent	30.5	31.4	38.1	205*
Total	5319	5475	6642	17436

*Note: 1. * 2 Households are non-adopter and omitted from the calculation*

Source: Household survey, 2009

The majority of households reported that they do not have easy access to fertilizer as per their demands because of irregular supply system and higher purchasing costs. Among the elevation zones, the highest percentage of the fertilizer were used in the lower hill-slope (38.1%), followed by the middle hill-slope (31.4%) in the second.

The study reveals that the selected crop grower households have used the higher percentage of fertilizers with comparison to traditional food crop growers. For example, the paddy growers used the highest percentage of fertilizers in the lower hill-slope, while the vegetable growers used in the upper hill-slope. Other crop growers have also been used very low amount of chemical fertilizers. The majority of households reported that they have no idea about the quality of fertilizers available in the markets, so they often complained about the poor quality of fertilizers and possible negative impact on soil quality degradation. Moreover, along with fertilizers chicken and animal manure are also used.

(ii) High-Yielding Varieties of Seeds

The majority of households (65%) in the study area have used indigenous seed with local crop gene over generations. However, their local seed preservation technologies were very poor because their scale and nature of production is too very small. By the effects of media, neighbourhoods, field trips and institutional supports (GOs and NGOs) the uses of high yielding varieties (HYV) of seeds are increasing. In addition, Pakhribas Agriculture Research Centre has disseminated newly innovated HYV of seeds and that has given better results for maize, potato, paddy and vegetables crops in this environment. But, most of the vegetable grower households are using locally available HYV of seeds in the market or Agro-Vet centres. One of the key informants from Magar communities (50 years old) in the upper hill-slope narrated that:

> We are used to vegetable (HYV) seeds by the initiation of our own efforts and experiences. We observed what our relatives and neighbours were doing in this locality. We have practiced and tested following several trial and error methods. Ultimately we adapt it because it produced more than previous crops to fulfill growing needs of our family and other cash requirement under the unfavorable environmental conditions.

This statement proves that the role of Junior Technician of Agriculture (JTA) and agricultural research centre is less significant than local self-efforts to the selection of HYV of seeds. This study reveals that about 34.1 percent of the total households have often used HYV of vegetable seeds (Table 6.7).

Table 6.7: High yielding varieties of seed user household (Rs)

Classes of Rs used in seeds	Frequency	Percent	Cumulative percent
<500	44	44.4	44.4
501-1000	23	23.3	67.7
> 1001	32	32.3	100.0
Total	99	100	

Source: Household survey, 2009

Table 6.7 shows money spent by households for purchased of high yielding seeds. The result indicates that the largest percentage of the households (44.4%) have demanded low amount of high-yielding seeds. For example, Rs <500 accounts for the first (44.4%), followed by Rs >1000 (32.3%) and Rs 500-1000 (23.3%).

Present study found that about one-fifth of the vegetable grower household have used improved seeds, especially for production of cabbage, cauliflower, onions, potato and so on. Among the elevation zones, highest percentage of HYV users (69.7%) used in the upper hill-slope who spent an average of Rs 1844.1, followed by the middle hill-slope (16.4%) with an average of Rs 308.4. It is seen that the highest percentage of the vegetable grower household who used more improved seeds with comparison to traditional crop growers.

(iii) Pesticides

With the introduction of market-oriented cash crops and HYV of seeds the annual consumption of poisonous substances are also increasing. The intensive cultivation of profitable crops is needed protection from different types of diseases and insects. Thus, most of the households have used common poisonous pesticides, such as BHC dust, parathion methyl (Metacid), Malathion (DDT). The result shows that only 34.3 percent of the total household used the pest worth Rs 31250 and average Rs 151/household. Among elevation zones, the largest amount of pesticides user are observed in the upper hill-slope (60.5%) followed by the lower hill-slope

(30.9%) and the middle hill-slope (8.6%). The result indicates that intensive cultivators (both vegetable and crop growers) households were the largest pest consumer than the subsistence crop grower.

6.1.5 Cropping Pattern

The cropping pattern is largely determined by the physical, socio-economic, technological and institutional factors in the study area. This part describes crop rotation, crop combination, crop diversification, commercialization and intensification. These forms led to new patterns of cropping suitable for this area which affects livelihoods in the study area. This involves attention to the changes in the livelihoods are taking place in terms of cropping patterns.

(i) Crop Rotation

Crop rotation is a traditional agricultural practice taking place in this area since long time. Local communities have developed integrated agricultural system in which land is periodically fallow or rested and often planted with species that help restore soil fertility. The crop rotation generally begins in the month of March-April and ends in November-December and it covers nine months. The local communities have vital role in the systematic selection of different crops. Their deep rooted knowledge and trial and error methods enable their succession on the same piece of land in a year according to seasons. They grow two or more crops in different plant-harvesting cycles in a year. These communities follow different cropping seasons, which can be identified into three crop rotation cycles. They are: the rainy season crops, the autumn season crops, and the winter season crops.

The upshot of rainy season crops begins with the onset of the monsoon rain and showing of the crop takes place in the fields (April-August). In this season, most of the households prefer paddy, maize, and sorghum in the middle and the lower hill-slopes while maize, potato and vegetables in the upper hill-slope. Other minor crops are also grown such as ground-nut, buckwheat, and different kinds of vegetables among different elevation zones. The autumn crops are sown after harvesting of first crops with beginning of late monsoon (especially August-September months) like, millet, lentil, bean, pea, buckwheat, mustard, radish and vegetables. And, the winter crops are sown with the advent of winter months, generally from the beginning of

November. The main winter crops are wheat, pulses, mustard, potato and vegetables (Annex 6.4).

(ii) Cropping Pattern

The spatial distribution of different crops in the study area makes a distinctive cropping pattern. Here, the cropping pattern refers to the areal distribution of crops and one can see at a glance the dominant crops cultivated in the study area. It is noted that land use and the cropping patters have a close relationship which bearing on climate (rainfall and temperature), soils and moisture conservation), use of manure and fertilizers and farm power and associated implements.

Table 6.8: Cropping patterns in different elevation zones

Elevation zone (masl)	Cropping pattern in (Bari)	Cropping pattern in (Khet)
Upper hill (>1800)	Potato-vegetables-fallow Maize-potato- vegetable Maize-millet/mustard-wheat/buckwheat Tea, broom-grass & large cardamom	Paddy- fallow Paddy-vegetables
Middle hill (1000-1800)	Maize- potato - fallow. Maize- millet - potato. Maize-vegetables. Maize-mustard-. Maize-vegetables-vegetables	Paddy- Fallow Paddy-wheat Paddy-vegetable Paddy-potato Paddy- lentil
Lower hill (< 1000).	Maize- lentils - fallow. Maize- millet - fallow. Maize-vegetables-fallow. Maize-mustard- fallow Maize-vegetables-vegetables	Maize-Paddy- Fallow Paddy-paddy-fallow Paddy-paddy-vegetable Paddy-paddy- wheat Paddy- wheat-maize

Source: Field survey 2009

Table 6.8 shows the cropping patterns in the study area by elevation zones. The result indicates that Bari land is used for more crops than Khet in all elevation zones. It is mainly due to the facts that the percentage of Bari land is more than Khet land in the first; the percentage of all year irrigated land is very limited than seasonal irrigated land in the second; introduction of commercial crops in the third and lastly, most of Bari land is used to produce summer and autumn crops and kitchen gardening in winter season while the largest percentage of Khet land is used only for summer crops.

(iii) Crop Combination

The local communities have developed traditional agricultural practices in which crop combination is also playing significant role in household economy. The crops combination refers to the designation of the study area on the basis of the number of crops showing least deviations from the standard. The main crops in the study area are maize and paddy. The area can grow different crops at the same harvesting time. Other crops sown after the harvesting of maize or paddy are lentils, millet, wheat and vegetables. Some crops are grown in inter-cropping pattern and some are also in multiple cropping. The result indicates that the cropping system in this area is mainly based on monoculture, but the scope for cropping pattern may differ depending on the nature of terrain and infrastructural facilities.

In this environment, earlier, most of the households were satisfied with their traditional produce of agro-pastoralism which was sufficient for their yearly needs. But this process has changed now with the introduction of various types of farming practiced in different elevation zones. For example, all irrigation resources in Suntale, Baire, Lower Kintang and Lamigara are used mainly for growing paddy and commercial crops in the upper hill-slope.

This study used the method of least square is applied to determine crop combination in the study area. In fact, the result indicates that the sum of squares (the least squares) is the lowest at third calculation is 459.25 and compared with 594.38 for the fourth calculation. So, the result is signified that majority of households have adopted three crops in a year (Appendix 6.5). For example, potato, cabbage and pea in the upper hill-slope while maize/paddy, tomato, beans, onion and cauliflower in the middle and lower hill-slopes. Weaver devised the method to determine crop combination region, and he argues that sometimes there may be crops whose area may be insignificant (cite in Shafi, 2006, p.133).

(iv) Crop Intensification

The important resource available in this area is arable land. Since arable land is uneven, intensive land use is yet another important traditional practice taking place in this area. Crop intensification refers to the density or areal occupancy of a crop in the study area. The occupancy is largely determined by the terrain, climate, transport

and irrigation facilities and purpose for the crop production. Most of the households have more efficiently used their small portion of land by using their own efforts and technology. Three factors may be possible for crop intensification in the study area, such as increasing accessibility of physical facilities of roads, irrigation and markets; diffusions of agricultural innovation through GOs, NGOs, neighbourhoods and media effects; and institutional supports from Pakhribas Agriculture Research Center, National Citrus Research Center and District Agriculture Development Office. But the production of different crops has not been possible at desired level in this area despite the priority because of the adverse monsoon conditions, lack of irrigation facility, agricultural extension services, lack of fertilizer, improved seeds and pesticide supply and agricultural roads (NPC, 2002).

For long, inaccessibility has severely reduced the higher costs of developmental activities and diffusion of new technology in this area. But the construction of Koshi Highway has broken down its historical isolation with increasing access of road networks since 1990s. Road transportation led to commercial vegetables has a high intensively produce in the upper hill-slope because of the suitable climate and paddy in the lower hill-slope by irrigation facility. These changes may vary depending on introduction of new crops such as potato, vegetables and large cardamom in the upper hill-slope, while and paddy in the lower hill-slope. The intensification of agriculture resulting from connection of Koshi-Highway and technical inputs from donor funded development projects like KHARDEP and PAC in Dhankuta district (Virgo and Subba, 1994, p.168).

(v) Crop Diversification

Crop diversification is another way of increasing food security in adverse monsoon conditions. The households often grow two crops on the same field at the same time. Among the two or more crops is known as crop diversification. Here, crop diversification refers to the system growing a variety of crops, some requiring more water and some less water. The households have grown a variety of crops on the same field. They have used both traditional and modern farming methods. It helps in maintaining household income in adverse monsoon conditions and where adequate rainfall or irrigation facilities are available, the households would practice

monoculture while in other areas, a variety of crops are grown in both Khet and Bari lands (Table 6.9).

Table 6.9: Crop diversification

Crops	Area (ha)	Percent	Crop	Area (ha)	Percent
Maize	90.4	38.2	Lentil	3.5	1.5
Paddy	63.6	26.9	Cash crops	3.4	1.4
Vegetables	37.3	15.8	Mustard	2.5	1.1
Millet	17.8	7.2	Fruits	1	0.5
Potato	6.4	2.7	Others	10.5	4.7
Total				236.4	100

Source: Field survey, 2009

Shafi (2006) used the formula for index of crop diversification is given below (p.110):

$$CDI = \frac{percent\ of\ sown\ area\ under\ n\ crops}{number\ of\ crops}$$

The area grows 10 crops (Table 6.9) and the percentage of the area under crops is $\frac{100}{10}$ = 10. The majority of the households have practiced diversify crops to mitigate their income in adverse monsoon conditions.

(vi) Crop Specialization and Commercialization

In recent years, private sectors and individual households are interested in the investment of modern activities in agricultural sector. Some farmers have equated crop specialization and some in commercialization. Here, the term crop specialization refers to those crops which cannot grow on level land and require special characteristics of cultivation. The immense ecological diversity of this area is suitable for crop specialization. Tea and large cardamom are specialized crops these can be grown on hilly terrain with sloping surface where the water is drained off. These crops offer a range of economic possibilities for local livelihoods with creating marketing niches outside the region. The result indicates that only 1.4 percent of the total households have adopted specialized agriculture.

Commercialization of agriculture in the study area is recent phenomena. For a long time, hills' agriculture was considered to be intensive subsistence farming. The introduction of HYV of seeds and short growing horticultural crops has entered commercial agriculture system. These crops are potato, cabbage, cauliflower, radish, tea, large cardamom, ginger, paddy and fruits. They provide a vital link to urban

markets of the Tarai. These changes may vary depending on accessibility of road transportation and irrigation facility. This study reveals that more changes in commercial crops are concentrated along the road headlink areas with comparison to remote areas. This study supports to similar ecological opportunities through livelihood intensification, diversification and commercialization in many mountain areas. Clark (1990) has found similar ecological conditions have offered economic opportunities for human occupation in Ethiopia and East Africa (p.4). Virgo & Subba (1994) argue that road has progressively reduced the socio-economic isolation and increased exposure to commercial markets for agriculture, livestock and forest products in Dhankuta district (p.169) while Bishop (1990) found that farmers grow a wide variety of crops: paddy, maize, millet, wheat and potato in Karnali zone, western Nepal (p.196).

The above discussions show that the importance of agricultural activity in the livelihoods of the communities in the study area. The theoretical basis of this retrospective study can be argued that agro-based livelihood of the communities is largely affected by access to natural resources especially arable land, water and forest. Their livelihood is still dependent on intensive subsistence farming. Caplan (1970) referred to Mair (1957) that ' in this type of economy there could be no commodity more valuable than land, no circumstance in which it would be profitable to dispose of land' (p.190). Bencherifa (1988) verifies the theory of change in mountain agricultural systems. He suggests that multiple cropping, agro-forestry, integration of crop-livestock and altitudinal differences or niches are path way to the livelihood changes in the mountain areas of Morocco (p.312). But this study found that the nature of terrain and physical infrastructure imposes severe limitation on the community's livelihood activities. Thus, household members are to be found a variety of forms of livelihood options along with agriculture and they are often known as non-farm livelihood activities.

To test first hypothesis, this study is used to Pearson correlation coefficients as follow.

Null hypothesis $H_{0:\,\mu_1=\mu_2}$	There is no differences between the magnitude of agricultural changes and increasing access to roads and markets.
Research hypothesis $H_{1:\,\mu_1>\mu_2}$	Agricultural activities change at varying magnitudes due to increasing access to roads and markets.

Significant level 0.05 levels (2-tailed test)

Interpretation

The computed value indicates that the sample variances are equal to the 0.05 significant levels, and the calculation of t using the effect of market and the calculated values are paddy (.281**), maize (-.182**), millet (-.103), potato (.314**), cabbage (.275**), radish (.226**) and cauliflower (.053). Meanwhile the effect of roads and the calculated values are radish (-.284**), cauliflower (-.199**), cabbage (.523**), potatoes (-.523**), millet (.394**), paddy (.154*), maize (.301**). The result rejects the null hypothesis ($H_{\circ}$) and supports to research hypothesisH_1 that is the effect road makes differential in livelihood options is significant. Correlation is significant ** at the 0.01 level and * at the 0.05 levels (Annex 6.3 A & B).

6.2 Non-farm Livelihood Activities

The non-farm activities are associated with the socio-cultural aspects of Rais, Magar and Tamang communities. Indeed, non-farm sector did not yield remunerative works to sustain household income; it is mainly due to that a large number of non-farm activities are characterized to unregister small-scale home-based activities. Most of the non-farm activities are combined with agriculture and it requires low amount of capital and simple technology to operation and usually handled by family members on part-time basis within the local areas. Sometimes, household members are also involved in urban-base seasonal migration during the agricultural off-seasons. They come back to do farm work in peak agricultural seasons. The small proportions of family members are also involved in regular jobs outside the village that was not currently working in the farm field. A large number of unskilled labour forces have been seeking this job outside the country and it is a recently growing non-farm business.

It can be argued that the most economically successful households are those which combine crop production with a variety of non-farm income generating activities. The discussion can be contextualized within a framework which attempted to identify those households are likely be poor although they are being economically non-diversified. These were two types: first, those with small arable land, who were obliged to sell their labour to other farm. Second, crop is only households' income source with no access to non-farm income-generating sources, where poor harvest could have severely limitation for the economic viability of the household. By

contrast, more successful households have adopted a range of livelihood diversification involving both non-farm and off-farm activities.

The importance of non-farm income is increasingly in the livelihoods of this locality. Bu the distinction between farm and non-farm activities is fuzzy and unclear because they are regarded as on/off-farm (work outside household) and non-farm activities (work in household). The result indicates that most of the family members are involved in diversified non-farm activities to supplement agricultural incomes. The scale and nature of non-farm activities in the local area are thus largely related to agro-processing, manufacturing of bamboo mats, agricultural implements, weaving, petty trading, remittances and services including transport and services. They adopt these activities either at the local area or outside the village over centuries. The importance of non-farm activity has made considerable progress during the past decades. Indeed, non-farm sector did not yield remunerative works to sustain household incomes.

Types of Non-Farm Activities

The nature, scale and scope of non-farm activities are largely influenced by the local context. Population density, household wealth status, access to transport and demand for services are determined the nature and scale of non-farm opportunities in this area. The available non-farm activities can be divided into two broad groups: traditional and modern non-farm activities.

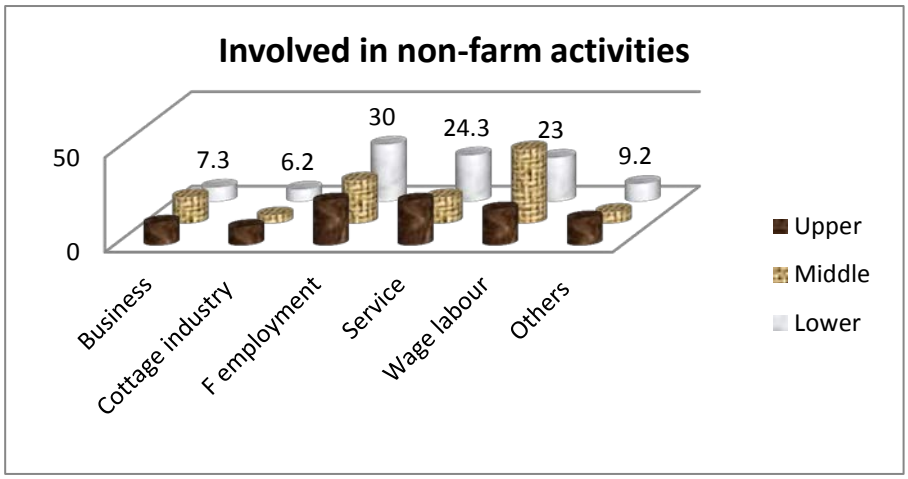
(i) Traditional Non-farm Activities

The household members are involved in traditional non-farm enterprises with agricultural work to supplement their household income. Moreover, they adopt different types of non-farm livelihood activities such as construction, thatching, fire wood and thatching grass collection, kitchen gardening, cooking, collecting and gathering, food processing (liquor-making, husking/drying, grinding, and others); cottage industry (weaving, rope, basketry, and others); petty trading; wages labour and working in the offices; portering and remittance from migration. This study found that about 30 households (14.5%) producing and marketing a combination of crop and locally produced alcohol or malt-liquor in the upper hill-slope. They produce alcohol commercially and sell to Hile bazaar since 1990, but income from alcohol was very smaller.

(ii) Modern Non-Farm Sectors

The modern non-farm activities refer to activities which are carried out on the farm but which are not related to crop production such as brick making while off-farm activities refer to activities carried out away from the farm. The off-farm activity includes working in village school teachers, health post, road construction, administrative and police or army. The individuals or households members are involved in various non-farm occupations such as trading, processing, services etc. depending on location, urbanization and population thresholds. By nature, the modern non-farm livelihood activities can be divided into six classes. They are: business, cottage industry, foreign employment, services, wage labour, apprenticeship, and others (Figure 6.2).

Figure 6.2: Population involved in non-farm activities (percent)



Source: Field survey, 2009

Figure 6.2 reveals the percentage of the non-farm activities in the study area. The result indicates that the largest percentage of the non-farm livelihood activities is constituted by the wage labour (30.5%). The wage labour includes apprenticeship skills such as tailors, blacksmiths, and all works done in daily wages outside the home. This is followed by the foreign employment (24.7%) and cottage industry (5.8%). In this analysis, pensions, priest (Pujari and purohit) and transport and communication works are considered in the 'others'.

(a) Cottage Industries

The contribution of the non-farm livelihood activities by the cottage industry was relatively very low (5.8%) with comparison to other non-farm sectors. The

regional distribution showed that the middle hill-slope accounts for the largest percentage (38.4%) followed by the upper and lower hill-slopes (30.8%) respectively. Most of the cottage industries are based on local raw materials and employed indigenous knowledge in their operation. The bulk of their products are locally consumed. There are four types of resource-based cottage industries available in this area. They can be divided into agro-based, livestock-based, forest-based and mineral-based.

Weaving is the most important cottage industry and usually is operated seasonally or on part time basis by family members. The coarse cotton textile has been made by indigenous communities. They are usually making different marketable items such as shawl, a handmade bag, a colourful Nepali cap, lungi, woolen blanket, woolen carpet and Allo-clothes. The weaving activity is associated with the symbolic identity of folk-cultures of Rais, Magar and Limbu communities. Earlier, more than 50 traditional coarse cotton yarns were operated by local communities for local uses before 1960 while it was only five yarns in 2009.

Furniture is considered as forest-based cottage industries in this area. Nepali handmade paper and folk-medicines and yeast (fermentation of malt-liquors) are also forest based cottage industry which requires low amount of capital and simple technology. Bamboo-baskets are also made (*doko, naglo, dalo, thunse, mandro*) for domestic uses as well as for the local hat-bazaars.

Blacksmith is considered apprenticeship works. They are generally involved in make and repair agricultural tools and implements. They receive food crops in exchange from the households and it is not signified only economic vale but as part of community obligations in rural agrarian economies. Some jewelers were working for cash income outside the village at Hile and Dhankuta bazaars.

(b) Trade and Commerce

The contribution of trade and commerce in household income is considerably very low. It accounts only 11.7 percent of the total non-farm and employment. Among the elevation zones, the largest percentage of non-farm contribution is accounted by the middle hill-slope (61.6%) followed the upper and lower hill-slopes in the second (19.2%) with respectively (Figure 6.2).

Table 6.10 shows the distribution patterns of different trading activities. The result indicates that the largest percentage of the trading activities were accounted by the cottage industry (25.8%) followed by Kirana (19.7%) and furniture (3.0%). Among the elevation zones, the largest percentage was constituted by the collection (60.0%) in the upper hill- slope, followed by the tailoring in the middle hill-slope (71.4%) and cottage industry in the lower hill-slope (35.3%), while the lowest percentage of cottage industry (23.5%) was found in the upper hill-slope, followed by the tea shop (36.4% and 18.2%) in the middle and lower hill-slope respectively. Transport and communication have been taken as the service sector.

Table 6.10: Distribution pattern of trading activity (percent)

Types of functional unit	Elevation zone			Total	Percent
	Upper hill	Middle hill	Lower hill		
Kirana	38.5	38.5	23.0	13	19.7
Tea stall	45.4	36.4	18.2	11	16.7
Cottage industry	23.5	41.2	35.3	17	25.8
Furniture	50	50	-	2	3.0
Collection	60.0	40.0	-	5	7.8
Services	37.5	37.5	25.0	8	12.1
Tailoring	-	71.4	28.6	7	10.6
Others	33.3	33.3	33.3	3	4.5
Total	22	28	16	66	100
Percent	33.3	42.5	24.2	100	

Source: Field survey, 2009

The households are primarily the producer-sellers of agricultural product. Although their marketing behaviour is affected by several factors such as dire need, accessibility and threshold value. However, market centers have offered goods and services to the surrounding area. The key informant told that earlier, they obtained goods and services such as salt, kerosene, cooking oil, spices, clothes either from Dharan or Dhankuta and Hile bazaars, but this facility has changed with increasing access to small-market centers in the study area. Guranse, Jorpati, Bhirgaundanda are emerging small market centers and Ramite, Chanpe and Suntale can be considered potential nodal centers in the study location. The result indicates that the central location of Bhirgaundanda that offers different types of commercial activities (10 items) as compared to other market center. Table 6.11 shows different trading activities available in the study area. They can be divided into Kirana, tea stall, cottage industry, furniture, collection, services, tailoring and others.

This study reveals that upstream and downstream resource exchange system was the common trading activities in earlier times. Local exchange was consisted by different farm product among different elevation zones, such as the upper hill-slope were bartered potato and livestock products with paddy and maize from middle and lower hill-slopes. But this system has now changed with increasing access of small market centers and road facilities. Moreover, Bishop (1990) reveals that most of the rural economies trade was still associated with the seasonal rhythm of agriculture, animal husbandry and petty trading in Karnali zone of western Nepal (p.101).

(c) Wage Labour

The households with small area of arable land were obliged to sell their labour to other farm fields. In this study, wage labour includes all types of work like agricultural labour, commuters, porter, construction and tailoring. The result indicates that about 30.5 percent non-farm employment is created by wage labour (Figure 6.2). Among the elevation zones, the highest percentage of wage labour is constituted by the middle hill-slope (66.2%), followed by the lower hill-slope in the second (22.0%) and lowest in the upper hill-slope (11.8%). However, wage labour is affected by the nature of agricultural work because peak agriculture season demand more helping hands with comparison to agricultural off-seasons. Thus, agricultural off-season requires more non-farm employment opportunity outside home to supplement household income.

Porterage is another source of non-farm activity, especially in those areas which are not unconnected by road transportation. But the significance of porterage activity in household income may vary depending on location and family composition within households, gender and generational differences. Earlier, more than 50 percent households of the Rais, Magar and Tamang were involved in portering activity. They carried every quintal of goods from Dharan to Dhankuta and Hile which was provided porterage employment for four to five days. But this situation has now changed with increasing access to roads, thus portering activity has become more vulnerable. Some porters have involved in alternative income-generating activity, such as vegetable farming. The extension of Dharan-Dhankuta road has positive change in traditional porterage activity in the upper and lower hill-slopes. But some households in middle and lower hill-slope are still involved in that activity, however, long distance porterage skewed in the local area. For example, they are carrying surplus agricultural

products to local hat-bazaars along with resin and timber, dairy and so on. Recently, further extension of agricultural roads has also synchronized this job and a number of porters have moved into new areas of trading and retailing outlets.

(d) Services

Service sector is another important source of non-farm income and employment. The service sector is regular job provider sector which includes government services (including civil service, arm force and police), non-governmental sectors and social sectors (Figure 6.2). Among the services, the largest percentage of non-farm employment is accounted by teaching (18.8%). The largest contribution of teaching in each elevation zone is accounted by the middle and lower hill-slopes (38.1%) respectively and lowest in the upper hill-slope (23.8%). The non-farm jobs are increasing in this area because of growing number of schools, village level service centers like sub- health post, post office and drinking water supply offices and NGOs and CBOs. Moreover, these offices are located in the middle hill-slope, while hydropower station is located in the lower hill-slope. Teaching and education sector is a major source of service because primary schools are more ubiquitous (75%) in this area.

(e) Foreign Employment

Historically, migration has been a key factor in shaping households livelihoods in the study area. The overwhelmingly majority of family members have engaged in a variety of migration. Some have moved out to lowland agricultural areas. Many households have lands in the hills as well as in the Tarai. Some migrants have moved directly to cities for work and education while some were abroad for seeking better income and employment including Indian and British arm-force. Moreover, young men and women were remained the bulk of migrants; they were seeking newly growing overseas employment because of increased flows of information, new employment opportunities by neighbourhoods who have gone abroad and media effect. Moreover, declining incomes from farming have resulted in the steady increase of their mobility.

At present about 55 (4.8%) people have got foreign employments and their movement to distant destinations, often across national borders such as Malaysia, Qatar, Dubai and Saudi Arab in 2009. The result showed that foreign employment

provides about 24.7 percent of the total non-farm jobs. The number and frequency may vary depending on location and caste and ethnicity. The regional distribution by elevation zone indicates that the largest percentage of the people were involved in this job by the middle hill-slope (43.6%) followed the lower hill-slope in the second (36.4%) and lowest by the upper hill-slope (20.0%). Among the different communities, the figure reveals that largest percentage of foreign employers was found in the Rai community.

Another noticeable trend is that migrant households have at least one member involved in this job. This percentage is not affected by household wealth because economic motivation was the main reason for involving this activity, while remittance was considered as a major source of national economy in Nepal (MOF, 2010). One of the key persons stated that remittance impacts household livelihoods both positively and negatively. Most of the households can organize access to remittance resources and bring about positive change in their lives. But they are unable to return home for the farming season, as a result labour shortages are increasingly in the agricultural sector. This has resulted into households' dependence on remittances is growing. They are sending remarkable amount of remittances ranges between NRS 15000-25,000 per month per capita and it was 30 to 50 percent in Sub-Saharan Africa (Ellis, 1998). The contribution of remittance to the households' livelihoods is increasing because growing needs of their family and cash requirement for food security, education, and health and farm inputs. Moreover, the contribution of migrant to the construction of public facilities such as schools, drinking water and road are also increasing in this area. The above statement indicates that the livelihoods of different groups have increased dependence on migrant members' remittances signals further profound changes in household economies.

The regional distribution of non-farm activity undertaken by elevation zone is also important. For example, the largest percentage of the household members involved in non-farm activities were accounted in the middle hill-slope (25.6%), followed by the lower hill-slope in the second (17.5%) and lowest in the upper hill-slope (12.8%), while it was 23 percent in the rural Nepal (CBS, 2004).

The above discussion shows that the relative importance of non-farm sector in the household employment (Figure 6.2) is considerably very low (19.3%), and it was 34.3 percent for Nepal in 2001 (CBS, 2002) while it was 30-40 percent in Many Asian countries (Shand, 1986). There is a dynamic dimension to non-farm income, which has

reflected by higher levels of multi-activity among young generations. Some conceptual issues relating to the changes in the traditional non-farm activities in rural settings have been examined in many mountain areas of Hindu-Kush Himalayan countries (Jodha, 1992; Banskota, 1986). But contribution of non-farm income sources was growing in Sub-Saharan Africa (30 to 50%) and it was 30 to 60 percent in Asia (Uphoff, 1986; Shand, 1986; Ellis, 1998; Ashley & Maxwell, 2002; Davis, 2003).

6.3 Livestock Rearing

Livestock is another most important livelihood asset in the study area. It provides supplementary income source and employment opportunity. The key informant told that at least one milking cattle, a pair of oxen and goats or pigs is essential for milk, meat and manure. Like land, livestock is a common asset among the households and which is often taken as social symbols of wealth status. They often keep different types of animals, such as goats (50.7%), cows (28.4%), pig (12.4%) and buffalo (8.7%) and chicken (1600). They are exclusively local breeds and their productivity is very low. But households' perception towards local breed is that which can resist common diseases because they have limited access to veterinary service.

The majority of households have developed integrated agricultural system in which agricultural residue feeds the animal and animal waste fertilizes crops. Thus, fodder and nutrient cycle is a traditional practice taking place in this area since long time. The importance of livestock is increasing because of socio-cultural rituals. Ethnic communities have offered chicken, goat and pig at their home god or local deity. Sometimes women and children keep goats, pig and chicken as their private property. But the number of livestock population is decreasing and it is the result of forest controlled under the supervision of Community Forest User Groups and children are enrolled and attend schools. Table 6.11 shows quintile distribution of livestock by the household and these can be grouped into five groups such as very poor (<=4), poor (4-7), rich (7-9), richer (9-12) and richest (>12).

Table 7.11 shows the quintile distribution of livestock in the study area. The result indicates that the largest percentage households have 4-7 numbers of livestock followed by the 20.8 percent of the very poor household who have only 4 (20%) livestock and 19.3 percent richest households hold more than 12 (80%) livestock. The

regional distributions of livestock among elevation zones are also vary depending on household economic status and location. For example, largest percentage of the very poor households (28.6%) accounted only 4 (20%) in the middle hill-slope followed by the upper hill-slope in the second (20.3%) and lowest households in the lower hill-slope (10.9%). The largest percentage of the richest households (29.7%) accounted more than 12 livestock in the lower hill-slope, followed by the middle hill-slope in the second (16.7%) and lowest by the upper hill-slope (11.9%). It can be said that richest (20%) households have accounted about three-fold of what the very poor household own. The bottom quintile was constituted 20 percent of livestock while the top quintile was 80 percent of the total livestock.

Table 6.11: Quintile distribution of livestock by household (percent)

Elevation Zone	Classes of livestock number by households					Total
	<= 4	4-7	7-9	9-12	>12	
Upper hill	20.3	25.4	22.0	20.3	11.9	100
Middle hill	28.6	27.4	17.9	9.5	16.7	100
Lower hill	10.9	14.1	15.6	29.7	29.7	100
Total	20.8	22.7	18.4	18.8	19.3	100

Source: Filed survey, 2009

This study found that livestock and its contributions in households' income might be described as the progressive changes in recent years. But this change may vary depending on distance from major dairy collection centers like Jorpati, Guranse, Trisule and Hile.

6.4 Trade-Off of Livelihood Activities

The previous section discussed about the role of farm and non-farm livelihood activities of the communities in the study area. The section attempts to the trade-off between farm and non-farm livelihood activities. Consequently, many households of this area are able to change their lifestyles and broaden their earning sources by a shift in the mode of production.

The term 'trade-off' in this study is used to refer to change in the village economies, from being principally subsistence oriented to being focused on more income generating opportunities. It requires a risk-bearing enterprise of households (producers). This study reveals that an agricultural economy has been described as the

only means of the development of trade-off. The natural development of trade-off is seen in terms of the introduction of commercial crops within agriculture and diversification outside agriculture mostly takes place only as a subsequent development. Given the limitations of flows of resources, products and services the most of the households are involving entrepreneur skills, such as art and crafts, furniture, carpenter, agro-processing and petty trading. These activities have been leading to the growth of livelihood diversifications and the trade-off can be developed by livestock based enterprises, enterprises based on diversified farming, natural resource based enterprises and processing and manufacturing based enterprises (Figure 6.3) which were discussed in Chapter 6.1 and 6.2.

Figure 6.3: Resource based enterprises for Trade-off building

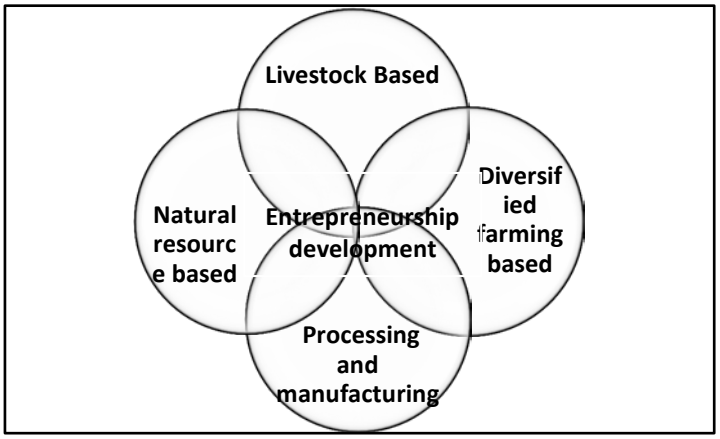


Figure 6.3 shows that surplus productions of different sectors are required to trade-off building. In the study area, a household is involved in diversify livelihood opportunities along with agriculture. It requires investment in technology, infrastructure development, agricultural extension service, credit and extension of rural link roads.

This section describes factors responsible to the growth and development of trade-off, and they can be discussed as follows:

Transportation

Trade-off, transportation and livelihoods are interrelated phenomena because an easy access to transportation is paramount to its vigorous growth of livelihood diversification. It is evident that most of the non-farm activities are located at the point of route convergence namely Hile and Jorpati. The transport network has played

significant role in the flows of people and goods and services. It connects different places that leading to today complex patterns of regional trade. The gradual extension of Koshi Highway united the area by providing more effective means of connecting people and resources. The opening of highway that linked the area with the urban markets has resulted in the growth and development of market centres. The market centres has become the trading the resources of this area for agricultural products.

Transportation network has linked farmland into larger urban centers outside the regions. The highway has channeled flows of goods and services between the north of Mountains and to the south of Tarai. Spreading transportation networks led to the growth and expansion of market places along those networks. Efficient modern movement of goods is a reliable measure to trade-off. But some places in the upper hill-slope can thrive without goods and services from other places which allowing for economic specialization in this region because more than 66 percent households still residing more than 8 KM way from the road heads.

Introduction of New Crops

The spread of ideas, attitudes and discoveries through communication and trade are important aspect of trade-off. It can be used to understand the importance of place. The spread of technological and scientific knowledge has lead to transformations in the agricultural sector. This involves attention to the changes in the livelihoods of different groups; these changes were largely related to introduction of new crops in the competitive markets. It can be argued that the study location can rely only on ideas of market-oriented agricultural products since 1990s. The distinctive character of this place is often based on ideas that the local communities have accepted and made part of their livelihoods in this environment. The farm land has soon linked together by improved road transportation which has reduced the time and costs. The area produces hill-specific agricultural products with unique taste and flavor that is higher demand in the markets. Their product of agricultural produce is often appealing to most lowland dwellers. Here, new crops are not only carried to transformations in the agricultural sector, but also distribution of urban made goods and services to the rural areas, for example, agricultural inputs such as fertilizers, pesticides, seeds, and spices, sugar, salt, cooking oil etc. This has resulted into emergence of market centers in this area such as Guranse, Trisule and Jorpati.

Agricultural land use

Most of the trade-off activities are existed to surplus production of agricultural products. The need for provision of adequate facilities for commercial crop has been a major motivating force in the trade-off building. This fact can be examined in terms of correlation between the number of market center and their relation with the net sown and irrigated area. The land use and land cover change indicates that the negative changes occurred in pasture land and positive changes in tea estate and commercial crops area from 1992 to 2010 (detailed in Chapter 5.1.1.e).

Village level characteristics

The village level characteristics are always related to population density and available natural resources. The diverse ecological characteristics of the study area provide an opportunity for market-oriented agricultural products to the village. This has become more important with increasing agricultural incomes when new market centers are to be established. Earlier, most of the households were satisfied with their product which was upstream-downstream resource exchanged systems. One of the Magar key informants told that:

> Our earlier economic activity was largely dependent on the nieghbouring villages and local hat bazaars because our village is suitable for potato cultivation in summer season. From this has emerged barter system between *Lek-Bensi such as* potato from the *Lek* and grains from the *Bensi* for food security. But the previous type of exchange system has changed now with the introduction of new crops after the construction of road.

This has resulted into proper interactions between urban and rural area that had played an important role in the growth and development of non-farm activity. Guranse and Bhirgaundanda can be taken for example in this area because they are largely affected by transport facilities and resource potentialities.

Complementary exchanges

The study area is situated between Mountain region to the north where the area supplied food crops, tomato, fruits and potato; and Tarai region to the south where supplied vegetables, horticultural products, high-value cash crops and fresh milk, meat. This region is also known as a major producer of vegetables, horticultural crops, paddy, tomato and milk and meat. From this has emerged break-of-bulk point because bulk is broken on the broader of two dissimilar regions. This situation provides complementary resource exchange between mountains and Tarai which

become powerful asset to transformations in the livelihoods of the communities. The result indicates that Guranse, Jorpati, Hile have developed in a zone of contact between Mountain and Tarai regions. This has resulted into widespread flows of resources, products and services from the study area. This practice is more prevalent in the upper hill-slope with comparison to middle and lower hill-slopes. It shows there is positive correlation between access to transportation and volume of goods flows. They are discussed in Table 6.12.

Table 6.12: Flow of goods and services

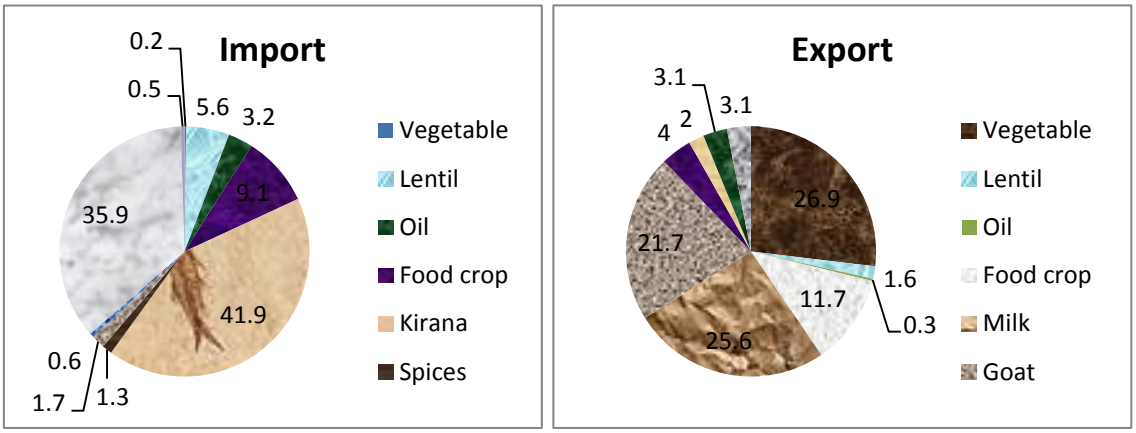
Flow	Upper hill slope	Middle hill slope	Lower hill slope
Export	Off-season vegetables such as cabbage, cauli-flower, radish (2339 quintals); potato (200 quintals); high-value cash crops such as tea-leaves, ginger, large cardamom, broom-grass (444.3 quintals); timber , dairy sold in collection centers at Trisule, Guranse, Jorpati and Hile; minor volume sold in the local hat-bazaars in	Citrus fruits (257.1 quintals) tomato, and vegetables (189 quintals), potato (20 quintals), cash crops (26.4 quintals); dairy, ghee and curds, husked rice and millets (203.1 quintals). These items are mainly sold in local hat-bazaars at Hile and Dhankuta, and only small volume is sold in the collection centers at Hile and Dhankuta	Husked rice (970.5 quintals), millet (278.8 quintals), vegetables (166 quintals), potatoes (18 quintals), cash crops (5.5 quintals); tomatoes and curd and ghee sold in local hat-bazaars at Dhankuta; Timber and resin for local collection centre at Dhankuta
Import	HYV of seeds, fertilizers (5319 kg), pesticides, compost, tools obtained from Hile and Jorpati; and irregular transport facilities are major constraints	HYV of seeds, fertilizers (5475 kg), pesticides, tools obtained from Hile and Dhankuta; and high transportation costs are major constraints	Fertilizers (6642 kg), pesticides are obtained from Dhankuta; and high transportation costs are major constraints
Consumer goods	Food crops, Kirana, clothes, spices, meat, tobacco, and luxurious goods from Hile and Jorpati	Food crops, Kirana, clothes, spices, meat, tobacco, and luxurious goods from Dhankuta and Hile	Kirana, clothes, spices, tobacco, and luxurious goods from Dhankuta

Source: Field survey, 2009

Figure 6.4 shows the flow of goods and service into trade-off building. The result indicates that trade-off is affected by its place specific agricultural produce and demand for manufactured goods and services. Now, there are about 35 percent households who produce commercial crops and purchase agricultural inputs, spices,

clothes and food grain for their use. This type of change is the outcome of trade-off of farm and non-farm livelihood activities in this area and it is shown in pie diagram.

Figure 6.4: Export and imports (Rs in percent)



Source: Field survey, 2009

Figure 6.4 indicates the export and import situations in the study area. The export consisted of agricultural products including livestock. The result indicates that the largest proportion of export is accounted for vegetables (26.9%) followed by milk (25.6%). Import consisted of both the agricultural and non-agricultural products. The largest proportion of the imports accounted for Kirana including clothes, soaps, tobacco etc. (41.9%) followed by fertilizers (35.9%) in Annex 6.6.

Migration and Remittances

The large number of migrants has contributed their knowledge and strength to growing their village economies. They brought together a rich blend of cultures, talents and ideas that form the fabric of livelihoods. Because the earliest human believed in self-sufficiency and they had no idea either of exchange or trade-off. Their very limited wants were satisfied either by their immediate environment or by the place they used to move to in search of food, water and favourable climate. When human started living in groups, population grew and place became the centers of their daily life. Land near the village was cleared to plant crops and hill-slopes were terraced to add level land for farming. They built artificial watering of crops; irrigation was then used to grow two or more crops a year on the same land.

With the growing needs of family, thus the large scale of migrants has moved out to lowland agricultural areas in the Tarai and some out-migrants moved

directly to Indian cities for work and coal mining. Moreover, some migrants have been engaged in specialized occupation, such as Gorkha soldiers of Nepal who are in the British and Indian armies. Sometimes other factors also brought flows of people by long-distance trade, however, their number and frequencies are very low. The location has still become sources of emigrants to other countries and their remittances have played an important part in the livelihoods of their family (Table 6.13).

Table 6.13: Flows of people

Types of migration	No. of people	Percent
Migration in the country	50	33.3
Migration abroad countries	55	36.7
Commuter	45	30.0
Total	150	100

Source: Field survey, 2009

Table 6.13 shows the flow of the people from the study area into different places. The result indicates that the largest percentage of the flow of people was constituted by the abroad countries (36.7%) for foreign employment, compared with 33.3 percent within country. The destination shows that the largest proportion of the migrants go to Kathmandu followed by the Solukhumbu, Pokhara and others areas. In contrast, Malaysia, Qatar, UAE were for the overseas destination. Another impact of pull factor is that now increasing labour intensive agribusiness demand the wage labourer in the vegetable farming, tea estates and milk collection centers.

6.5 Spatial Pattern of Livelihood Endowment Status (SPLES)

The spatial pattern of livelihood endowment status refers to the unequal distribution of resources and livelihood opportunities in the study area. It is concerned with a set of dynamic factors which can generate developmental activities at different rates. Primarily, it is dominated by rural area with inaccessible and isolated from the economic centers. It is mainly due to its several environmental limitations, such as climate, topographic features, scarcity of arable land and drudgery of transportation. The area remains mostly inaccessible with sparse population distribution in far-flung

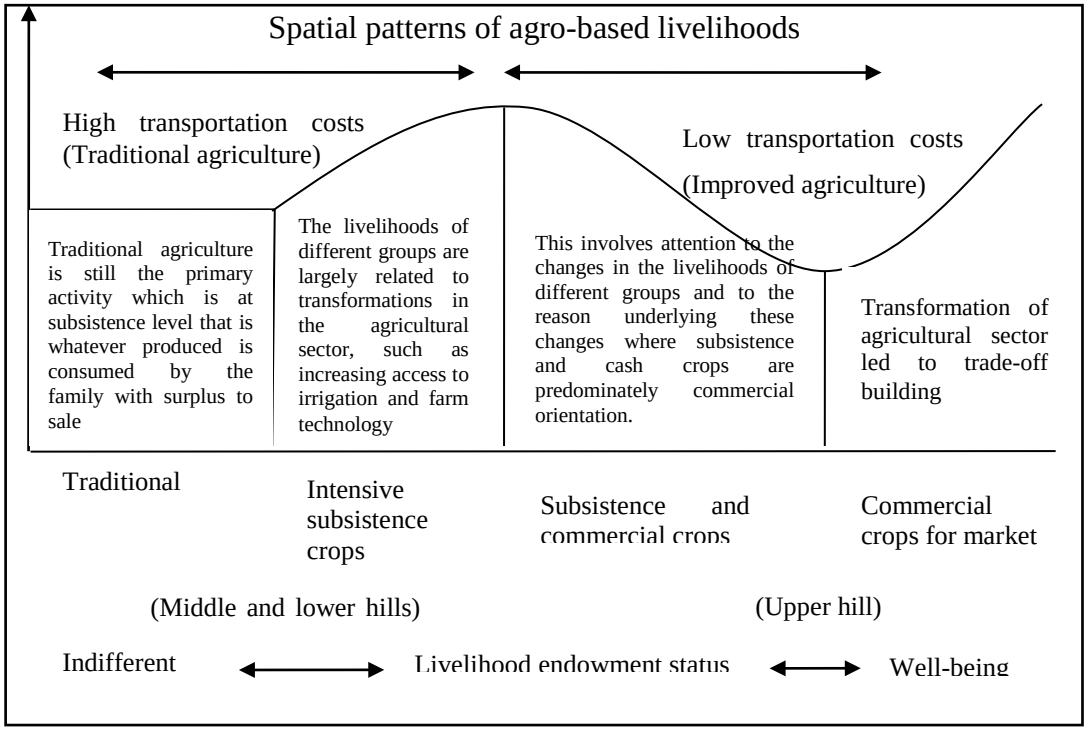
small villages. As a result, there are wide variations in opportunities and constraints to increase livelihood diversifications.

The fundamental basis of spatial patterns of livelihood stems from differences in its natural resource endowments and the potential production to increase productivity. The relationships between these facilities and physical distance of health services, education, drinking water and roads are equally important. It is apparent that local communities must travel the distance to obtain these services from their place of residences. Developmental interventions ranging from infrastructure and institutions to technology and human capabilities are also important to the pace and pattern in harnessing livelihood opportunities.

The differences in natural resource base between elevation zones can be identified. The livelihood opportunities in each elevation zone vary depending on flows of resources, products and services. The level and degree of livelihood opportunities can be measured how local communities properly managed available resources to yield livelihood endowment status (LES). Because of resources that function directly as factors of production (opportunities) and climate, topography and location which affect the efficiency of agro-based livelihood activities (constraints) in the study area. There is marked difference in livelihood opportunities between communities living along the road head and irrigated areas and those were not connected with these facilities. These factors are some of the major causes of spatial patterns of livelihoods endowment status (SPLES) in this area (Figure 6.5).

Figure 6.5 reveals the spatial patterns of agro-based livelihoods in the study area. The figure indicates that remote rural area is still having intensive subsistence farming (traditional) in the middle and lower hill-slopes that produced staple food crops. However, with increasing access to irrigation facility in Baire, Suntale, Guragain Tole, Lower Kintang and Lamigahara produced paddy and more than one crops in a year (locally linked), although some areas cultivated patches for the new crops of vegetables along with paddy and maize . And, the communities living along the highway and near road in the upper hill-slope were produced vegetables, large-cardamom, tea and livestock and its products for markets (Table 6.14).

Figure 6.5: Spatial pattern of agro-based livelihoods



Source: Field survey, 2009

Table 6.14 reveals that the spatial pattern of livelihood endowment status in the study area. In turn, this, two possible factors have been playing crucial role in livelihood opportunities, such as the provision of facilities and positive impact of developmental activities. To some extent spatial variables (for example distance) has affected agricultural development. Moreover, Wilbank (1972) suggests easier transport access can be interpreted as meaning lower costs, supporting more intensive, technologically advanced economic production with greater accessibility (p.429).

The households' members are involved in diversify livelihood activities in the study area. They make their livelihoods from different livelihood options such as agriculture, livestock, services, petty trading and so on. These options can be categorized into four groups (Table 6.15).

Table 6.14: Spatial pattern of livelihood endowment status (elevation zones)

Elevation zone (masl)	Traditional livelihood	Contemporary livelihood activity	Factors to change
Upper hill-slope (>1800)	Agro-pastroralism, based on upstream and downstream resource exchanged by barter system	• Emphasis on highly commercial agricultural activities such as vegetables, potatoes, high-value commodities (Table 6.17); • Livestock and milk playing a supplementary role in household income; • Increasing non-farm activities due to increasing demand for HYV seeds, fertilizers and pesticides	• Increased demand for hill-slope specific products outside the area with increasing access of roads and markets • Establishment of tea factory and chilling centers; • Innovation diffusion through neighbor, GOs, NGOs; and • Non-farm sector supported to increase agricultural products and productivity
Middle hill slope (1000-1800)	Based on subsistence food crop production with little surplus to sell in market; livestock and temporary migration played ancillary source of income	• Emphasis on staple crop production for household consumption and surplus to sell such as maize, millets and rice; • Use of traditional methods of cultivation (manual labour, simple and locally available tools and varieties); 10 households produced new crops for markets; livestock playing supplementary role in household income; • Increasing non-farm activity such as remittance from foreign employment, service and agro-processing industry	• Diffusion of agricultural innovation through GOs and NGOs; • Education and social networking and media effect increasing attraction on remittance and foreign employment; and • Non-farm sector supported to increase agricultural productivity
Lower hill slope (<1000)	Based on subsistence crop production with little surplus to sell in market, livestock and temporary migration played ancillary source of income	• Intensive cultivation of paddy, maize and millets are dominance crops, and 15 households produce new crops in Baire for markets; • Livestock and its products supported household income; • Increasing non-farm activity such as remittance or foreign employment, service and agro-processing industry	• Hydro-electricity project (1971); • Development of irrigation scheme (1990); • Non-farm sector supported to increase agricultural productivity; market demand for high-quality rice and livestock products

Source: Field survey, 2009

Table 6.15: Diversify livelihood options in Bhirgaun

Livelihood options	Option types
I	Only agriculture or wage labour
II	Agriculture and livestock/others
III	Agriculture, livestock and service or business or labour or foreign employment or others
IV	Agriculture, livestock, service or business or labour or foreign employment or others and high-value products
Total	More than ten livelihood activities are identified

Table 6.15 shows that about 2.4 percent households have only single livelihood options, however more than 42 percent households involved in two options, about 36.3 percent are in three livelihood activities and only 18.8 percent are in more than four activities. The result indicates that more than 55 percent households are involved in livelihood diversification as stated in table. This statement has been extracted from two narrations from two elevation zones as followed:

> C. L Tamang from the upper hill-slope said that our life is better than twenty years ago because we adopt new commercial crops which stimulate an ever increasing demand for markets. We are able to respond through possessing flexible assets e.g. about 7 ha land for tea-estate and cultivation of large cardamom. In addition, foreign employment and milk support to ancillary income sources. Our livelihood strategy is more diversified which is supplement to household incomes. However, D. B. Rai from the middle hill-slope said that our life is more precarious than of C. L. Tamang's because our livelihood is at subsistence level that is whatever we produce is consumed by the family. Since our land quality (*Pakho Bari*) is the main problem and market constraints imposes poorly developed transportation system. While agriculture is our mainstay of livelihoods and lack of alternative income generating opportunities make livelihood hardship than of C.L. Tamang's.

This statement proves that the improvements in physical structure of roads, irrigation and agricultural extension services have made spatial patterns of livelihoods in each and within the elevation zone as well as different communities. For example, upper hill-slope has produced a large quantity of high-value cash crops for export as stated in Table 6.16.

Table 6.16: Existing price level for selected crops (Rs/Quintal)

Crops	Dharan	Biratnagar	Birtamod	Average
Potatoes	2,600	3,000	2,500	2,700
Tomatoes	3,100	3,300	3,200	3,200
Cucumber	2,200	2,900	1,600	2,333
Cabbage	1,000	1,500	1,500	1,333
Cauliflower	2,000	2,500	2,500	2,333
Beans	3,500	4,000	4,000	3,833
Orange	4,200	7,500	4,800	5,500
Sweet orange	3,000	-	4,000	3,500
Ginger	2,300	2,500	2,500	2,433
L cardamom	1,34,000	-	1,41,000	1,37,500
Chilly	3,100	3,900	3,900	3,333

Source: CADP, Biratnagar, 2011

Large cardamom is considered most profitable crop, which drew average Rs 1, 37,500 per quintal in 2011while it was Rs 1, 04,315 in West Bengal of India. Increasing incomes through high-value cash crops are concentrated on a big-push effect on linkages and complementarities for change in the livelihood endowment status. These changes led to spatial patterns of livelihood endowment status.

6.5.1 Well-being Indicators

Most of the households have reported that the percentage of people engaged in agriculture has gone down significantly year-by-year. Thus, 'poverty' was serious problem in this area. However, 'development' interventions seem to have increased multiple livelihood strategies through diversification of household activities. These options are important for maintaining livelihoods in ordered to achieve well-being. The key persons were helped to identify five broader clusters of wealth groups based on access to arable land, livestock, income, food supply, housing condition and educational status namely, poorest of the poor, poor, rich, richer and richest.

6.5.2 Well-being Indicator Setting

The well-being indicators were set by the initiation of key persons in their context. In addition, household responses are also recognized to identify reasons for the choice of indicators. This exercise helped to verify some core aspects of well-being indicator setting.

The well-being indicators were completed with the agreement of key persons and a priority order ranking was conducted. These prioritized well-being indicators (Table 6.17), apart from rhyming with seeking for good-life by using the following steps:

Each indicator constitutes an individual asset cluster and given an equal weight (0=no and 1=yes). This was followed by calculating the individual asset sub-cluster index. Normalizations of individual asset sub-cluster index were then done to ensure comparability between individual asset clusters. Individual asset cluster portfolio index was then calculated an average from its entire individual asset sub-clusters for getting overall asset portfolio index.

Finally, using the overall asset portfolio index, a weight of 0-1 score (with quartile proportion) was assigned to derive the various well-being status (Table 6.18). The scores for households were then used to locate their position within the various well-being status categories. In this case, computed well-being index 0.64 score indicates medium well-being status.

Table 6.17: Livelihood assets statuses

Asset	Observed	Expected	Index	Asset	Observed	Expected	Index
Natural	147	195	0.75	Human	956	1560	0.61
Physical	1571	1950	0.81	Social	235	390	0.60
Financial	294	780	0.38	Institution	384	780	0.49
Overall					3431	5655	0.67

Source: Field survey, 2009

Table 6.18: Well-being status

LE status	Result analysis
I	The result indicates higher well-being status 0.76-1.0 or 76-99 percent score. They are the well off and with a secure well-being status which accounts only 19.8 percent households.
II	The second group shows medium well-being status with 0.51-0.75 or 51-75 percent score. They had considered having medium well-being status. They were near well off and with normal well-being status which accounts 38.8 percent households.
III	The third groups have 0.26-0.50 or 26-50 percent score. They were considered low well-being status which accounts 20.3 percent households.
IV	The lowest group have 0-25 or 0-25 percent score were considered an extremely low well-being status which accounts 23.1 percent households.

Source: Field survey, 2009

Present study found that the computed value is greater than 75 which indicated well-off accounted for physical assets with 0.81 scores. This means the area was better-well in terms of physical assets compared with 38.0 for financial assets. It is only possible through changes in agricultural sector. It can be said that households' financial assets is very poor, as compared to other assets.

Physical conditions are also playing an important role in determining Spatial Pattern of Livelihood Endowment Status (SPLES). In the study area, different types of SPLES are seen by the flows of natural resources (arable land, water, forest and scenic beauty), flows of potential traded commodities, flows of human resources and remittances and public sector investment flows.

Purvis (2005) has analysed spatial inequalities in sustainable development. His attention to geographical difference is reflected on explicit concern about the uneven fashion of capital distribution and redistribution. It follows that interest in the intermeshing effects of economic, social and environmental changes is accompanied by the attention to the ways in which they reshape or reinforce patterns of spatial inequality (p.36). The negative consequences of livelihood activity are reinforced by evidence of the uneven spatial distribution of its social and environmental resources. This study has shown that there is often an underlying logic to this uneven distribution of resources and developmental activity that reflects the patterning of agro-based livelihoods of the communities.

CHAPTER VII

ROLE OF LOCAL ORGANIZATIONS IN LIVELIHOOD ACTIVITIES

The chapter intends to describe the role of local organization in the livelihood activities of the communities. Efforts are made to answer the third research question: are existing local organizations playing role to promote livelihood activities? Further it also evaluates the role of existing organizations in improving livelihood of the communities in the study area.

Local organization refers to the structure of recognized and accepted role. These organizations are established by the rules within a specific geographical and cultural space. Local organization includes lower level geographic space such as village development office, cooperatives and community-based organizations. Local organizations have more varied capacities and role to support livelihood of the communities. It incorporates different kind of organizations, such as governance, resource mobilization, social and mutual exchange, conflict resolution councils, management committee for infrastructure and sector services, saving and credit groups, cooperatives, religious association and lineage organizations. They are key players in local development and that shape livelihood activities of the communities.

There are four categories of local organizations have been involving in local development-namely, government administrative agencies, local government (VDC), civil society and NGOs and donors. The role of households, kinships and political parties in socio-economic development are also equally important. Because households are the contact points with the government channel not only for administrative purpose but also participation in socio-economic development.

7.1 Historical Perspective

The evolution of local organizations in the study area has associated with the complex and evolving system of customary rights. The main characteristics are co-existence of traditional and statuary rights. The state is the overall legitimacy of local governance and complete authority over its resource allocation in local development.

The traditional local organizations had been strong and vibrant in earlier times through the customary rights of the Limbu and Rais, but eroded due to historical circumstances. With the unification of Nepal, Prithvi Narayan Shah in 1769, the state had neglected to this indigenous organizations.

Under customary rights, access to natural resources especially land, water and forest was allocated by village authority. These arrangements were more important for segmentary linage members because their livelihood was based on agriculture, animal husbandry, cottage industry and petty trading. When village population grew, they had cleared land near the village to plant crops under customary rights which is known as *Kipat* system. Their authority had gradually modified natural landscapes to make them more productive, such as terraced to added level land and irrigation which is used to grow more than one crops a year on the same land.

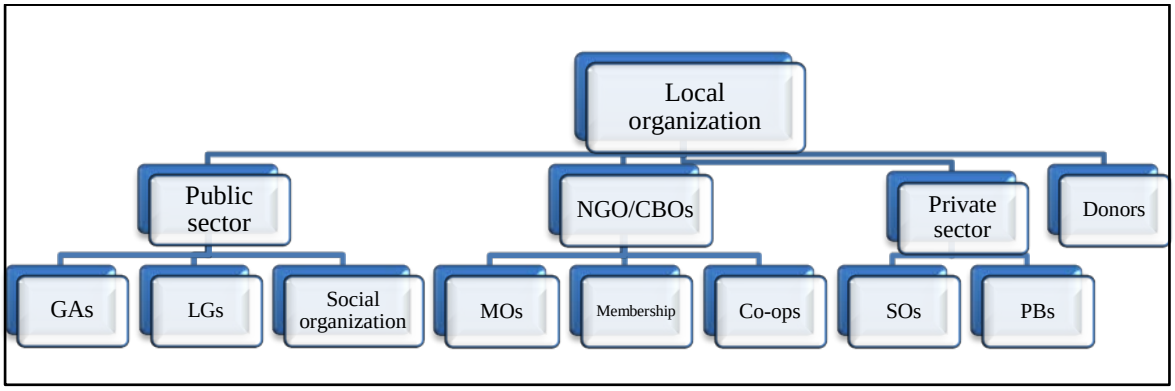
The Rana had added to the structure and function of the local organization creating by a government centric system where statutory rights had more formalized in this area. The newly restructured state's institutional system has followed the functionary role of land titling and registration. But the role of local organizations and their relevance to the changes in the socio-political systems were recognized since 1950s. These changes were underpinning a lot of extension services of socio-economic development in this area.

The inspection of Panchayat Political System, the local organizations had restructured into 14 Zones, 75 districts and about 4000 Village Panchayats. Village Panchayats were further divided into 9 wards. This has resulted into growth and development of elected authorities and village councils at local level. As a result, the traditional organizations became less significant due to the elected Pradhan Pancha and ward chair persons who governed day-to-day administrative functions. The changing political systems have further encouraged on setting up new local organizations after the restoration of multiparty democracy since 1990 and 2005. The Local Self Government Act (LSGA) of 1998 formerly recognized traditional organization as the base for rural development, setting up new existing VDC and ward by the initiation of government like the Bhirgaun Village Panchayat.

7.2 Existing Local Organizations

In the study area, there exist different types of local organizations ranging from a government administration service centres, local government (VDC), civil society of community based organizations (CBOs) or NGOs and donor agencies. They can be divided into four groups: basic service provider organizations, community based non-government organizations (NGO & CBOs), private organizations and donors (Fig. 7.1). For much of this area, households' are the key players in local organizations because they are facing a lot of livelihood problems, such as lack of physical infrastructures of irrigation, road and drinking water, inadequate agriculture support services- HYV of seeds, fertilizers, credit facility, training and regular markets.

Figure 7.1: Types of local organization



Source: Field survey, 2009

Figure 7.1 shows the number and types of local organizations involved in local development in the study area. The figure indicates that the community-based non-government organization (NGOs and CBOs) accounts the largest percentage (65.2%), followed by the public sector organizations in the second (19.3%) and it includes government administration centres and local governments (DDC and VDC), private organization in the third (9.5%) and lowest by the donor agencies (6%).

7.2.1 Public Sector Organizations

The public sector organizations are established for the provision of basic service delivery system in the study area. It was widely practiced in the rural areas of Nepal. But the government of Nepal has not explicitly defined what basic services are because her annual budget allocation were related to health, education, drinking water, and local

development under the heads of basic services. However, this study has considered as social welfare provision of lower level government services, such as health, education, communications and agricultural extension service, and local governance of Village Development Committee.

The government administration and sectoral ministries and their leaders have initially preferred government-planed sectoral initiatives opted for macro-economic growth tending toward the administrative decentralization model. This area has a basic service of post office, sub-health post and schools although their facilities are so poor. They are known as basic service provider local organizations. They follow state's existing laws and the resources, and are always responsible for higher level of decision making process. They can be divided into two different groups: local government and government administration centers.

(i) Local Government

The Village Development Committee (VDC) is considered as a lower level elected local government (LG) and it is further divided into nine wards. The VDC has legitimated for government power delegation at local level because their governance system is more likely importance to the needs of local communities. The local governments representatives were mainly elected either from political parties or independent member of society, since 1990s and while independent person was more prevalent in Panchayat Political System. The VDC and its governance system was made up of elected village council and authorities of chairperson and appointed bodies. The VDC secretary is paid employee of the government and he is playing leading role in developmental activities under the guidance of Village Development Committee Act (1990s) and Local Self-Governance Act (1999). But the elected authorities and their bodies were more accountable to their constituent areas. The VDC secretary told that:

> VDC has served the needs of the local village population. VDC Governance systems often interact with other institutional systems, such as sectoral administrative centres and donors for local development. It is mainly due to the local governments and its authorities are only legitimated for the planning, budgeting and implementing development projects.

As a result, they become more accountable to respond to local needs and priorities. But some of the major challenges for local government are: the limited support provided by central government, their limited capacity to carry out their responsibilities and the lack of coordination and networking between development associates. However, in such under-resourced conditions local government to take full charge of infrastructural facilities development such as construction and maintenance of road, suspension bridge, drinking water, irrigation, education and so on by local participation. Sometimes support of District Development Committee and donor agencies have also been playing significant role to local development.

(ii) Government Administration Centers

The government of Nepal has started the decentralization process in the mid 1980s. They are considered as basic service delivery systems at local level. Most of these service centers are located in the regional level and often known as government administration centres or Ilaka Level Service Centers of Agriculture, Veterinary, Health Post, Post Office, Police Station, Range Post and Education Resource Center at Chulachuli. However, physical distance (about 20 KM far) and poor infrastructure has far-reaching consequences to obtain Ilaka Level services from Chulachuli.

The figure reveals that the largest percentage of the public sector service center is accounted by the school with comparison to other government service sectors. Their spatial patterns vary depending on location and service delivery system. For example, the largest numbers of services are concentrated in Bhirgaundanda of the middle hill-slope with comparison to the upper and lower hill slopes. Health Post, Post Office, Family Planning Association (weekly clinic) and Nepal Red Cross Society are working with local communities. They are often known as social service organizations. The government administration centers are guided by the existing laws and orders as well as government-planned sectoral initiatives. One of the key informants from the Agriculture Development Office told that:

> The limited financial and human resource support provided by central government, our limited capacity to deliver services and lack of coordination between elected local authorities were some of the major challenges. Thus, our involvement in need identification, planning, budgeting and implementation jointly with the local government was meaningless because

we are more accountable to our higher level bureaucratic systems rather than local needs.

But the District Agricultural Office and its lower level extension service providers, like Senior Technicians, and Junior Technicians (JT and JTA), who normally helped to households at farm level. Pakhribas Agricultural Research Centre (PAC), National Citrus Fruits and Horticultural Research Centre, Paripatle have often involved in research, innovation and dissemination of appropriate agricultural technologies and HYV seeds and animal breeds.

7.2.2 Non-Government Organizations

Community-based organization is closely associated with the civilization of ethnic community. They are also known as membership organizations. In the study area more than 80 percent men and women are involved into membership organizations. They were frequently formed a small groups and engage in rotating credit association. Each participant regularly pays a small amount of money into a saving account and every weekend one member is paid out and uses the money to earn their livelihood. They are discussed under the heads of traditional and modern organizations.

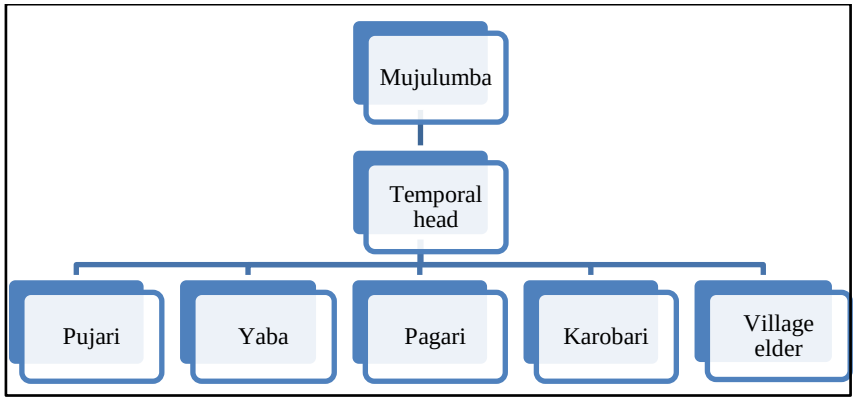
(i) Traditional Organization

The area is the homeland of ethnic communities of Rais, Magars and Tamangs. They are organized into their own socio-cultural groups. Their governance system is based on a complex system of customary rights. For this purpose, the Athapahariya Rais and their traditional organization system can be taken an example. They have well developed own their traditional organizations and authorities. The overall community is devoted and trusted to this authority. The main characteristic of this authority is the continuity of different types of rights which was based on village chieftaincies and village councils. The village chieftaincies and authorities are allowed the de-facto hereditary systems. The temporal-heads of the Athapahariya Rais is Subba (*Tututumyang*). One of the key informants told that their temporal-head was brought from Bijayapur (the successor of Bijayapure king or *Tumtumyang*) and gave Chhitlinge sub-clan by the aboriginal Athapahariya of Hombrak and Chhara.

The Athpahariyas' chieftaincies had established its own assembly of village caste councils (VCCs) which is known as *Mujulumba* or *Amalkachari*. Their formal

structure is shown in Fig 7.2. This council was more legitimated customary rights over resource management and land allocation as well as in socio-cultural and religious aspects of rural life. Members of Athpahariyas accept their authorities and communal decisions based on solidarity, equity and consensus of the people.

Figure 7.2: Organizational structure of Athapahariya village council



The village assembly and other de-facto hereditary systems of socio-cultural and religious functionaries were also playing significant roles to assist main authorities. Focusing on these functionaries, *Pujari, Pagaries, Bichari, Dhupaure, Yaba, Mangkata* and *Janawa*, some were involved in well being of public health, farming, cattle and fowl, others in the folk-medical treatments and the rest offered puja at local deities. The dispute in the overall local affairs was solved by the common decisions of the village authorities and advisory assemblies of linage councilors (Figure 7.2).

The village headman was in-charge of the whole Athapahariya community before the Panchayat political system. He was legitimated for local affairs of administration, judicial and financial functions such as collection and submission of revenue, accomplishment partition, punishment to sexual abuses, fine to divorced couples, conflict management settling a quarrel, reconciliation in conflicts and murder case. But their traditional organization has become less significant than previous days because of inspection of Panchayat Political system. Recently, they have reorganized their traditional organization into purely caste-based organization, namely *Athapahariya Rai Kirat Samaj, Nepal* since 1990s.

Guthi is another form of traditional organization which is still functioning in the area. Some other co-operations are also noticed in this area in different socio-

cultural and religious functions, such as Puja, marriage and *Suddhai* (funeral activities). Parma a reciprocal agricultural labour exchange system is more common phenomena in this area. These systems are widely practiced in different socio-cultural groups of Nepal, such as Dhikur of Thakali, Gram Majhi of the Dhimal and Parma/Pareli/ Nogar. All these refers to the reciprocal labour exchange systems in different communities in Nepal and can be compared with the Karbari system in the Chittagong Hill Tracts (CHT) of Bangladesh and the chieftaincies in Burkina Faso, Africa (Uphoff, 1986; Bhattachan, 2000; Donnelly-Roark *et al.* 2001; Padaki &Vaz, 2003).

(iii) Modern Organizations

The origin and evolution of modern organizations in this setting are associated with government and non-government organizational efforts. This involves attention to the associations of local communities into different organizations which is known as community-based membership organizations (CBMOs). The existing modern organizations in this area can be divided into community based organizations (CBOs), NGOs, user groups and networks. These organizations perform five main activity areas for rural development: natural resource management, rural infrastructure, human resource development, agriculture development, and non-agricultural enterprise. They are discussed as follows:

A. Community-Based Organizations (CBOs)

Most of the household members are involved in different associations of community-based organizations. They formed 29 organizations of women groups, sustainable village development groups, credit and saving groups (Table 7.1). Their decision making process is always responsible to local needs and priority. This includes needs identification, planning, budgeting, and implementation jointly with VDC and other development partners. Their role in community development has more closely reflected the broader shift towards local participation since 1990s. The VDC secretary told that:

> Community-based organizations are involving in different developmental activities while Local Self-government Act was accountable for policy implementation. This involves attention to every step of development planning process because the limited support provided by government. In this

> situation, local participation is playing an important role in physical infrastructure development. They often contribute to the provision of services of physical, social and economic sectors which influence the livelihoods of this region.

CBOs are more accountable to local participations. They have limited capacity to carry out their responsibilities to the livelihood changes. Table 7.1 shows household are involved in different organizations. This figure was calculated from household responses.

Table 7.1: Household involved in different organizations

Types of organization	No. of organization	Percent	No. of membership	Percent
NGOs	3	8.2	60	8.5
CBOs	17	45.9	197	28.1
Cooperatives	5	13.5	105	15.0
Women groups	7	18.9	140	19.9
User groups	5	13.5	200	28.5
Total	37	100	702	100

Source: Field survey, 2009

Table 7.1 shows different types of memberships in community-based non-government organizations, like NGOs, CBOs, cooperatives, women group and user groups. The figure indicates that the largest percentage of the households was accounted by user groups (28.5%), followed by the Sustainable Village Development groups in the second (28.1%) and least by NGOs (8.5%). Their efforts make the targeting of poor and disadvantage groups more effectively. For example, one of the woman key informants told that:

> Our group has often given priority to the livelihoods of the poor and disadvantage women. Our focus is not only to support to economic reforms but also to increase individual capabilities to earn better livelihood opportunities, such as improving health conditions, education, income-generating activities, water and sanitation, social awareness and infrastructure development.

The VDC record shows that households and their members are involved in the micro-finance and village level sustainable development groups. They are engaged in

rotating credit association for income-generation and livelihood diversification (Table 7.2).

Table 7.2: Saving and credit among the different groups

Groups	No. of HH	Saving (Rs)	Credit (Rs)	Investment area
Janasewa	25	2,25000	2,25000	Vegetable farming
Sustainable	18	90,000	90,000	Livestock and vegetables
Shreesamuha	17	1,90000	1,90000	Livestock
Mahilabikas	20	20000	20000	Livestock and vegetables
Chhintangdevi	9	15000	15000	Livestock and vegetables
Pashupati	17	50000	50000	Livestock
Sungava	10	110000	110000	Livestock
Margdevi	16	7000	7000	Livestock and vegetables
Hattidhunge	24	25000	25000	Livestock
Dantakali	16	36000	36000	Livestock
Makalu	17	68000	68000	Livestock and vegetables
Dhaulagiri	18	75000	75000	Livestock and vegetables
Total	207	9,11000	9,11000	

Source: Field survey, 2009

Table 7.2 shows the households are involved in different Sustainable Development Groups. It is made by VDC level. Their legitimated activities were collection of revolving funds and participation in local development. The households who saved their small proportion of income on monthly basis were Rs 4400 per capita in 2009. This saving often contributed in the livelihoods of different groups while they were largely affected access to loan (39.4%) during the period of last one year. This study reveals that more than 56 percent households are still dependent on local money lenders and bankers for credit. It is clear that rotating micro-saving has certainly supplemented to their financial needs. This contributes to the provision of farm inputs, expenses for foreign employment, vegetable farming and livestock rearing. Usually, group members are involved in small-scale income generating activities, such as vegetable farming, pig, goat rearing and petty trading.

Cooperative is also considered as membership organization. It is playing important role in local development and livelihood improvement. This study reveals that

the area has only one registered cooperative where more than 88 households (including 22 women and 10 local Janajatis) are organized into Panchakanya Multi-purpose Cooperative. Although a numbers of households are involving in unregistered cooperatives of vegetables farming, marketing, dairy, and irrigation management and road construction in the local area. They often contribute to the provision of physical and social capital formation because physical and social infrastructures are basis for the transformations in the livelihoods of the communities.

(B) Local NGOs

NGOs actors are also playing a significant role in the livelihoods of the communities. In the study area, NGOs have taken over service provision especially poor groups who have less access to basic education, health and credit facility. They also help to the more away from traditional intensive subsistence farming towards commercial farming of fruits, vegetables and ginger. Madhuganga Samaj Sewa (MASS) a right-based local NGO can be taken for an example who works with the fifteen CBOs. MASS provides some significant roles in the linking with VDC and funding of income-generating activities. Other contributions are related to advocacy, capacity building, literacy, coordination and networking. One of the key informants reported that:

> The contribution of MASS was focused on the livelihoods of Rai and Dalit communities. MASS often contributed us to various ways, following to livelihood change this includes needs identification, planning and budgeting for VDC planning. This has resulted into VDC support provided budget to the livelihoods of Dalit, Janajati and women as well as seed-money from donor agencies. This effort led to changes in traditionally associate farming with vegetable farming, livestock rearing and petty trading. The impact of all this has increased our earning sources through more than one livelihood opportunities.

In addition, district headquarters based non-governmental organizations (NGOs) are also playing an important role in local development. They often contribute to the provision of services and of physical and social infrastructure development. SOLVE, HUSADEC and PARDEP have often contributed to the provision of education, health facilities, drinking water and agricultural input services. But MASS is only local NGO working with the local communities since 15 years.

(C) User Groups (UGs)

The user group approach has been adopted in schemes for the development of community forest, small irrigation project, drinking water and road construction in the study area. This was attributed to the improvement in natural resource management. The goal of user group approach is to increase agricultural productivity through forest and water conservation. In addition to the above objectives, user group approach aims to increase employment through labour intensive activity. This has resulted that more than 90 percent households are involved into different types of user groups. All user groups have their own elected executive committees which consist of not less than 11 and not more than 15 members. For this purpose, Federation of Community Forest User Groups (CFUGs) has taken for detail consideration. They are discussed in networks of CBOs.

(D) Networks of CBOs

The government line agencies, local government, (I)NGOs and social volunteers are playing significant role in the livelihoods of this locality. They often need networking in local development. Nowadays, associations of different types of community-based organizations have taken place in the rural area; indeed it was centuries-old traditions in rural Nepal. They often contribute to natural resource management and sustainable resource use. Following livelihood reform VDC has coordinated different types of networking. They can be divided into vertical and horizontal networks. The federal structure of community forest user groups (CFUGs) can be considered as a vertical network while sustainable village development groups in the horizontal network. Both types of networks have been suggested by Uphoff (1986) and Padaki & Vaz (2003) in many developing countries including Nepal and India.

Federal Body of Community Forest Use Groups

In the study area, forest is a major natural resource. Its economic linkages are manifested by flows of forest products and services. It requires managing forest resource flows to support livelihood of the communities. District Forest Office has handed over its forest resource to local communities under the Forestry master Plan

through the formation of Forest User Groups. For instance, each settlement with its own Community Forest User Group (CFUG) and villages may get together in a network (Table 7.3).

One of the members of Chapeheet CFUG reported his success story:

> The area was barren when working with the assistance of Nepal-UK Forestry Project before 1990s. We began protecting the existing forest and planting new ones. We kept our livestock out of the planted areas and the forest quickly regenerated. We have practiced multi-storey agro-forestry systems to take benefits from community forest, for example, Uttis (alnus nepalensis), large cardamom and broom-grass. This success was mainly due to the effort of CFUG which has become an effective local organization for community forest management practice not only in this area, but also Dhankuta district.

Table 7.3 shows the numbers of households involved into different CFUGs. The result indicates that Madhuganga CFUG has accounted for the largest percentage of households (68.9%) followed by the Dansepakha CFUG in the second (13.9%) and least by Chapeheet (3.5%). The table also revealed the area covered by the different CFUGs such as the Dansepakha Community Forest has accounted for the largest area (41.8%) as compared to Madhuganga (31.6%) and Chapeheet (4.2%).

Table 7.3: Household involved in different CFUGs

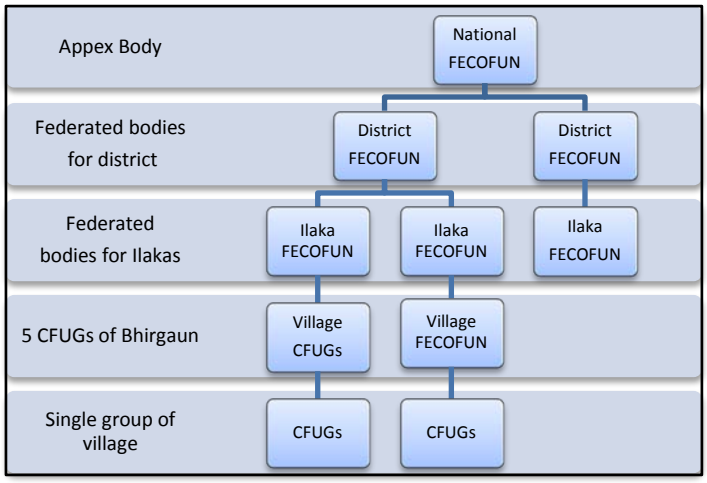
Elevation zone	CFUGs name	No. of Household	Area (ha)	Formation
Upper	Chapeheet	26	10.36	1992
	Dhandkharka	69	41.41	1999
Middle	Madhuganga	486	76.73	1999
Lower	Simle	64	13.5	1994
	Dansepakha	104	102	1998
Total		749	244	

Source: LFP, Dhankuta, 2009.

This study depicts its federal body structure (Figure 7.3). The vertical network is federal body structures which often contribute to the provision of livelihood of the communities. In the lower level, all households are united into CFUG. They have elected council of CFUG executive committee, which consist of 15 members of whom 25 percent must be women, Dalit and Janajati.

Their general body is made up of Chairperson, vice-chairperson secretary and treasurer. Broad meetings are held every month. They are more responsible towards the apex body of Federation of Community Forest User Group Nepal (FECOFUN) at the village level and Ilaka level. All the Ilaka come together as a district and district as a national level FECOFUN.

Figure 7.3: Vertical institutional bodies of CFUGs



Source: FECOFUN, Dhankuta, 2009

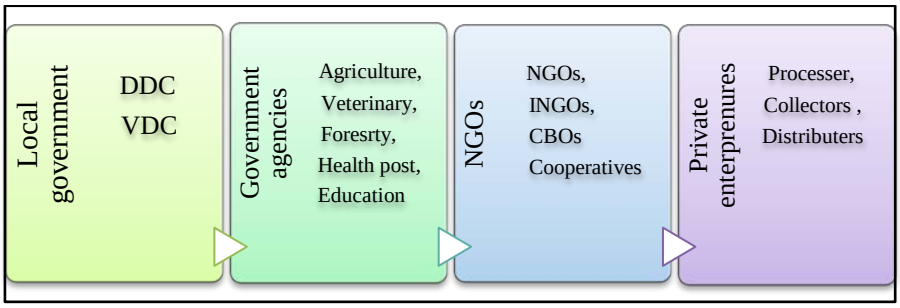
The district level FECOFUN is more responsible to local needs and priorities. This involves needs assessment, planning, budgeting and implementation of their priorities, such as social awareness, organization development and income-generating activities. Their decisions are intimately the broader transfer towards local participation and create more accountable organizational systems.

The figure depicts the hierarchical arrangements of CFUG into FECOFUN at different levels which consists vertical associations of local, Ilaka, district and national level FECOFUN body. This type of arrangement was discussed by Padaki and Vaz (2003) in the study of membership organization and their federated body structure in India.

Horizontal organizational structure is also important to resource interactions among different development actors. It is observed that VDC, government agencies, NGOs and private entrepreneurs often contribute to the same livelihood pursuit. They create horizontal network for the development of Sustainable Village Development

Groups (SVDGs) which was stated in Table 7.3. Horizontal networks are more accountable to the service delivery systems.

Figure 7.4 Showing horizontal institutional bodies of SVDGs



Source: VDC Record, 2009

Figure 7.4 shows the horizontal federal structure of SVDGs. It is consisted by both governmental and non-governmental membership organizations because they have similar goals and priorities to local development. The result is that SVDG members especially poor and disadvantage groups who have less access to basic education, health facilities and income-generating activities are better in this area. Now they can respond to diversified livelihood pursuits as stated in Table 7.3.

In the case of agricultural sector, complexity of agriculture comes in part from the variety of units and local organizations which are involved and form the difficulties of a good fit among the sets of institutions. Supporting institutions represent the crucial link in getting effective and broad-spread agricultural development. In this context, Uphoff (1986) attempts to role of local development planning and implementation are the relationships between individuals and organizations that physical, economic, and social circumstances. The relationships are both horizontally (among persons and institutions at the same level for creating initiatives for cooperation among different organization) and vertically levels for inputs, processing, marketing, transportation and storage (P.137).

7.2.3 Private organizations

With increasing accessibility of road transportation private sectors are interested to invest agribusiness. It is mainly due to local organization and their efforts were inadequate to development interventions. The provision of public private participation in local development has led to the growth of private organizations, since 1990s. In the study area, many private agro-entrepreneurs were involved in

agribusiness in the upper hill-slope. The Guranse tea estate (Guransedanda), Narayani tea estate and Kuwapani tea estate were established at Hile bazaar. Dairy collection centers, milk chilling centers at Hile and Jorpati, and dairy processing cottage industry *(Chhurpi making)* in the middle hill-slope are also equally important to the growth of private organizations.

The private sectors have provided some amount of credit either for buying milking cows/ buffaloes or tea plantation. Their financial, technical and marketing efforts were important to organize households into dairy or tea producer farmer cooperatives. This study reveals that the relationship between private sector and local communities has improved situation and has encouraged the cooperative to produce green-tea and milk for market especially in the upper and middle hill-slopes. The impact of all this is discussed into two groups, such as small business and market chains.

(i) Small Business Organizations

Business activity is a locational characteristic in relation to surplus products, transport facilities and demand for goods and services. Business activity is a process of interaction among producers, distributers, buyers and users. It requires market size threshold below which a place will be unable to supply goods and services. However, the study area has covered small area on the surface of the earth around a settlement that offers limited goods and services to people living in this area. As a result, there are voluntary small business activities organized with their own capital with various types of goods and services. One of the informants who involved in business told that:

> The main occupation of this area is agriculture which is at subsistence level that is whatever produced is consumed by the household. Lack of surplus production and low population size do not support to the growth and development of profitable business activities. This is the main reason for business activities to be local level. We often offer lower orders of goods and services.

This statement indicates that there exists a wide range of spatial variations in the business activities, which is the result of geographical environment, regional economy and population thresholds. The area has not followed the rules of articulated business activity.

Periodic markets locally known as hat-bazaars are playing significant roles in small business activities. Most of the households are the producer-sellers of their farm produce on specific day in specific place. Periodic markets may be considered as a place of contact where hundreds of farmers from different villages gather. This study reveals that more than 80 percent households who are the producer-sellers of local husking rice go to Thursday market place at Dhankuta from Suntale, vegetable from Baire and western side of middle hill-slope. The primary objective of the farmer is to sell the produce and to buy whatever they need. They often buy Kirana, cooking oil, tobacco, spices, and farm inputs from the same market place. Hile is the second largest Thursday market place and Sunday market place at Jorpati also provide the same services for the upper hill-slope as like Dhankuta.

(ii) Market Chain

The marketing system has played an important role in the livelihoods of the study area due to a range of possibilities and niches support to the growth of market economy. Market causes local changes because it also helps to unify the region and increase its economic potentiality through market chain. The regulated market chain also helps to move away from traditional agriculture towards commercial crops. This change is only possible followed improving transport facility and access to markets. Most of the households get more opportunities from both farm and non-farm activities in the same area.

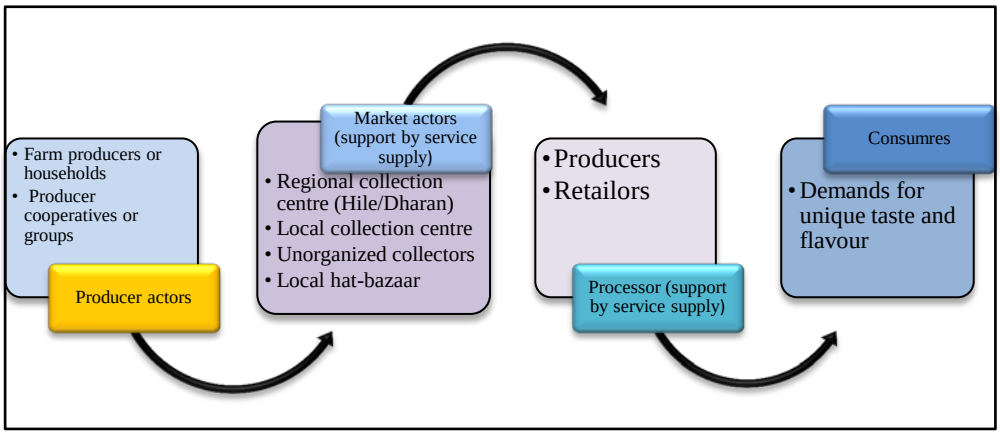
The study area is usually impeded to other economic regions especially in Tarai but which often provide resources. The result indicates that doubts arise as to the livelihood improvements which the overwhelmingly of households have obtained economic opportunities from increasing access to road and markets. The livelihood is considered purely economic factors which, in turn, are linked with markets. This process has accelerated commercial activities with increasing access to markets. Megendra Gurung told that:

> In this area, CEPREAD a national level NGOs support provided farmers new farming methods of off-season vegetable production. In addition, construction of Koshi-Highway has also provided better marketing facility when four-wheel vehicle makes easier to export more profitable crops. Because of this area produce a large quantity of agricultural produce, such as

potato, cauliflower, cabbage, radish etc which are greater demand in the outside markets with their unique taste, colour and flavor. They are known as high-value cash crops in this area. However, the producer-sellers of agricultural produce are needed to qualify their products.

This statement proves that commercial activities are increasing through access to markets and marketing channels especially in the upper hill-slope. Figure 7.5 gives an idea about expected market chain of vegetable producer farmers in the upper hill-slope. The households sell their products either directly to the local collector in the small market centers like Trisule, Hile, Guranse, Jorpati or local hat-bazaars like Hile, Jorpati and Dhankuta. Many households now have maintained the quality of their produce because they know that good quality means good returns. Another impact of market chain is the change in behavioural pattern of the households. Now most of the households bring their produce for sale to either local unorganized collectors or farm-gate trades because they can be considered as active agents of market.

Figure 7.5: Expected market chains of vegetables



This study reveals that more than 50 percent households sell their produce at local collection centers, followed local hat-bazaars in the second (30%) and lowest for farm-gate traders (20%). This facilitates households to sell their vegetable produce in the regional collection centers outside the area. But individual households cannot get good price for their produce to regulated market like CEPREAD.

In addition, consumers, hat bazaars and agro-processing industries are also considered as a part of market chain. This study reveals that households are gradually

getting out of the grips of middleman, as they now receive better price for their produce from a wider markets outside the regions like Dharan, Biratnagar and even in Siliguri and Jogbani of India. Thus, market chains are providing help to households in improvement of the agricultural system as well as standard of living.

7.2.4 Donor agencies

Donor agencies supports have been a part of development interventions in this area. The major interventions have made by British Government in the Koshi Hills in different sectors. Along this line, substantial efforts were made to promote the potential physical and human resources through construction of the Dharan-Dhankuta road, establishment of an agricultural research center at Pakhribas, providing technical assistance in agriculture. The implemented integrated activities are improvement of the strong marketing facilities for farm and non-farm production, increase crop-livestock and forestry production, and rural industries. In addition, infrastructure development in road, education and drinking water; institutional development in agricultural extension service, Small Farmer Development Programme; and education and training programs are also important development interventions. Most of the households in the study area thank to the contributions in agricultural sector, education, health and social awareness efforts of KHARDEP. LFP, CEAPRED, CLPN, CADP, CSP have also supported in the field of forestry, commercial farming, community literacy and community support programmes.

7.3 Local Organizations Efforts for Livelihood Improvement

Earlier, agro-pastoralism was the main occupation of the study area. It is mainly due to the nature of terrain imposed severe limitation on the scale of productive activities and on the efficiency of infrastructure and facilities. This is the main reason for its economic activity to be at local level. But this situation has changed now with increasing development interventions in different sectors. The result indicates that a lot of changes have been taking place in terms of access to road, irrigation, introduction of new crops, livestock and remittances. In addition, extension government services, electricity, drinking water, education, health and market are also important. They are discussed as follows:

7.3.1 Access to Roads and markets

Bhirgaun VDC was accessed for the road after the completion of Koshi-highway (Hile-Jorpati section). It is connected by the feeder or agricultural link roads from Hile bazaar ranges with 4 KM from the Chanpe to 8 KM to the Bhirgaundanda. The trunk road took gradually to build from Bhirgaundanda-Madhuganga-Suntale-Baire and Dhankuta bazaar (30 KM) and Dhankuta-Ramite-Madhuganga (10 KM) which was a long time but local people have reported that it was all built by their own labour since 1997. Koshi highway was begun as part of KHARDEP with British ODA support in the late 1970s. In addition, District Development Committee, Village Development Committee, Department of Local Infrastructure and Agricultural Roads and Commercial Agricultural Development Programme have supported to the extension of feeder roads branching from the highway as stated above. The advantages of the road was that most of households reported 'we eat rice all the time now' rather than the occasional consumption at special occasions in the past. This study suggests that there is also a status which is associated with eating rice because eating rice all the time refers not only to the possibility to bring rice into the area in large quantities but the increased purchasing power of households at least in part resulting from increased market access for their products.

The road access increase the opportunity to sell agricultural product in larger quantities and with less spoilage remains a major and significant impact of the roads and continues to be the prime rationale for extending the road networks further. But the provision of exports, in turn, may vary depending on location and scale of productive agricultural produce for markets. For example, upper hill-slope exports more quantities of vegetables, potato and milk with comparison to middle and lower hill-slopes.

7.3.2 Agricultural Crops

Earlier, subsistence agriculture was the main occupation in the study area which was dominated by traditional staple crops of maize, potato and wheat in the upper hill-slope while maize, paddy and millet in the middle and lower hill-slopes. Most of the households were sufficient with their limited agricultural production with various other activities, such as livestock, petty trading, *Lek-Bensi* barter system and migration. They consumed whatever they produced with little surplus for the market.

But this situation has been changed nowadays because of individual effort, diffusion of new agricultural technology, markets and access to road. Most of the households in the upper hill-slope have switched maize with commercial vegetables, potato and milk tea, broom-grass and large cardamom which were introduced either own trial and error methods or support provided by District Agriculture Development Office, KHARDEP, Pakhribas Agriculture Research centre and NGOs like CEPREAD (Khatiwada, 2010).

The introduction of commercial vegetable farming has also increased this situation with the application of chemical fertilizers, pesticides and herbicides with increasing access to road and markets. The Magar informant from the upper hill-slope stated that 'we are proud of this place because it provides us many income earning opportunities and economic possibilities. We earn more than Rs 300000 annually from commercial crops, since 1995s'.

Environmental degradation in this area is set against a background of rapid population growth placed great pressure on the natural landscape since 1971s. Indeed, the agricultural economy is under severing threat from landscapes degradation due to improper uses of soils and marginal lands.

Vegetable production with the support of Centre for Environment and Agricultural Policy Research Extension and Development (CEAPRED) was another effort in income generation especially for women. With the help of this project, majority of households have initiated to produce fresh vegetables for export along the Hile-Basantapur road corridor, such as Chanpe, Guranse, Magargaun and Upper Kintang. Most of the vegetable grower households reported that they were switching from maize to vegetable cultivation because potato, cabbage, cauliflower, tomatoes, beans and chilly making good income than maize and millet cultivation.

Koshi Hills Seeds and Vegetable Project and Commercial Agricultural Development Programme are also working in this area. All these donor supported development interventions have strengthened capital assets of this area. They are ranging from natural (land, water and forest), physical (road, irrigation and health services), human (capabilities, education and training), social (institution, gender relation and cooperation) and financial (economic linkages). These efforts have broken the economic relationship between hills and Tarai that of a hinterland-

metropolis type, although the area still serves raw materials for the lowland economies; indeed, it was widely practiced in the HKH regions (Jodha, 2000:550).

7.3.3 Livestock

Livestock rearing is important part of the commercial activity correspond with agricultural system. The commercialization of milk has meant that it has become an important source of income. For example, dairy cooperative households, milk sales made significant contribution to total income in the upper and middle hill-slopes while lower hill-slope remains at the lowest level. Both private and National Dairy Development Corporation supports have developed chilling centres at Jorpati and Hile bazaars. Local communities have collected milk in different centres and 4-10 persons were regular involved to dairy transportation. In addition, keeping goat, pig and chicken for meat are also considered as a growing income and employment sources. This change was the efforts of KHARDEP and Pakhribas Agricultural Research centre, District Agriculture Office, Small Farmer Development Programme and private sectors.

7.3.4 Migration and Remittances

Historically, migration has been a key factor in shaping households livelihoods in the study area. The overwhelmingly majority of family members are engaged in a variety of migration. Some have moved out to lowland agricultural areas. Some migrants have moved directly to cities for work and education while some were abroad for seeking better income and employment including Indian and British arm-force. They were seeking newly growing overseas employment because of increased flows of information, new employment opportunities by neighbourhoods who have gone abroad and media effect. The reason that people migrate was mainly because of the paucity of land and declining productivity. Work abroad was widely considered as easier and incomes are better. There is also a perceived status associated with working abroad and a prevalent perception towards migrant workers. Remittance is more likely to increase households' access to assets such as solar panels, improved CI sheet roofs, plastic water tanks, TVs, dish antennae and other electrical goods and sending their children to 'boarding schools. This statement was supported by the findings of Koshi-Hill area project evaluation teams (GRM *et al*, 2012).

7.3.5 Community Forestry

Forestry sector is a key livelihood asset in this area. Community forest was another increasing source of income in the study area. The community forestry programme was often viewed as the law of government of Nepal. In the present study area, community forestry programme has been initiated in 1999, when the government of Nepal had handed over state-owned forest to Community Forest User Groups (CFUGs). Livelihood and Forestry Program (LFP) record shows that about 220.73 ha forest cover area had handed over to CFUGs for conservation, management and sustainable use of forest products. In this area, most of the forest land was under the control of different community forest user groups (CFUGs). For instance, Chanpe-Heet, Madhugang-Salleri, Dansepakha, Simle and Guranse five CFUGs are involved in the forest management and conservation practices.

The community forest sector in this area has received assistance from government of Nepal and donor agencies. KHARDEP was the first instance of forest conservation programme to support in Chanpe, upper hill-slope. Given that deforestation was considered and nurseries to support plantation work. Koshi Hills Community Forestry Project, Nepal-UK Community Forestry Programme and Livelihoods and Forestry Programme were some of the major donor support programmes this area. All these efforts, expanding partnerships in forest conservation, changes in forest resources and ultimately it support to changes in socio-economic conditions of households.

Local communities have improved their physical assets through the export of multi-storey agro-forest products and resin as stated above. The regulations are often interpreted such that the forest is open once per year for people to collect fodder and cut a restricted amount of timber. One key informant from upper hill-slope told that: exporting timber provides income and employment opportunity for local people. For example, a young man who employed to cut and carry Uttis trees can earn relatively good wages (more than Rs800 per day) compared to other wage labour. In addition, community forest user groups have also provided access to loan for income-generating activities especially for Dalits and marginal communities.

7.3.6 Other Activities

Communication

Communication is certainly important, improving spatial linkage not only for personal contact but also positive impact on marketing of agricultural production. Telephone sets and mobile phone are major sources of communication. The mobile phone was regarded as a significant development because every household had at least one mobile phone. However remote, they sell recharge cards in some of the busiest shops in the Hile and Dhankuta.

Education

The education status and perception of education has changed enormously in the last twenty years in particular. Examining the education levels of households and host households were different depending on age, sex and caste and ethnicity. This study reveals that most of the grandparents (60+) often with little or no education, parents (40-60yrs) with some education (often only to primary level and men more than women) but their children (20-40) with secondary education and the current school-going numbers very high with parity between boys and girls. This result has proved when there were often more girls than boys in many schools. The change in education status was attributed by the increasing access of primary schools at ward level although many of the children had still to walk over an hour to primary school. The extension of schools to 10+2 has made a big difference to continuing education in Hile and Dhankuta for higher education. Dropping out was a serious problem in the past; boys to work on the farm and girls to get married. This has largely changed, but some have problems of regular school attendance and teenage boys are now more likely to drop school than girls.

Health

Health condition improvements were rarely noted in this area. The indigenous systems of medicine have been existence for several centuries. The majorities of households are still rely on folk medicine as well as traditional Dhami and Jhankri, however, only in the last ten years or so, are supplemented by support from commercial medicine shops in Hile, Jorpati and Dhankuta. Most of the low income groups preferred to go to the government health post at Bhirgaundanda.

Electricity

The importance of electricity is increasing not only for lightening but also a key to development of small-scale industries since 1995s. Before people used kerosene lights and used battery-operated radios. The main advantage of electricity expressed by our families was the possibility to charge their mobile phones. Electric powered grain mills were also mentioned as an important change in recent years and important in terms of the time-saving achieved by not milling at home. Banchare Khola Hydro Power Station and District Electricity Office provided support to electricity supply in rural areas.

Irrigation

Most of the irrigation systems are managed by the local communities, which rely on the Tankhuwa Khola, Nibuwa Khola and other streams. The remaining irrigated land in Suntale, Baire, Lower Kintang and Guragain Toles are served by the District Irrigation Office through the assistance of external donors, such as KHARDEP and Asian Development Bank. District Development Committee and VDC supports are also equally important to construction, maintenance and operation of irrigation systems. This study reveals that most of the irrigation systems are built and managed by the communities themselves.

Local organizations

Local people were involved into different membership organizations. Generally they were found in farmers association of commercial dairy cooperative, vegetable producer farmers' cooperative, community forest user groups, women groups, and other user groups. Most women were involved in rotation saving and credit groups in which most of them were self-initiated and some had been facilitated by NGOs. Their roles can be divided into three groups in this consideration, such as: internal, external and support to livelihood change (Figure 7.6). They are discussed as follows:

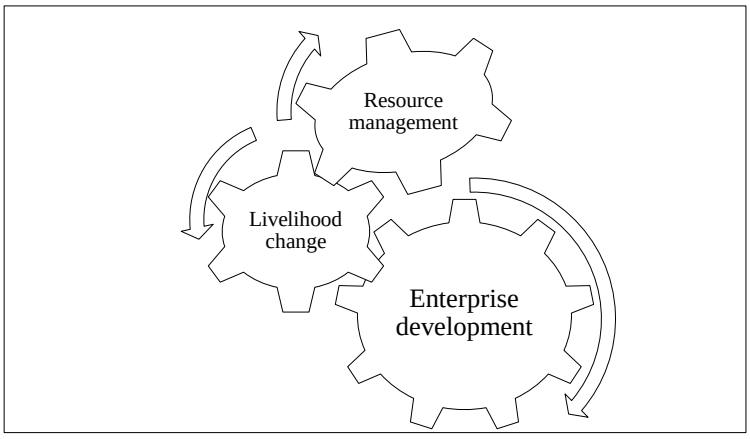
(i) Internal Role of Local Organization

The local organizations are playing an important role in capacity building because individuals' capability affects access to diversify livelihood options. Each and every individual is made up of many livelihood interests, each with its own individual

differences, such as age, sex, education, skills, health and information on market prices and fluctuations. In this context, local organization can contribute to the setting vision, mission and goals to respond to local needs and priorities. This is the result of local participation MASS has recognized to identify their working area, target groups and development priorities (Figure 7.6). The chairperson of MASS told that:

> When we involved in practicing participatory organization capacity analysis process (POCAP) then we identified our working area, target and development priorities. The result is that low-income groups of Dalit, Rais and disadvantage communities who have gradually increased access to education, health and income-generating activities opportunities, since 2002. Our focus mainly is based on capacity building, resource management, entrepreneurship skills and livelihood changes.

Figure 7.6: Role of local organizations

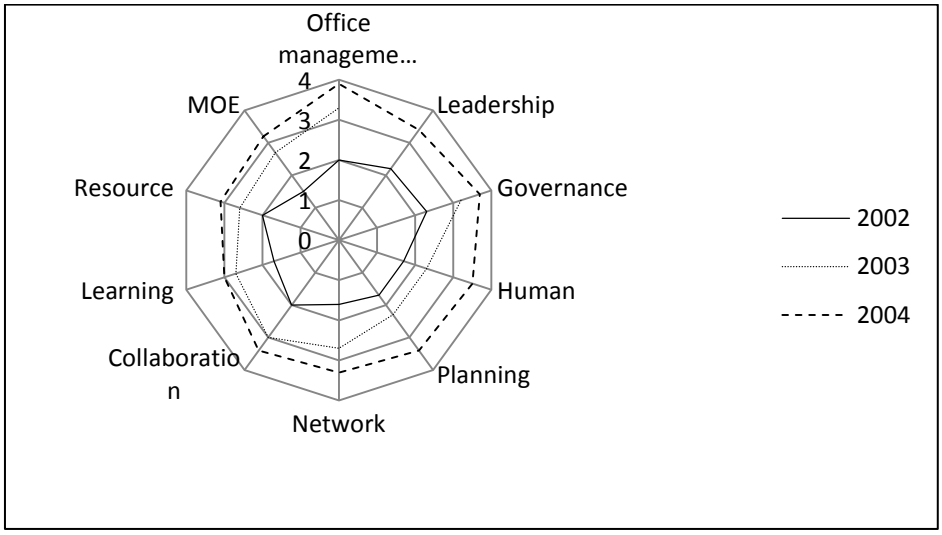


There have been a lot of internal changes seen when MASS involved in participatory organization capacity analysis process. For this purpose certain indicators were developed which underpin and affect livelihoods in the study location. For this, an attempt is made by the calculation of five point scales which ranges from 1 to 5 such as very poor (1), poor (2), good (2-3), better (3-4) and best (>4). The average calculated values of different indicators are gradually improving in 2004 as compared to previous year (Annex 7.1).

Figure 7.7 is a spider diagram showing how the variables have changed for MASS in the study area. The score for all indicators range 3 to 3.9, thus their internal structure is better than previous year in 2004.

The community analysis process (CAP) can be applied to identify livelihood status of different communities. Pankhidevi Sustainable Village Development group (SDVG) from the lower hill-slope can be taken for an example. The computed average value of each parameter was 2.0 which indicate the poor livelihood condition in this area, while it was 2.5 for Jwalakanya SDVG in the middle hill-slope in 2004.

Figure7. 7: Changing organization level of MASS



Source: MASS record, 2009

(ii) External Role

The local organizations are responsible for a wide range of functions. This includes needs identification, participatory planning, budgeting and implementation jointly with local government. The result is that in the community analysis process they are more closely shift towards local participation. The process has a desired to create a more accountable and better to respond to local needs and priority. They often contribute to identify development partners who jointly go hand-by-hand for resource mobilization and program implementation.

The MASS chairperson again acknowledged that networking among the different actors with meaningful support was one of the achievements of organizational effectiveness in this area. The local government allocated regular budget and heard the voice of woman, Dalits, poor and marginal groups which can be taken as an example of networking. This involves attention to the livelihoods of different communities and to the reason underlying these changes. Their support was provided to produce vegetables,

potato and fruits, meat and milk which are greater demand in the market. It is only possible joint efforts of VDC, government service centres and NGOs/CBOs.

(iii) Livelihood Change

The above discussion shows the increasing relationship between local organizations and individual or households where livelihood situation is critical. It is also the consequence of financial resources and shifting of responsibilities and costs away from VDC authorities.

Table 7.4: MASS's input for livelihood change

Inputs	Livelihood change indicators
• Participatory planning • Training and lesson • Knowledge and skill development • Information collection and analysis • Linkage building • Innovative action plan and budgeting • Resource mobilization	• Policy change in local government (budget allocation and linkage and Rs. 1.3 million received from donor) • Strengthening diversified livelihood strategies, shift of traditional agricultural products into markets (off-season vegetables, milk, poultry, fruits) • Promotion of indigenous and apprenticeship knowledge and technology • Livelihood patterns as being multi-faced especially low income groups who have less access to resources and involve in agricultural and non-agricultural activities

Source: Adopted from Khatiwada, 2008: 78

Some of the major challenges for livelihood changes includes: the limited support provided by central government, their limited capacity to carry out their responsibilities, and limited infrastructure facilities in the economic development of the area. They are considered as far-reaching consequences and resultant affect on the scale of productive activities. This is the main reason for agro-based livelihood patterns to be at local level. In this context, MASS efforts to the livelihood changes of different groups can be depicted in Table 7.4.

7.4 Planning for Livelihood Change

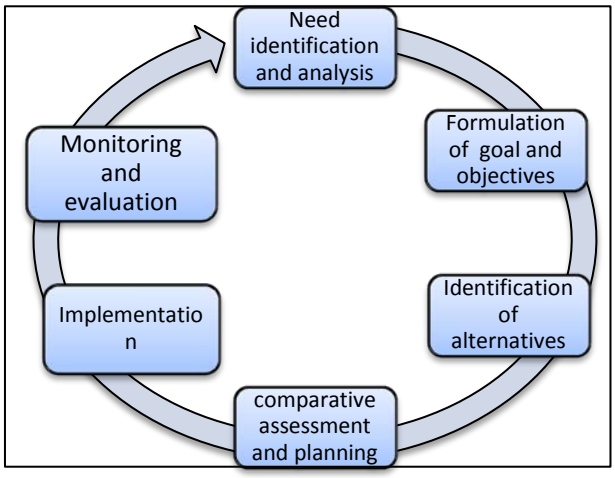
Livelihood change is important in a wider sense. It is only possible if the development plan more closely reflects the sense towards local participation because it is a better way to respond to local needs and priorities. The local development priorities have incorporated many of the livelihood issues and relative importance has given to agricultural development. However, the Local Self-governance Act 1998 has been guided by the periodic and medium-term plans on squarely on economic development, social development, and physical infrastructure development,

organizational capacity building, and population, environment and settlement development sectors. The plan has also assumed the importance of comparative advantages of agriculture, either in food production or in the growth of non-farm sectors. It depends on the individual circumstances of this area particularly in agricultural sector with linkage. But the mechanisms creating these linkages are not spell out because the sectoral focus of the plan leaves little space for such linkage. In addition, lack of elected body for a long, poor planning, budgeting and implementation processes during last 15 years are most crucial points in agricultural development. The local needs, priorities and budgeting are inadequate emphasis on economic development. For example, the largest percentage of budget was accounted by the physical infrastructure development (50%), followed by social development in the second (25%), economic development (15%), organizational capacity building (5%) and population, environment and settlement development sectors (5%) in 2009.

Types of Participation

Majority of households are involving in local development. Their participation is mainly comprised to physical infrastructure development (road, irrigation, and drinking water), social development (school, cooperative, social networks) and natural resource management. MASS chairperson told that the relationship between local government and communities is to create more closely to participation. Ward councils and VDC councils were more responsible authorities to contribute local needs and priorities. The LSGA policy is accountable for the provision of support depending on the nature of developmental activities. Thus, exact amount and types of participation cannot be said. The level of individual participation has been playing significant role in the livelihoods of different households. This involves participation in needs identification, planning, budgeting and implementation at different levels (Figure 7.8). These, in turn, vary depending on individual difference of education, gender, authorities and social status.

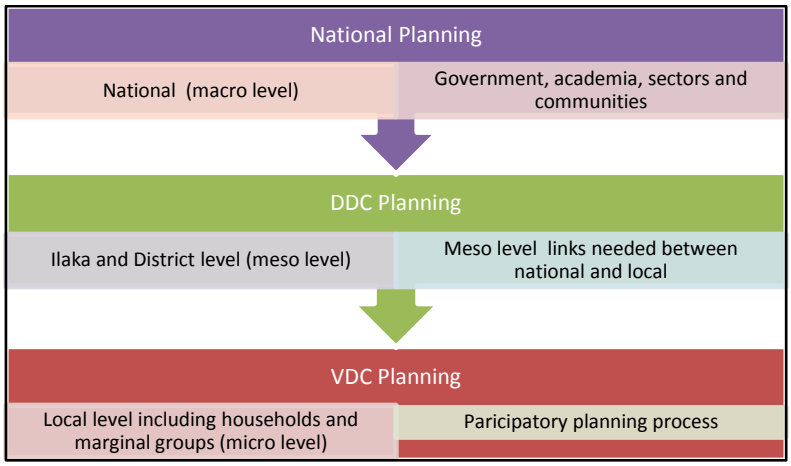
Figure: 7.8 Schematic representation of planning model



The VDC secretary reported that:

> All household members are involved in every steps of planning process, as developed by the government of Nepal, with quite effective ways to needs identification, planning, budgeting and implementation. One day ward level meeting is organized. Each and every household are involved in their needs and priorities assessment under the authority of elected ward chairperson. It is assumed that all households or segment of communities were actively participated in every step of planning processes. This involves attention to the positive changes in the rural areas where more than 80 percent livelihoods is depending on agriculture.

Figure: 7.9 Schematic represents planning model



Present study found that the planning process has guided by the national planning commission and LSGA. This makes vertical linkages of local problems in the national levels (Figure 7.9). This process is based on bottom-up a development strategy which provides autonomy to each and every aspect of communities such as women, Dalits and minority groups in wider development activities. This process has often contributed to the provision and maintenance of local development and they are thus largely related to the livelihoods of different groups.

This study reveals the facts about how households are involved in planning and implementation. Their levels of participation can be measured in terms of very active, active and inactive. Table 7.5 shows the levels of households' participation in all process of local planning and implementation process.

Table 7.5: Households involved in development activities

Participation	Distribution of household by elevation zone (percent)			Average
	Upper hill	Middle hill	Lower hill	
Very active	5.7	10.7	16.4	10.9
Active	52.4	52.4	63.4	56.1
Inactive	42.1	36.9	20.2	33.1
Total *	29.1	38.8	32.1	

Note: Total indicates percentage of total population*

Source: Household survey, 2009

The result indicates that about 10.9 percent of the households reported that they are very actively participated in VDC planning and implementation processes. But, most of the households (56.1%) are involved in need identification, planning and implementation at ward level. They can be considered as active participant. About one third (33.1%) households are inactive because their participation could not influence in decision-making process.

In this view, a key informant told that:

> In Panchayat political system, our development plans were prepared by outsiders and we have no reference of the local participation. They fixed our priorities which didn't address our needs and priorities. Nowadays, things have changed, the decision about our needs identification, planning and

> implementation that is really mattered of ward councils (the actual users), however, some degree of local management for our development priorities are continuing by traditional financial support systems.

This statement indicates that local participation in developmental activities has been increasing in this area. Although the study location is in such under-resourced area, it is unrealistic to expect central government full charge of basic infrastructure development. They are able to construct the road from Dhankuta-Suntale-Madhuganga-Bhirgaundanda to Hile and different irrigation projects with little supports from government.

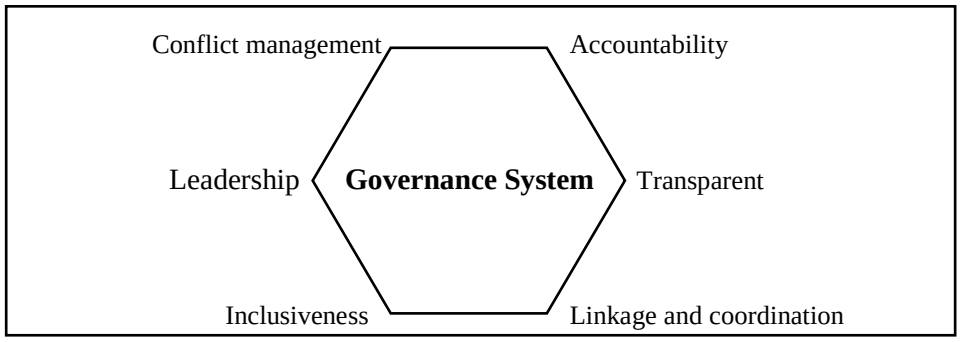
In this area, road still under construction provides access to households in Chanpe, Guranse and Upper Kintang to the Dharan-Dhankuta road. The main advantage is that households can transport milk, livestock, potato and vegetables out and bring in other goods. Here production and marketing of these items has transformed the economy and provided households with disposable income. Bhirgaundanda, Ramite and Suntale which are considered remote and where there is poor earthen road access (15 KM) to the district headquarters in Dhankuta. Most of the households still indicated that the road was a key development because they had to walk for three to four hours as no vehicles due to the bad road in the rains. Inhabitants expressed a hope that the road would be extended to this area to broaden their livelihood opportunities and bring in cheaper goods.

Governance System

The local governance system in this area is important aspect of customary rights. This involves attention to the changes in the different types of rights especially land, water, forest, financial capital, information on market prices and social inclusion. Access is also mediated by a combination of factors ranging from national policies of land tenure system, village level characteristics of ethnic composition and natural resource bases, and differences within and between socio-cultural groups. VDC governance system is largely affected by accountability, leadership, linkage and coordination, inclusiveness and the ability to manage local affairs. The result indicates that the role of VDC is found to be more significantly successful in promoting inclusiveness and accountability, although it has limited capacity to carry out its

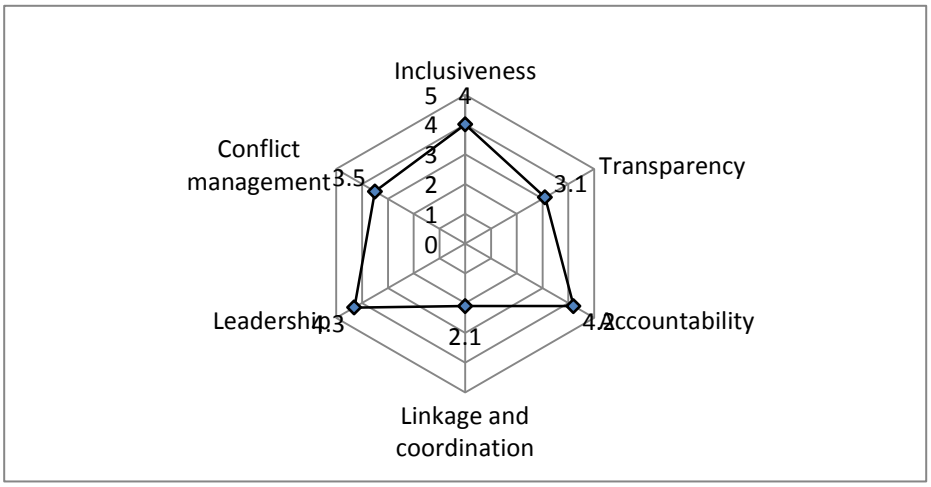
responsibility in linkage and coordination among NGOs and donor agencies (Figure 7.10).

Figure 7.10: Good governance system



The semantic values of local responses about the VDC governance systems can be described on different scale (Figure 7.11). They can be divided into five point scales: very good, good, indifferent, poor and very poor and valued at 5, 4, 3, 2, and 1 respectively. It remarks to the DADO (2009) statement in the background is still important in agricultural development and their governance systems (7.11). Figure 7.10 shows the VDC governance system in the study area. The result indicates that leadership accounts the highest score (4.3) and least by the linkage and coordination (2.1).

Figure 7.11: VDC governance system



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governance system in the study area. The result indicates that leadership accounts the highest score (4.3) and least by the linkage and coordination (2.1).

Local organization for agricultural development is more complicated than other activities: because two different types of organizations are involved: supporting organizations and units of production. Uphoff (1986) argues that 'these activities needs to be support for agriculture in the form of policies and programs at different levels… Supporting institutions represent the crucial link in getting effective and broad-spread agricultural development' (p.12).

7.5 The Mark of Livelihood Problems

Most of the livelihood problems are related to the provision of basic services of physical infrastructure, health, education and government service delivery systems (Table 7.6). These problems are largely related to transformations in the agricultural sector where it still contributes the livelihoods of more than 80 percent of the workforce. Changes in the nature and scale of production activities and their relevance to the livelihoods of different groups has affected by access to irrigation, roads and markets.

Table 7.6: Livelihood problems by relative proportion (n=207)

Problems (order)	Responses		Problems (order)	Responses	
	Frequency	Percent		Frequency	Percent
Irrigation	165	80.5	Improved seeds	84	41.0
Road access	156	76.1	Lack of credit	66	32.2
Agricultural support services	121	59.0	Appropriate market price	46	22.4
Drinking water	107	52.2	Coordination	17	8.3
Marketing	106	51.7	Others	30	14.6
Training	109	53.2			

Source: Field survey, 2009

But local government can be mediated by a combination of factors ranging from education, skills, health, credit, transport and market. These factors are playing significant role in the process of socio-economic change because market and transport unify the area into wider economic regions and increase its economic possibilities.

Table 7.6 shows the multiple responses about major livelihood problems facing by households in the study area. The largest percentage of the households (80.5%) stated that irrigation is the major problem, followed by the access to road in the second (76.1%), agriculture support services (59.0%) and least order by the coordination (8.3%).

The households have also suggested to the changes in their own livelihood status. It has very important meaning because their suggestions are often contributed to the improvement in the limited support provided by government, their limited capability to effective service delivery systems and governance systems. These factors affected access to resources. But these suggestions vary depending on location and individual differences of age, sex, education and caste and ethnicity (Table 7.7).

Table 7.7 shows the individuals or households suggestions for their livelihood improvement. The result reveals that the largest percentages of the households (81.5%) have suggested to the improvement of irrigation facilities because the area has larger potentiality of irrigation in the middle and lower hill-slopes. It is followed by the access to road transportation in the second (73.3%) and regular supply of drinking water in the third (69.3%). Other suggestions are related to the government service delivery systems, regulated markets, control market prices, credit for income-generating activities, and investment in research and development and increasing coordination and linkages.**Table 7.7:** Suggestion for Development by relative proportion (n=207)

Suggestions (order)	Responses	
	Frequency	Percent
Increase Irrigation facility	167	81.5
Increase access to road transportation	151	73.7
Regular drinking water supply	142	69.3
Effective agricultural support services	116	56.6
Organized marketing facilities	107	52.2
Market price stability	72	35.1
Access to credit	57	27.8
Investment in income generating activities	47	22.9
Increase health & education facilities	43	21.0
Investment in research and development	41	20.0
Increasing coordination and linkages	21	10.2

Source: Field survey, 2009

Table 7.7 shows the individuals or households suggestions for their livelihood improvement. The result reveals that the largest percentages of the households (81.5%) have suggested to the improvement of irrigation facilities because the area has larger potentiality of irrigation in the middle and lower hill-slopes. It is followed by the access to road transportation in the second (73.3%) and regular supply of drinking water in the third (69.3%). Other suggestions are related to the government service delivery systems, regulated markets, control market prices, credit for income-generating activities, and investment in research and development and increasing coordination and linkages.

The above discussion shows that local organizations have been playing key roles in development activities in this area. Their efforts have qualified human and financial resources, infrastructure development and service delivery systems. In this process, numerous government ministries and departments, local government, NGOs, donor agencies and private sectors have all contributed in some way to the livelihood of the communities. GRM International *et al*. (2012) suggests there are two-tire systems of government agencies working at local level: District Development Committee in the higher tire and Village Development Committee as the lower (P.379). Padaki & Vaz (2003) argue that the Deccan Development Society organized women in village level organization and the programme led to changes in the traditional multi-cropping practices with cash crops, in India (pp.131-132).

Uphoff (1986) analyses the roles of local organization in agricultural development are as follows: 'agriculture requires converting natural resources… into useful products through the application of human resources, which are made more productive by the use of capital- infrastructure, equipment etc. (p.11)'. Thus, local organizations should provide training for capacity building.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

This chapter presents summary of the key findings.

8.1 Summary

This study has attempted to describe the spatial pattern of agro-based livelihood of the communities in Bhirgaun of Tankhuwa Khola watershed of the eastern hills, Nepal. The emphasis has placed households' living and provides methodological underpinning in livelihood, which seeks to formulate empirical generalization in the study of the unique hill-slope areas. In addition, generalizations are also tested in agro-based livelihood activities of the community so that subsequent theories of livelihood studies may be improved. This study sought a causal understanding of the relationships between households and their environment. The area is made up of distinctive character of three elevation zones, its resources as shown having developed through a long history of interaction between man and nature.

The Bhirgaun is a hilly region of remarkable grandeur and pristine resources. The area is situated in the southern slope of Milke-Tinjure range, which steeply rises from the confluence of the Tankhuwa Khola and Nibuwa Khola to the south and maximum elevation in Guransedanda to the north with elevation ranging from 300 masl to as high as 2150 masl. Its north-south extends not more than 6.9 KM and covers 2095.35 ha (20.9 sq.km) of the total area and the watershed covered 79.1 sq.km. It consists of metamorphic and sedimentary rocks with rugged topography making up more than 95 percent area by the hill-slope. The area comprises a narrow river valley with alluvial soil and undulating slopes with flat upland terraces (*Tars*). In this context, main objectives of this study is attempted to analyse spatial patterns of resource in the livelihoods of the communities; to assess the trade-off between farm and non-farm activities; and to analyse the role of existing local organizations in improving livelihood of the communities in Bhirgaun of the Tankhuwa-Khola watershed.

8.1.1 Natural Resources and Livelihoods

First, the village level characteristics are more important to livelihood analysis which consist the population density and resources. This philosophy is closely

associated with the deterministic orientation in human geography which has considered livelihood as a part of naturally determined causal structure. Subsequently, social science orientation has considered the nature more as the supplier of resources and waste deposit for the social system. Zimmermann (1951) suggests that resourcehip evolves through the interaction of natural, human and cultural assets (p.15). In addition, other factors social, economic, financial conditions and physical infrastructures are also determined to livelihood opportunities.

Human population can be interpreted as the maximum resource user because resource provides means of livelihood substances in both time and space. This study area is manifestation of the harsh natural conditions, ecologically fragile and generally underdeveloped. It is mainly due to several environmental constraints such as temperature, scarcity of arable land in sloppy terrain with stony soils, adverse monsoon conditions, drudgery of transportation and sparse population far-flung small villages throughout the elevation zones. The area generally lacks infrastructural facilities for road, irrigation, markets and institutional services. As a result, it remains inaccessible and isolated from the main economic centers with limited economic linkages.

Over the past few decades, the area has been subjected to rapid changes. Expansion of road and diffusion of commercial activities are drastically altering livelihood opportunities. As a result, the fragile hilly area has become a basic life supporting system and natural resources. A large part of the population in the Tarai is dependent on its resources. These are some advantageous forms of linkages in natural resource flows, exchange of human resources and transfer of information and technology to improve livelihoods of the chronically poor communities.

The majority of the households are usually dependent on land, water, forest and minerals for their livelihood activities. These resources are derived from their proximate environments. Among them, arable land was as much a prime resource and land was variously used in this area. For example, the total area of the study area is 2095.35 ha which consists of arable land (74.4%), forest (23.1%) and others (2.5%). The arable land comprises of Khet (37%) and Bari (63%), while it is true that arable land is relatively scarce because of geographical conditions and steep slope gradient. The largest percentage of Khet is found in the lower hill-slope (58.1%) while Bari land dominates in the upper hill-slope (40%). There are wide variations in agricultural productivities and growth of output between Khet and Bari lands. Khet is less used

than Bari in terms of crops used due to distance between village and location of those farmlands, lack of irrigation with little use of manure and fertilizers.

This study found that 23.2 percent very poor households have owned only <0.4 ha and 19.8 percent richest households have more than 1.7 ha land. The largest percentages of very poor households were concentrated in the middle (28.6%) and upper hill-slopes (28.8%) and richest households in the lower hill-slope (23.4%). Thus, landholding size, in turn, varies depending on one elevation zone to others as well as caste and ethnicity. The access to land and cluster of households are characterized to richest households who have sufficient land to produce food (19.8%), richer produced enough food (17.9%), rich produced food for a year (20.3%), poor who have food for not more than 9 months (18.8%) and very poor for less than 4 months (23.2%). It shows that more than 20 percent households did not have access to resources for their basic needs, even for those who had small and marginal holdings.

The differences of landholding size distribution suggest that there is significant correlation between family size and landholding with coefficient at the 0.01 level. The individual asset-sub-clusters value of Chi-square statistic indicates that all households were well-off in physical resources and weak in financial resources. Thus, the government efforts should focus to change the financial resource in this area.

Next to the land, water, forest and scenic resources are also important to livelihoods in this area. Most of the households used water and forest both for domestic use and other purposes. But the area cannot be used economic opportunities and niches of water, forest and scenic resources for sustainable income sources. There were a few Community Based Organizations (CBOs) involving to manage water and forest resources, like irrigation and community forestry and few opportunities for poor to participate income generating activities. Nowadays, there have some changes noticed in the field of education, health services, roads, irrigation and electricity. Overall, there were little changes in physical asset with very good condition (4.1 average score) followed by economic assets in the second (3.5), social assets in the third (3.4), human assets in the fourth (3.3) and least by the natural assets (3.2).

The total sample population was 1156 persons and it comprise of the male (53.5%) and the female (46.5%). This differentiation is made up of combination

factors namely desire for male children, female infanticide, male birth exceeds than female birth and more male involved in overseas jobs. The area encompasses different communities, such as Rai (31.4%), Chhetry (24.9%), Magar (20.2%), Dalit (10.1%), Tamang (7.4%), Bahun (3%) and others 2.9%).

Present study found that the largest population is concentrated in the middle hill-slope (38.8%), followed by the lower hill-slope in the second (32.1%) and lowest in the upper hill-slope (29.1%). This is mainly due to uneven distribution of arable land it consisted the largest percentage of arable land in the lower hill-slope (37.7%), followed by the middle hill-slope in the second (35.3%) and lowest in the upper hill-slope (27.4%). The regional variations in population distribution among elevation zones is manifested due to uneven distribution of resources, that is, 'if a population concentrates in one area (here hills), then the resources available necessarily make this concentration possible' (Bencherifa, 1998,p.310). This statement is a premise of sanctuary theory and it is still valid in this area.

Education is a knowledge resource which adds human effort and new idea in use of resources. It makes individual differences in livelihood opportunities on the one hand and intra-household differences in income and employment on the other hand. The literacy rate in the study area is 79.9 percent and it comprises 92.1 percent for male and 67.7 percent for female. It is mainly due to most of the households invested heavily in educating their male children and the hope of qualifying to compete successfully for a skilled job in comparison to female children.

Although the government provided free education up to secondary level and strongly encourage sending their children to school, lower enrollments and higher dropouts are typical problems associated with labour shortage, lack of financial resources and lack of competitiveness for further education. Poor education and low qualifications of education indicates low portfolio of livelihood opportunities of the communities. As a result, the lowest percentages of household members are involved in highly skill oriented livelihood activities, such as teaching, self-employed entrepreneurship works and government services.

The study area remains economically isolated for long due to its peculiar geographical conditions, topography and soil characteristics as well as efficiency of physical infrastructure of road transportation. In addition, the remote and inaccessible settlements made it difficult to develop social infrastructures. Recently, attention towards

investment in extension services of clean drinking water, electricity, education, health, road transportation, irrigation facilities are increasing. This study found that more than 44 percent households are still dependent on traditional medical treatment and local healers for health care. Only 42.9 percent women and 42.7 percent child have received full course of immunization. Overall, there was little improvement in the health of communities due to the policy towards extension of free medical services in rural areas as well as privatization in health services.

The finding of first hypothesis is tried to explain the access to resources and services on agro-based livelihoods of the communities and also the reason for such activities. The nearest service centres were statistically significant with service utilization by the Pearson correlation coefficient at 0.05 levels. This statistics has supported the hypothesis: the effect on distance makes differential in the livelihood options and access to services in this area. This study has presented viewpoint in respect to the location of livelihood activities and service centers. The intensity of production of new crops and livelihood diversification declines with the increasing distance from a road heads and. But the relationships between resources and diversified livelihood phenomena does not arise much interest among geographers. There are few studies dealing with the relationship between physical environment, especially natural resources and economic development. But much attention have been paid on the mechanism of economic development and little pace is given in the spatial structure.

These findings are also made up of spatial patterns of livelihood activities in different households and elevation zones. Quite naturally, too, this view has been depending on the quality of space itself or more precisely those of economic potentialities hold one of the keys to explaining spatial patterns of agro-based livelihoods in Bhirgaun. Much geographical analysis of location hypothesis argues that 'all regions in any given economic system are competing for a share of the total economic activity generated by that system; but that, by virtue of their location, some possesses relative advantages for production and are therefore, able to attract an over-larger share of producers at expense of other regions' (Rich, 1980 cited as Carter & Jones, 1989,p.3).

8.1.2 Livelihoods and Farm and Non-farm Activities

Second, the overwhelmingly majority household members are involved in diversified livelihood activities. The main source of livelihood continues to be subsistence agricultural activities, livestock, remittances, petty trading, cottage industry and services. They can be divided into two sectors, namely, agricultural sector which provides more than 81 percent employment opportunities and non-agricultural sectors (19%).

Crop production is dominated by paddy (52.1%), maize (28.1%), millet (16.5%) and potato, the staple food of this area. When roads came to Dhankuta in the 1980s crop production was increased and people began to sell their surplus or barter for rice and vegetables. The use of chemical fertilizer at this time was noted by many could be brought in easily by the new road and was distributed through the Agricultural Service Centres. The key decade for significant change in agricultural production was generally noted by households in the study area to be the 1990s. This was the period when vegetable farming has taken place. In this area several households claimed that they introduced vegetables either to the work of CEAPRED or their own watched others making a good profit and soon adopted the practice in the upper hill-slope. This study reveals that the small-farm sector is going major transformations, including a switch from mixed of subsistence (65%) and cash crops (35%) to commercial orientation and they were relying on wage labour. Vegetables, large cardamom, tea and potato are the most importantly growing commercial crops in this area.

The non-farm activities are also important source of income which are comprised by the traditional sector namely cooking, thatching, firewood collection, grinding, cottage industry, petty trading, wage labour and migration; and modern sector like service, teaching, trade and commerce and migration. It is found that their contribution in household income vary depending on location, individual effort and caste and ethnicity. For example, wage labour was the largest contributor in the non-farm job in the study area (30.5%), service in the second (24.7%) and service in the third (18.8%). It is mainly due to most of the non-farm activities are combined with agriculture and it is usually worked in agricultural free time due to the growths of non-farm sectors are requiring risk-bearing entrepreneurial skill.

In this environment natural development of trade-offs are seen in terms of the introduction of commercial crop enterprises (based on diversified farming), livestock based enterprises, natural resource based enterprises and agro-processing and manufacturing. It requires appropriate policies towards infrastructural facilities development and financial supports (group credits) to promote both farm and non-farm enterprises.

Historically, migration has been a key factor in shaping households livelihoods in this area. The main reason for migration is inadequate arable land and declining productivity. Remittances are a crucial component of households' income. Work abroad is widely considered as easier and incomes are better. There is also an apparent status associated with working abroad and a widespread awareness that household with migrant workers (4.8%). This study found that migrant households are more likely to own assets such as solar panels, improved CI-sheet roofs, plastic water tanks, TVs, dish antennae and other electrical goods and send their children to boarding schools. This study found that the households who depended on abroad remittances have strong idea about foreign employment is a good thing because those who do not have regular remittances their livelihood conditions were poor. The number of households left behind to look after farm lands are not enough to keep the land productive and the scarcity of labour makes labour planning costly and difficult. It is the major drawback of remittance in this area.

Livestock is another most important livelihood asset in the study area which provides supplementary income and employment opportunity. This study found that the livestock population distribution varied from place to place as well as household to household. For example, the very poor households (20.8%) who have only 4 livestock and it was more than 12 for the richest households (19.3%). In addition, the association of livestock and agriculture has traditionally developed the exchange of feed, manure and animal traction. Recently, some households raised livestock for commercial purpose to export milk, meat and eggs from the upper hill-slope and gradually extent towards middle hill-slope.

This study found that positive benefits of integrating agriculture, forest and livestock and developmental activities as steady in this area. It is mainly due to improvement in physical infrastructure like roads, irrigation and agricultural extension services. The regional disparities were revealed between road head areas like upper

hill-slope with rural and inaccessible areas of the middle and lower hill-slopes. There is marked differences in livelihood opportunities which makes spatial patterns of livelihood endowment status (SPLES) between roads heads with that those are not connected by roads.

Introduction of liberal market policy has brought both positive benefits through harnessing unique opportunities and comparative advantages of above stated crops as well as minimized rural opportunities are also negative impacts. The government should have focused to production of organic agricultural produce, quality control and organized small-producers into cooperative associations to take more opportunities from markets. The location quotient statistics shows the calculated value (0.96) is tending towards to 1, and then the majority of the households are involved in the agricultural sector. In addition, different narrations about their living conditions in different elevation zones as well as ethnic groups and table and quintile statistics support to second hypothesis improved agriculture brings about changes in livelihoods of the communities in the study area. However, these changes are occurred at varying magnitudes due to increasing access to roads and markets. It is mainly due to access of road transportation and markets. Nowadays, new crops producer households receive better price for their produce from a wider markets outside the regions. Thus, increasing access to road and markets are providing help to households in improvement of the agricultural system as well as standard of living.

The finding of second hypothesis is related to transfer of natural resources into comparative potential livelihood diversifications. The distribution patterns of resources especially arable land is very sporadic resulting in bio-physical conditions as well as uneven developmental activities. The agricultural activities are not uniform over which the climate, altitude, soil properties and socio-cultural values of the communities. Except, upper hill slope, the physical barrier is still crucial to move across the study area. The Koshi Highway and local periodic markets at Hile and Dhankuta are the only access to sell surplus produce from all elevation zones. The highway passed from the upper hill slope is only sole supplier of commercial crops to the Tarai. The extension of agricultural link roads has gradually changed agricultural practices in the middle and lower hill slopes where two types of agricultural activities are practiced. One which applies high doses of agricultural inputs and irrigation on the other very less, the one which applies high doses of

inputs and irrigation shall have high production per unit of land and classified as an improving well-being area. The new crops adopter households in all elevation zones have maximized their profits with compared to subsistence crops. Thus, improved agriculture brings about changes in livelihoods of the communities. Correlation is significant at the 0.01 level

With increasing agricultural income the flooding of manufactured goods produced in the plains and unfavorable terms of trade of primary goods supports the growth of small market centres and non-farm livelihood options in the hills. The trade-off of similar condition exists between developed (upper hill slope) and lagging regions (middle and lower hill slopes) within the study area which makes spatial patterns of livelihoods of the communities. It results the inequality in level of physical infrastructure of road transportation, irrigation and socio-economic developments of education, community health services and agricultural support services. It gives the impression that level of development is directly and indirectly related to the potential livelihood options in the study area. Households have full knowledge of the prevailing choice of crops in each elevation zone, because the cost of the transport is directly proportional to the distance.

The finding of third hypothesis is that the new crops like cabbage, cauliflower, radish, tomatoes, beans, peas, potato and chilly are close to the road heads and it showed that the profits of large cardamom, paddy and zinger are cultivated considerable away from the road heads. This has expounded the idea that the type of livelihood diversification vary depending on distance from farm to the market or road heads. Correlation is significant at the 0.01 level and 0.05 levels for the effect of road and markets. In fact the spatial variation on agro-based livelihood of the communities is dependent on cost of transport, irrigation facilities, and government service centers. In this context, the version of Probler is stated by Shafi (2006) is still relevant in this study area 'everything is related to everything else, but nearer things are more related than distant things (p. 366)'. Allan (1986) argues that increasing accessibility of road transportation in the mountain areas has major changes in farming practice, tourism and agro-pastoralism in Alpine regions.

8.1.3 Role of Local Organizations in Livelihood Activities

Third is related individual capability to involve in diversifying livelihood activities, either in food production or in non-food products. It is the result of government effort and support provided in the provision of agricultural inputs, credit; improve infrastructure development and information on markets and prices. Although, the area underwent changes in socio-economic and political conditions when the dictatorial Panchayat Political System was overthrown the people at large did not witness any practical changes in living conditions.

Present study found that successive achievements most obvious advantage of livelihood changes in the study area was agricultural transformation by the advantages of the roads. Most of the households responses are supported this statement 'we eat rice all the time now' rather than the occasional consumption at special occasions in the past. The finding indicates that there is also a status which is associated with eating rice because eating rice all the time refers not only to the possibility to bring rice into the area in large quantities but the increased purchasing power of households at least in part resulting from increased market access for their products. Most of the households are proud of this place because it provides us many income earning opportunities and economic possibilities.

Other changes are also associated with hydro-power projects, government service centres, roads, markets, irrigation facilities, community forestry and investment in agri-business. These major changes were taken by the efforts of KHARDEP, CEPREAD, DADO, PAC and different NGOS. But uneven development and the geography of production has been recognized as a major issue of livelihoods in the study location. Road infrastructure in the middle and lower hill-slopes is extremely poor which makes transport costs prohibitive for cash crops while it is generally good condition in the upper hill-slope, but some remote settlements, in practice these are out of reach for small farmers (29.6%) and landless (1.4%). In this situation, local government should take full charge of basic infrastructure and they are responsible for a wide range of functions related to agricultural input services, capacity building, linkages and coordination, planning and implementation and governance.

This study found that the government has provided some basic services like, roads, irrigation, education, health service, drinking water supply, electricity in the rural areas. Although urbanization and developmental activities had led to the loss of land for physical infrastructural development like roads, hydropower and army camps without adequate compensation mechanism being placed in this area. In addition, most of the households did not have funds to improve in intensive farming and non-farm enterprises, such as agro-processing, cultural tourism. Thus, the local organization should have planned to implement target schemes, such as group saving and credit and compensation laws.

Finally, the livelihood approach does not look at development with a sectoral lens but in the context of households' everyday live. To understand how people make decisions and prioritize to life supporting activities. It also provides insights into what works and what does not. For example, everywhere the junior agricultural technicians (JTA) was support provided, even where agricultural sector generally was not regarded as having improved much.

This study found conjectures of spatial patterns of agro-base livelihoods of the communities in Bhirgaun. They are the detritions and demise of environmental resources in the first; individual capability or knowledge to expansion or intensification of resources in the second; geo-economic and social conditions of the area in the third; and innovative use of economic opportunities in the fourth. In this context, the local organizations should responsible to increase individual capability and empowerment to adopt new agricultural crops and provision of infrastructure development to change in the agricultural sector in order to achieve well-being. This study hypothesized that livelihood is general and every elevation zone is an individual phenomena and it can be seen as unique. Thus, uniqueness offers economic opportunities for increased well-being, but has also acted as in response to the spatial patterns of agro-based livelihood into general process.

8.2 Conclusion

This study has provided an understanding about how individuals or different households made their livelihoods in hill-slope terrain. The discussion has helped to understand the relative importance of resources and their significance to the livelihoods because it is located the zone of contact between the Tarai and Mountains.

This study aims to provide better resource use system in order to discuss the household livelihoods in relation to the comparative advantage of potential resources. In relation to environmental conditions four basic alternative resource use systems have developed in this area. They are agriculture (commercial crops), livestock, agro-forestry and cultural tourism. It has special value in other similar environmental and socio-economic conditions of hill-slopes, since it is obtained through spontaneous interview and conversation with individuals. Findings were persistently tested by cross checking and other forms of triangulation and since they are generated through different approaches and in different places provide a reasonable degree of rigorous study.

Meanwhile, the livelihood issues in the hill-slope environment are more complex and dynamics and it has changed over time and space. Some general characteristics are introduced, therefore, of traditional production systems which interact with the potential new economic opportunities available for hilly-communities of this area. But this study covers only single VDC of the Tankhuwa Khola watershed (20.9 sq. km) and do not cover whole watershed area (79.1 sq. km). Thus, two basic questions can be raised:

First, can the findings of this study which has drawn from case study into a wider area? Second, can this finding understand livelihood phenomena for policy implication? The answers of these questions are complicated and debatable. But this study is significant to the spatial organization of livelihood phenomena and is far from conclusion. They can be discussed as follows:

First, the opportunity of small area study (in terms of watershed) corresponds to answer more precisely from the recent past. The small area studies involves processes and patterns markedly different from those conceived for hills as a framework to attract greater numbers of economic opportunities than surrounding lowlands. It has been employed to generate theories, test methodologies and hypothesis in order to see how local communities improved their livelihoods. On the basis of this study, conclusions about Bhirgaun can be analysed to other similar geographical conditions and socio-cultural groups, because livelihoods translated by tradition that enable individuals or group of people to live in particular environments. But small area study requires more reliable research design to refine livelihood theories and methodologies. Peet (1998) suggests that with the notion of small area

studies, human efforts and labour, a process which ended natural determinism as it produced new effects on nature as well as society (p.16). Tuan (1976) the valleys or basins of modest size apple as highly diversified ecological niches promising easy livelihood. People pay attention to aspect of the environment … and fulfillment in the context of life's purposes (cited in Peet, 2011, p.53).

Second, the findings of this study may not be directly applicable in a wider policy efforts namely national planning, indeed, it can be useful at the regional and local level. The provisions of basic utility services, physical and social infrastructures are more important at local level. The individual circumstance of the area is important to understand local level planning for both macro and micro-environments. Because resources are placed in a particular area, thus planners and policy makers must be able to take decision to impose that they cannot easily be overcome in this process. For example, Khet is less used than Bari in terms of crops used due to distance between village and location of those farmlands and therefore more care such as application of farmyard manure (FYM), or availability of inputs, scale (size of land being used), and so on. Data on livelihood changes are needed to design and accomplish rural development efforts. Second, livelihood is closely associated with environmental resources and human effort to transform these resources into productive life-ways. Over time, livelihood changes expressed in household characteristics, production and consumption patterns. These, in turn, may vary depending on provision of agricultural inputs, socio-economic and infrastructural support services especially for transformation in the agricultural sector.

The overall finding of this study integrates the spatio-temporal aspects of agro-based livelihoods of the communities both methodologically and theoretically. There is a positive relationship between change in the existing use of resources and physical infrastructure and socio-economic development because the friction of distance (travel times, transport costs, dwelling place and locality) of positivist geography; and place specific potential comparative resources and households perceptions of humanistic geography. They are equally important to the growth and development of livelihood diversification. Thus, more efficient use of resources is essential to achieve higher level of livelihood endowment status. It requires individual capability, availability of capital, access of road transport, markets and initial linkages with outside the area.

To conclude, local organization assistance has been important in many areas and possibly under-attributed in many cases if the diffusion of innovations introduced and indirect benefits is considered fully. However, it was steadily limited by inadequate observation of the natural processes of change and connectedness to households' realities. This was further compounded by insufficient review of alternative future scenarios including preparation of livelihoods contingencies did not follow common sense. Thus, there is the need of more financial resources to improve potential comparative livelihood opportunities. This result the regional problem arising out of the diversity of resources and livelihood endowment status whose locale lies in the investment to strengthen livelihood assets or capital.

8.3 Recommendations for Further Research

There has been no research done on the issues of local context understanding about socio-cultural sensitivity. It is mainly due to growing tendency towards undermining indigenous knowledge and increasing anxiety between insider and outsider perceptions in this area. Thus, this study suggests some issues a way for further research.

- How local communities adapt cultivation of crops to climate change in hill-slope environment?
- What is the perception of local communities towards organic farming to meet needs of their family?
- How local communities manage to environmental conditions in commercial agriculture?
- What about the views of the local communities towards migration trend of youths in the past as well as now, creating more patched of abandoned land and alternatives to mitigate such migration?

Appendix: 1.1
Changes in agricultural development policies and practices

Period	Core agricultural development policies and practices
1950 -1960s	A model based on top-down approach, small farm development has been dominant; agricultural development strategy associated with rural development programme;
1960-1970s	The Green Revolution was associated with large-scale state investment in infrastructure, research, and support for the adoption of new technology;
1970-1980s	Priorities shifted to the social investments required by integrated rural development programmes and a variety of participatory paradigms, scrambling for policy space; representing the balance between productive sectors and social sectors, and between state and market;
1980-1990s	Structural adjustment, public sector institutions were trim livelihood approaches, and participatory paradigms; intensive subsistence cultivation with complex stratified exploitation of resources.
1990s +	With an upsurge of interest in poverty reduction and sustainable livelihoods; commercial agricultural exploitation of comparative advantages such as vegetables, HV commodities, dairy, intensive cultivation; and a more balanced view took hold on Food, Agriculture and Rural Development through market linkages.

Adopted from Ashley and Maxwell (2002)

Appendix 2.1

Agricultural paradigms

Lipton and Mellor	Griffin	Johnston and Clark
• Emphasize the improvement of exchange entitlements through a sectoral shift in resource in resource allocations and pricing policies; • Emphasis on private ownership; • Stressing employment and better terms of trade for the rural poor through agricultural income and yielding better well-being.	• Entitlement raising through structural change (especially ownership vector and exchange entitlement mapping); • Emphasizes on collectivism and cooperative ownership in place of private ownership; • Radical change must be preceding any significant improvement in the lot of poor.	• Change in the ownership vector, through land reform; • Believes land reform is probably necessary for uni-model agricultural development; • Development is to achieve through the demand for working-age population seeking employment opportunities.

Appendix: 2.2

Selected Agricultural Development Approaches in Nepal: 1970-1990s

Parameter	Green Revolution Technology (1970s)	Farming Systems Research (1980s)	Sustainable Agriculture (1990s)
Temporal	Annual cycle	1-3 years' cycle	5-25 years
Spatial	Plot-field	Field-village	Catchment, watershed & eco-region
Beneficiary	Farmer/consumer	Households (on-farm)	Multiple groups (on/off-farm)
Technology	Component	Whole farm system	Complex, ecosystem sensitive
Target	Farm profits/surplus	Farm profit/ poverty reduction	Monetary/non-monetary
Role of farmer	Recipient of technology	Provider of information	Participatory, indigenous knowledge
Policy	Inputs/prices	Marketing	Multiple (society/individual)
Environment	None	Marginal/on-site	Maximum/off-site
Equity	Irrelevant	Gender/benefits to poor	Gender/benefits to poor/intergenerational

Source: Adopted from Rhoades, 1997:11

Appendix: 3.1

Methodological Debates

Changing methodology paradigms has evolved for the scientific research approach that uses quantitative methods; the humanities approach as well as inductive and deductive methods; and the participatory method that rely on data from all actors in the interventions (Roche, 1999).

Methods	Quantitative methods	Qualitative methods	Participatory methods
Data collection method	Sample survey using a closed questionnaire	Multi-stage sample of semi-structured narrative interviews	Case study, focus group discussion and participatory observation
Data analysis	Interpretation of statistical tables and multiple regression analysis	Systematic scoring of types of impact from interview notes and transcripts	Verbal and experiential learning among participants, interpretive reports
Epistemology	Rigorous statistical inference and peer review	Rigorous qualitative analysis and peer review	Process transparency and expert judgment
Potential strengths	Possibility of quantitative estimates of impact. More convincing to skeptical outsider	Richness in detail and understanding of differential impact; ability to pick up unexpected and un-measurable impact	More timely and cost effective with potential for shorter feedback loops from suppliers to user of information; positive learning tool for respondents too
Potential weakness	High cost and time lags, restricted to measurable impact indicators. Reveals little about causation, difficult to counter selection bias problems	Not suitable for demonstrating that findings are representative of wider populations; lack of clarity and consensus about how to achieve rigour	Participant may withhold important facts from peer as well as facilitators; risk of response bias can make it hard to convince outsiders of the reliability of findings

Source: Adopted from Lakwo (2007:70)

Appendix 3.2

Sample Selection Criteria

Criterion	Justification using criteria
Location	The location of study area is both road-head link and remote location; the road-head link (upper elevation) is gateway location for external trade of its unique agricultural products which are demand for outside markets. Thus, the need to confirm to the demand of and inform policy also requires this focus in our objectives.
Commercial orientation	The agricultural activities in the study area are oriented towards the commercialization of its comparative advantage, such as off-season vegetables, potatoes, tea, large cardamom, fruits, paddy, and minor forest products (broom-grass) and agro-forestry as evident since 1990s.
Coverage of operation	The institutional delivery of services in a wider geographical coverage implies increased products and productivity; increased knowledge and ability to learn and adapt services to the needs of the local people. In Bhirgaun, the heterogeneity of its terrain, altitudes, climate and aspect with different livelihood pursuits (primarily agriculture, service, trade and commerce, cottage industry and remittance) provide a better learning point for this study.
Participatory methodology	The focus of this study is to analyse empowerment at individual, household and community level. A better departure for such an entry is in the participatory methodology where individual members from solidarity groups.
Service delivered process	A part from agricultural extension services, infrastructure development, market linkage and input deliver services being the core products and provides value-added in agricultural transformation. This equally creates a point for comparison among the elevation zones involved in this study.
Base of operation in Bhirgaun	Bhirgaun is an institutional commitment to the service provision in the area rather than providing an outreach that is normally seen as tapping locally available resources for household well-being improvement.

Appendix 3.3

Observation protocol form

Name of Settlement…….VDC…….. Ward…….

Distance from District headquarters……. Distance from road……
Access means to District headquarters: a. by foot b. by bus c. both

1. Type of settlement (Tick off √)

i. Dispersed ii. Compact iii. Agglomerated

2. Locational attributes (Tick off √)

i. River-bank ii. Foot-hill iii. Tar/ plain

iv. Ridge/hilltop v. Slopping terrace

3. Morphological aspect (Tick off √)

i. Linear ii. Crisscross iii. Circular iv. Others

4. Area extent of the locality

i. Length (meter)…… ii. Breadth (meter)……

5. Environmental condition (Tick off √)

i. River-cutting ii. Flash flood iii. Land-slid

iv. Erosion v. Water logging vi. Deforestation vii. Embankment

viii. Forest conservation ix. Watershed management x. Others

6. Types of road head links (Tick off √)

i. Black topped ii. Graveled iii. Earth iv. Foot-track

7. Street facilities between village (Tick off √)

i. Main track ii. Foot-path iii. Lane

8. Transportation facilities (Tick off √)

i. Public services ii. Bus stop iii. Bridge iv. Non

9. Utility service (Tick off √)

i. Drinking water ii. Electric line iii. Telephone iv. Solar

v. Irrigation vi. Mills vii. Others

10. Sanitation facility (Tick off √)

i. Private toilet ii. Community toilet iii. Open defecation

11. Resources (Tick off √)

i. Cultivated Land ii. Forest iii. Water iv. Mineral v. Shrine

12. Housing condition

Features	Tally	Total	Remark
12.1. Building roof type			
(1) Thatch			
(2) Tin			
(3) Tile			
(4) Cement			
(5) Wood/Bamboo			
12.2. Building storey			
(1) One			
(2) Two			
(3) Three			
(4) Four and over			
12.3. Building wall			
(1) Stone/brick			
(2) Cement			
(3) Tin			
(4) Wood/Bamboo			
12.4. House condition			
(1) Maintained			
(2) Un-repaired			
(3) Dilapidated			
(4) under construction			
12.5. Uses			
(1)Business activity			
(2) Residential			
(3) Empty			
13. Functional structure			
13.1.Commercial			
(A) Retailing			
1. Kirana			
2. Clothes/fancy			
3. Others			
C. Catering			
1. Tea, snacks, sweets			
2.Others			
D. Professional			
2. Clinic/ Medical store			
3. Photo studio			
4. Others			
E. Personal			
1. Hair dresser			
2. Others			
F. Industrial			
1. Rice & Oil press mill			

2 Handloom			
3. Handy-craft			
4. Others			
G. Retail industry			
1. Tailoring			
2. Shoe-making			
3. Black smith			
4. Others			
13.3. Institutional			
1. Government agencies			
a. School			
b. Health-post			
c. Medicine store			
d. Veterinary			
e. Private school			
f. Post office			
2 Agro-collection centre			
3. Agro-extension services			
4. Others			
14. Recreational			
1. Shrine			
2.Religious places			
3.Religious places			
4. Others			

Field Researcher

Name: **Date: 2009/ /**

Appendix: 3.4

Questionnaire Survey form

A. Locational attributes

1. VDC/ Municipality Name ---------- Ward No -------- Tole----------

2. Distance from district headquarters----------

3. Distance from road access……..

4. Means of accessibility a. by foot b. bus/micro c. both d. others

5. Name of Household head (optional) ----------

6. Sex: M / F Age---------

7. Educational status: Literate/ illiterate

8. Caste/ethnicity:

9. Types of Family: nuclear/ joint

B. Social attributes

10. Family background information.

S.N.	Sex		Age 3	Education 4	Skill 5	Primary occupation 6	Secondary occupation 7	Remark
	M 1	F 2						
1								
2								
3								
Total								

11. Where did you born? a. Local b. outside
If, outside, Place of origin……. Migration year……
Sex- M/ F Number…

12. Have your family member involved in the work of outside the village?

Yes/ No

12.1. If yes, Name of the place…… year…….

Migration place	Sex		Remarks
	Male	Female	
In-migration			
Out-migration			
Total			

Types a. permanent b. temporary c. seasonal

12.2. Total remittance received by household…….

12.3. In what area have you invested the remittance? Investment area …… .

13. Information about utility services

SN	Facility types	Distance		Frequency
		In Km	Foot Hrs	
1	School/college			
2	Health post			
3	Post office			
4	Bank			
5	Cooperative			
6	Police station			
7	VDC office			
8	Veterinary			
9	Others (specify)			

Frequency=daily/weekly/monthly/yearly

C. Economic attributes

14. Information about landownership pattern

Land category	Area Ropani	Mode of tenure			Total
		Own	In	Out	
Khet					
Bari					
Others (specify)					
Total					

If in/out of tenure, a. rental (kut) b. share cropping (adhiya) c. both

14.1. Who own the land?

Ownership type	Area in Ropani		Total
	Khet	Bari	
Male			
Female			
Other (specify)			

14.2. Do you have any fallow land? (Tick √) Yes No

If yes, causes ……..

14.3. Do you practice Khoriya cultivation? (Tick √) Yes No

If yes, type …….

Area……

Causes……

14.4. How did you use your land 10 years ago?

Khet……

Bari……

15. What is the status of land fertility within 10 years?

a. Increasing b. decreasing c. constant d. others

Causes……

16. How do you manage soil fertility? ……

a. by organic/compost b. by chemical c. both

If use of compost, amount (in kg./Doko/ Ropani)…… Frequencies ……

17. Livestock information

S.N.	Types	Breed		Remarks
		No of Local	No of Improved	
1	Cow and oxen			
2	Buffalo			
3	Goat			
4	Sheep			
5	Pig			
6	Poultry/chickens			
7.	Others (specify)			
	Total			

17.1. How do you raise livestock?

a. pasture and grazing b. stall-feeding c. both

17.2. Do you sell any livestock? (Tick √) Yes No

If yes, number ……. Types …….

Annual income (in Rs.) …….

17.3. Do you sell any livestock products? (Tick √) Yes No

If yes,

Amount	Livestock product					
	Milk	Ghee	Egg	Wool	Skin	Others
Quantity in K.G.						
Income in RS.						
Frequency						

Frequency=daily/weekly/monthly/yearly

17.4. Do you have separate animal-shed? (Tick √) Yes No

a. Cowshed b. Pig-sty c. Goat-pen d. Poultry-coop e. others

17.5. How do you obtain fodder?

a. private land b. community forest c. agricultural residue

d. farm land e. others

18. Information about source of fuel (Tick √)

a. firewood, b. bio-gas c. LP gas d. electricity

e. by-products f. others

19. Do you collect any products from the forest? (Tick √) Yes No

19.1. If yes, a. food b. fuel-wood/timber c. fodder/litter e. apiculture

d. fiber/sericulture timbers f. medicinal plants g. others

19. 2. Why did you collect?

Purpose	Quantity (in Kg)	Annual Income (Rs)
1. Household consumption		
2. Selling		
3. Others (specify)		
Total		

19.3. Where do you sell?

Name of market/other marketing channels ……

D. Production patterns

20. How much land do your family used for farming?

Land types	Khet	Bari	others	Total
Area in Ropani				

21. Information about cropping pattern

Cropping pattern	Area		
	Khet	Bari	Others
One time			
Two times			
Three times			

Crops in Bari: M=maize, Mi=millet, L=lentils, Mu=mustard, V=vegetable, F=fruits, B=beans, S=soybeans, P=potato. Crops in Khet: P=paddy, W=wheat, M=maize, Mu=mustard, V=vegetable

22. Information about agricultural production

Cereals	Cropping calendar		Quantity (In kg./Muri)	Income (In Rs.)	Surplus
	Shown	Harvest			
Paddy					
Maize					
Millet					
Others					
Pulses					

Lentil					
Bean					
Potato					
Ginger					
Spices					
Others (specify)					

22.1. Which crops do you usually combine?

Type	Winter	Summer
Khet		
Bari		
Others (specify)		

23. Have you produced fruits and vegetables? (Tick √)Yes No

If yes,

Vegetables/ fruits	Area	Quantity (in kg)	Annual Income (Rs)
1.			
2.			

24. Have your farm produced enough for the livelihoods? (Tick √) Yes No

If no, how many months have food adequacy for your family?

a. 0-3 Months b. 4-6 Months c. 7-9 Months

d. 10-12 Months e. above 12 months

25. If no, how do you manage your family expenditure?

a. Borrow b. Credit/loan c. Mortgage of land/ ornament

d. sale of livestock/poultry e. wage labour f. Others

26. What factors caused you to adopt the crops?

(Specify) …….

E. Agricultural Inputs

27. Do you have irrigation facilities in your farm land? (Tick √) Yes No

If yes, types……..

Mode of irrigation…… Conditions- adequacy/ non-adequacy

28. Do you use following agricultural inputs? (Tick √) Yes No

If yes,

Input	Type	Quantity (Kg)	Frequency	obtaining place
Seeds (specify)				
Fertilizers(specify)				
Pesticide				
Tools				
Loan				

Type= local/ improved; frequency= using time (1 or 2 times), obtaining place= market/cooperatives/neighbour

29. Which factors inspire to adoption of agricultural service?

a. Self b. Neighbor c. Office personal /JTA f. Never g. Others

30. If no, why didn't you adopt farm inputs?

a. lack of knowledge b. distance from market c. high transportation cost d. never use e. lack of money f. lack of supply centres g. others

31. Do you hire labour outside your family for agriculture? (Tick √) Yes No

31.1. If yes, types a. wages b. rotation (parma) c. others

31.2. Gender a. male b. female c. both d. others

31.3. Wages in a. cash b. kinds/grains c. both d. others

31.4. Frequencies ……

F. Marketing

32. Do you sell any farm products? (Tick √) Yes No

If yes,

Types of crops	Quantity (Kg/ Muri)	Income in Rs.	Frequency
a. Maize			
b. Paddy			
c. Millet			
d. Potato			
e. Lentil (Specify)			
f. Vegetables(Specify)			
g. Fruits(Specify)			
h. Spices (Specify)			
i. Others (specify)			

Frequency=daily/weekly/monthly/yearly

32.1. Why do you sell farm products?

a. Cash for different purpose b. Marketing goods and services

c. School fee and stationeries d. for social rites/passage e. Others

32.2. Do you sell any other products? (Tick √) Yes No

If yes a. Fuel-wood b. Handicraft c. NTFPs d. Fodder e. Others

32.3. Did you sell the same crops before 10 years? (Tick √) Yes No

If no, what change ……..

Causes ……

33. Where do you sell your farm products?

Name of Bazaars	Place	Distance Km/Hrs	Frequency in a week	To whom	Quantity

Place= P for permanent and H for weekly hat- bazaars; whom= consumer, farm-gate trader, itinerant traders, collection centers, other specify. Frequency=daily/weekly/monthly/yearly

34. Where do you usually buy household goods?

Name of Bazaars	Distance (km)	Types	Quantity (kg)	Frequency

Frequency= Never, ones a year, twice a year, thrice a year

35. What is the mode of transportation for carrying farm produce to the markets?

a. Self-carrying b. Hire labor c. Bus/truck d. Others

36. Do you face any marketing problems? (Tick √) Yes No

If yes, a. lack of transportation facility b. lack of appropriate price

c. lack of organized markets d. lack of collection centres e. others

G. Prospects and problems

37. Did any organizations involve in this area development? (Tick √) Yes/ No

If yes, a. Government service centers b. NGOs/INGOs c. others

38. Are you affiliated any social organization? (Tick √) Yes No

If yes, specify……..

39. Do you have knowledge about any organization involved in agricultural development? (Tick √) Yes No

If yes, a. women group b. male group c. cooperative

d. user-group e. others

40. Did you get any incentives from any organization? (Tick √) Yes No

If yes, a. Government service centers b. NGOs/INGOs c. others

Type …….

Frequency….

If no, why……

41. Did you get any training for agricultural improvements? (Tick √) Yes No

If yes,

Name of training	Days	Organized by	Remarks

42. What type of changes do you want in your village?

a. road access b. irrigation facility c. electricity

d. government service centers e. marketing facilities

f. technological change in farming method g. others

43. Have you participated in any development activities? (Tick √) Yes No

If yes a. VDC planning b. Decision making c. economic donation
d. labour contribution e. others

44. What are the potentialities of development in this village?

Potentialities	Rank (in priority order)		
	1	2	3

45. What are the problems of area development? (in priority order)

Problems	Rank (in priority order)		
	1	2	3

46. Do you provide any suggestions to solve these problems? ……

Appendix: 3.5

Focus Group Discussion Checklist

1. Locality name- VDC- Tole-
2. Details of the FGD participants

SN.	Name	Current position	M/F
1.			
2.			
3.			

1. Current livelihood activities:
   a. Farm-based activities-
   b. Off-farm activities-
   c. Others-
2. Local employment opportunities-
   a.
   b.

6. Any planning for enhancing livelihood opportunities
   a.
   b.
7. Crops are usually selling
   a.
   b.
8. Access to the utilization of common property resources
   a.
   b.
9. Determinants of livelihoods
   a. Social-
   b. Economic-
   c. Environmental-
   d. Institutional-
   e. Others-
10. How communities adopt?
    a.
    b.
11. Any organization involved in agricultural extension services (types and amount)
    a.
    b.
12. Any development activities initiated by external efforts

Activities	Initiated organization	People participation	Benefited family	Remarks

13. Thoughts about development
    a.
    b.

14. Major possibilities for enhancing livelihoods (specify)
    a. Farm-based activities-
    b. Off-farm activities-
    c. Livestock/dairy-
    d. NTFPs-
15. Major needs of this area?
    a.
    b.
16. Major problems (in order)
    a.
    b.
17. Suggestion for enhancing better lives of communities

Name of Researcher **Date: 2009/ /**

Appendix: 3.6

Key Informant Survey Checklist

Name of settlement VDC Ward
Distance from District headquarters……. Distance from road……
Access means to District headquarters: a. by foot b. by bus c. both
Caste/ethnicity…… Sex- M/F
Status of Key informant: (Tick off √)
a. Teachers b. Village elders c. politician d. social workers
d. business man e. administrative personal f. others

1. Major needs of the area (in order)
   1. 2. 3.
2. Potential resources of this area?
   a. Farm-based activities-
   b. Off-farm activities-
   c. Livestock/dairy-
   d. NTFPs-
   e. Tourism-
3. Major livelihood activities
   a. Farm-based activities-
   b. Off-farm activities-

3.1. Local employment opportunities-
   a.
   b.

3.2. Any planning for enhancing livelihood opportunities
   a.

4. Current development trends

Development activities	Organization involvement	Types of participation	Amount

Types of participation= Cash or labour; Amount= Rs or no. of worker

4.1. Role of government in livelihoods
   Specify…….
5. Factors to change farming methods
   a.
6. Farm inputs adoption trends
   Increasing/decreasing ……..……
   Causes ……..
7. Major import and export items
   ……..
8. Thoughts about people participation in decision making
   9. Manage about source of funds
10. Thoughts about development

a. b. c.

11. Major problems (in order)
12. Suggestions for livelihood improving

Name of Researcher **Date: 2009/ /**

Appendix: 4.1

Temperature and rainfall distribution

Month	Temperature (°C)		Rainfall (mm)	Month	Temperature (°C)		Rainfall (mm)
	Max	Min			Max	Min	
January	14.5	5.0	13.1	July	23.0	18.0	458.5
February	15.1	4.5	0	August	23.7	18.0	236.5
March	21.6	10.0	109.4	September	22.6	16.7	41.6
April	23.0	13.2	60.6	October	21.8	14.0	190.4
May	23.8	14.6	139.4	November	19.1	9.5	1.0
June	23.2	17.1	468.9	December	16.0	5.6	0.0
Average					20.6	12.2	143.3

Source: DADO, Dhankuta, 2007

Appendix: 5.1

Land classifications by standard grading systems

Land category	Characteristic	
	Khet (irrigated terrace)	*Bari* (un-irrigated terrace)
Awal	According to FGD participants told that the plot can be all year irrigated, the soil is good and moist with best quality is known as Awal. The yield per Ropani is at least 4 Muri either with two or one paddy crop.	The land that contains good, moist and fertile soil with a minimum yield of 2 Muri/ Ropani. Maize, millet, mustard crops are cultivated.
Doyam	The plot can be irrigated at least 5-6 months; the soil is good and moist; the yield is 2-4 Muri/Ropani either with two or one paddy crop with the help of rainfall.	Land with a yield not exceeding 2 Muri/Ropani of grains. Generally, soil contains with sand, gravel and of inferior quality.
Sim	The plot can be irrigated less than 3 months; cultivation dependent on rainfall; the soil is sandy and the yield is 1-2 Muri/Ropani.	Land with sandy and gravelly soils and yield of 1 Muri/Ropani; the land is situated on a slope.
Chahar	The plot is dependent on rainfall; the land is sandy, stony and water does not stay on it. There is only one crop in the year and the yield is less than 1 Muri/Ropani.	Chahar land with yield less than 0.5 Muri/Ropani. The land may be left waste because of slope or rocky soil condition.

Source: Field survey, 2009

Appendix: 5.2

Index of Land Use Change

The degree of individual land use dynamic was calculated through the numerical change in particular land use dynamic multiplied by the length of time of the study. Jianchu *et al*., (1998:249) referred to Wang (2000) and Yang (2001) to use the following formula:

$$\mathrm{LC} = \frac{Ub - Ua}{1!\,Ua} \times \frac{1}{T} \times 100$$

In the formula, LC represents the degree of land use change, Ua for the amount of the particular land use of the beginning of year 'a' and Ub the amount at the end of year 'b' and T for the length of time. When the unit of T is set as a year LC indicates the degree of annual individual land use change.

The degree of interrelated land use change defined by the integrated numeric change of all the categories of land use during the length of time of the study in the area. The formula used to work is adopted from Jianchu *et al*., (1998:249) as follow:

$$\mathrm{LC} = \frac{\sum_{i=1}^{n} DLui - j \times \frac{1}{T} \times 100}{2\sum_{i=1}^{n} Lui}$$

In the formula, Lui represents the area of category I at the beginning year of the study, DLui-j represents the amount of land use category i converted to other land use, and T represents the length of time of the study, LC indicates the degree of annual integrated land use change.

Appendix: 5.3

Distributions of Household by Different Services

Distance (km)	Household by different services (percent)									
	DR	DHQ	BK	PO	POL	VET	PS	VDC	MK	HP
0.5	2	-	-	7.1	-	-	10.7	7.1	-	7.1
1	7.2	-	-	5	-	-	47.3	5	-	5
2	9.7	-	-	22.2	-	-	1	22.2	-	22.2
3	6.2	-	6.6	6.7	6.6	-	40.1	6.7	6.6	6.7
4	3.4	-	8.7	20.8	8.7	-	-	20.8	8.7	20.8
5	-	-	-	1.9	-	-	1	1.9	-	1.9
6	5.3	-	15.1	30	15.1	-	-	30	15.1	30
7	-	-	1.7	5.8	1.7	-	-	5.8	1.7	5.8
8	21.7	11.6	17.4	-	17.4	11.6	-	-	17.4	-
9	11.1	5.8	-	-	-	5.8	-	-	-	-
10	13	13.1	24.6	-	24.6	13.1	-	-	24.6	-
12	5.3	5.3	-	-	-	5.3	-	-	-	-
15	15	15	26.1	-	26.1	15	--	-	26.1	-
17	-	8.7	-	-	-	8.7	-	-	-	-
19	-	10.6	-	-	-	10.6	-	-	-	-
21	-	9.2	-	-	-	9.2	-	-	-	-
23	-	5.3	-	-	-	5.3	-	-	-	-
26	-	15.5	-	-	-	15.5	-	-	-	-

Note: DR= Distance from road, DHQ= district head quarters, BK= bank, PO= post office, POL= police station, VET= veterinary, PS= primary school, VDC= village development committee office, MK= market and HP=health post

***Source*: Field survey, 2009**

Appendix: 5.4

Correlation Coefficient of Different Services

Access	PS	HP	PO	BK	POL	VDC	VET	MK	DR	DDH
P S	1	0.577**	0.577**	0.506**	.506**	.481**	.502**	.502**	.271**	.160*
HP	.577**	1	1.000**	.106	.106	.806**	.109	.109	.019	-.088
PO	.577**	1.000**	1	.106	.106	.806**	.109	.109	.019	-.088
BK	.506**	.106	.106	1	1.000**	.327**	.999**	.999**	.868**	-.236**
POL	.506**	.106	.106	1.000**	1	.327**	.999**	.999**	.868**	-.236**
VDC	.481**	.806**	.806**	.327**	.327**	1	.328**	.328**	.240**	-.144*
VET	.502**	.109	.109	.999**	.999**	.328**	1	1.000**	.867**	-.228**
MK	.502**	.109	.109	.999**	.999**	.328**	1.000**	1	.867**	-.228**
DR	.271**	.019	.019	.868**	.868**	.240**	.867**	.867**	1	-.325**
DHQ	.160*	-.088	-.088	-.236**	-.236**	-.144*	-.228**	-.228**	-.325**	1

Note: DR= Distance from road, DHQ= district head quarters, BK= bank, PO= post office, POL= police station, VET= veterinary, PS= primary school, VDC= village development committee office, MK= market and HP=health post

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix: 6.1

Location quotients in agriculture

The location quotient is calculated by the following formula: $LQ = \frac{\frac{X_1}{X_২}}{\frac{Rv_1}{Rv_২}}$

Where, X_1= employment in agriculture in the study area

$X_২$= employment in agriculture population in the hills

Rv_1= Reference variable in the eastern development region

$Rv_২$= Reference variable in the country

The computed value leads to the following rules of location quotient evaluation:

1. LQ> 1: if the location quotient is greater than 1, the study area is more specialized in the agricultural sector.
2. LQ< 1: if the location quotient is less than 1, the study area is less specialized in the agricultural sector.
3. LQ= 1: if the location quotient is equal to 1, the study area specialized to an equal degree in the agricultural sector.

$$LQ = \frac{\frac{80.7}{68.5}}{\frac{80.3}{65.7}} = 0.96$$

The computed location quotient value (0.96) is tending towards to 1, and then the study area population is involved in the agricultural sector. As the result, it can be said that structural transformation of agriculture is a pathway for trading-off building.

Appendix: 6.2

Respondent of Agricultural Potentiality

		Respondent	Non-respondent
Respondent	Pearson Correlation	1	-1.000**
	Sig. (2-tailed)		.000
Non-respondent	Pearson Correlation	-1.000**	1
	Sig. (2-tailed)	.000	
**. Correlation is significant at the 0.01 level (2-tailed).			

Appendix: 6.3 A

Magnitude of Agricultural Changes

(Impact of Market)

	Markets	Paddy	Maize	Millet	Potato	Cabbage	Radish	Cauliflower
Markets	1	-.281**	-.182**	-.103	.314**	.275**	.226**	.053
Paddy	-.281**	1	.418**	.329**	-.092	-.275**	-.210**	.224**
Maize	-.182**	.418**	1	.779**	-.014	-.172*	-.042	.030
Millet	-.103	.329**	.779**	1	-.039	-.168*	-.004	-.035
Potato	.314**	-.092	-.014	-.039	1	.650**	.416**	.337**
Cabbage	.275**	-.275**	-.172*	-.168*	.650**	1	.682**	.044
Radish	.226**	-.210**	-.042	-.004	.416**	.682**	1	-.020
Cauliflower	.053	.224**	.030	-.035	.337**	.044	-.020	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix: 6. 3 B

Agricultural change at varying magnitude

(Impact of Road access)

Types	Road	Radish	Cauliflower	Cabbage	Potato	Millet	Paddy	Maize
Road	1	-.284**	-.199**	.523**	-.523**	.394**	.154*	.301**
Radish	-.284**	1	.307**	.054	.195**	-.122	-.057	.256**
Cauliflower	-.199**	.307**	1	-.118	.231**	-.119	-.062	-.024
Cabbage	.523**	.054	-.118	1	-.142*	.306**	.068	.423**
Potatoes	-.523**	.195**	.231**	-.142*	1	-.100	-.055	-.081
Millet	.394**	-.122	-.119	.306**	-.100	1	.538**	.195**
Paddy	.154*	-.057	-.062	.068	-.055	.538**	1	.099
Maize	.301**	.256**	-.024	.423**	-.081	.195**	.099	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix: 6.4

Crop rotation according to season

Months	Agricultural activities by elevation zones		
	Upper	Middle	Lower
March-April (*Chait*)	• Preparing field • Planting maize, beans and potato • Preparing cabbage, chilly & cauliflower seed-beds • Plucking tea leaves	• Preparing field • Transplanting *Taulidhan*[1] • Planting maize in Khet • Preparing tomatoes seed-beds • Harvesting potatoes & vegetables • Taking cattle back to the main shed	• Preparing field • Preparing *Taulidhan* and tomatoes seed-beds • Planting beans (*Ghiusimi*) • Harvesting vegetables & potatoes • Taking cattle back to the main shed
April-May (*Baisak*)	• Preparing field • Transplanting chilly, cabbage, & cauliflower • Harvesting potatoes • Vegetables planted • Weeding maize & potatoes continued • Plucking tea leaves continue	• Preparing field • Transplanting tomatoes • Planting maize, beans & vegetables • Harvesting vegetables & potatoes continued	• Preparing field • Transplanting *Taulidhan* & tomatoes • Planting maize, beans and vegetables • Harvesting vegetables
May-June *(Jeth)*	• Weeding of maize & potatoes • Continued transplanting vegetables • Preparing paddy seed-beds • Plucking tea leaves continued	• Paddy seed-beds prepared • Weeding of maize, and *Taulidhan*	• Weeding maize, vegetables & and *Taulidhan* continue
June-July *(Asar)*	• Weeding vegetables • Reaping potatoes & vegetables • Plucking tea leaves continued • Transplanting millet	• Weeding of maize and *Taulidhan* continue • Paddy seed-beds prepared continue • Paddy field preparing • Millet seed-beds prepared	• Paddy seed-beds prepared • Weeding of maize and *Taulidhan* continue • Paddy field preparation • Millet seed-beds prepared
July-August *(Shrawan)*	• Reaping potatoes Transplanting paddy • vegetables & large cardamom continued • Plucking tea leaves	• Reaping Taulidhan and maize in Khet • Transplanting paddy & millets • Preparing cabbage,	• Reaping *Taulidhan* and maize in Khet • Transplanting paddy • Preparing cabbage, tomatoes &

[1] *Taulidhan denotes local variety of paddy seeds or improved Japanese varieties*

	continued	tomatoes & cauliflower seed-beds	cauliflower seed-beds
August-September *(Bhadau)*	• Harvesting potatoes vegetables & large cardamom continued • Plucking tea leaves continue • Weeding paddy	• Clearing maize field • Planting maize, beans and lentil • Transplanting millets, cabbage, tomatoes & cauliflower • Weeding paddy	• Clearing maize field • Planting maize, beans, lentil and vegetables • Transplanting millets, cabbage, chilly & cauliflower
September-October *(Aswin)*	• Harvesting vegetables continued • Clearing maize fields • Plucking tea leaves continue • Showing mustard oil-seeds	• Weeding paddy continue • Showing mustard oil-seeds	• Weeding paddy • Showing mustard oil-seeds
October-November *(Kartik)*	• Storing maize and maize stalked • Showing wheat and buckwheat	• Showing potatoes, garlic and vegetables • Harvesting soybeans	• Showing potatoes, garlic and vegetables • Harvesting soybeans
November-December *(Manshir)*	• Reaping paddy and millet • Tiding cowshed on the open terraces for manuring • Storing crops and millet stalks for animal fodder	• Reaping paddy, millets, lentil • Preparing field for winter crops • Showing wheat, mustard, lentil, vegetables & potatoes • Storing crops and millet stalks • Tiding cattle on the open terraces for manuring	• Reaping paddy, soybeans, millets & lentil • Preparing field for winter crops • Showing wheat, mustard, lentil, vegetables & potatoes • Storing crops and millet stalks • Tiding cattle on the open terraces for manuring
December-March *(Poush-Magh-Fagun)*	• Preparing field • Manuring • Engaging in minor activities • Taking cattle back to the main shed	• Collecting straw & thatching-grass (*Khar-Paral*) • Engaging in minor activities	• Collecting straw & thatching-grass (*Khar-Paral*) • Engaging in minor activities

Source: Field survey, 2009

Appendix: 6.5

Crop combination

The least square method is applied to determine crop combination in the study area. The ranked percentages of the first eight crops for the year 2008/09

In Bhirgaun, the ranked percentage of the first eight crops

The first calculation will be

$(100 - 38.2)^2 + (26.9 - 0)^2 + (15.8 - 0)^2 + (7.2 - 0)^2 + (2.7 - 0)^2 + (1.5 - 0)^2 + (1.4 - 0)^2 + (1.1 - 0)^2 + (0.5\text{-}0)^2 + (4.7\text{-}0)^2 = \mathbf{4879.38}$

The second calculation will be

$(50 - 38.2)^2 + (50 - 26.9)^2 + (15.8 - 0)^2 + (7.2 - 0)^2 + (2.7 - 0)^2 + (1.5 - 0)^2 + (1.4 - 0)^2 + (1.1 - 0)^2 + (0.5\text{-}0)^2 + (4.7\text{-}0)^2 = \mathbf{1010.38}$

The third calculation will be

$(33.33 - 38.2)^2 + (33.33 - 26.9)^2 + (33.33 - 15.8)^2 + (7.2 - 0)^2 + (2.7 - 0)^2 + (1.5 - 0)^2 + (1.4 - 0)^2 + (1.1 - 0)^2 + (0.5\text{-}0)^2 + (4.7\text{-}0)^2 = \mathbf{459.25}$

The fourth calculation will be

$(25 - 38.2)^2 + (25 - 26.9)^2 + (25 - 15.8)^2 + (25 - 7.2)^2 + (2.7 - 0)^2 + (1.5 - 0)^2 + (1.4 - 0)^2 + (1.1 - 0)^2 + (0.5\text{-}0)^2 + (4.7\text{-}0)^2 = \mathbf{594.38}$

The least square 459.25 is the lowest at third calculation, so the result is signified that majority of households have adopted three crops in a year.

Appendix: 6.6

Export and imports (Rs)

Particular	Export		Import		
	Rs	Percent	Particular	RS	Percent
Vegetable	1152600	26.9	Vegetable	10110	0.2
Lentil	70000	1.6	Lentil	235000	5.6
Oil	15000	0.3	Oil	135040	3.2
Food crop	500000	11.7	Food crop	377500	9.1
Milk	1099612	25.6	Kirana	1750000	41.9
Goat	932050	21.7	Spices	53000	1.3
Fowl	170500	4.0	Meat	71000	1.7
Eggs	83654	2.0	HYV seeds	25000	0.6
Honey	115000	3.1	Fertilizer	1500000	35.9
Fruits	150000	3.1	Pesticide	20000	0.5
Total	4288416	100		4176650	100

Source: Field survey, 2009

Appendix: 7.1

Assigned average score of different indicators of MASS

Variables	2002	2003	2004
Office management	2.0	3.3	3.9
Leadership	2.2	3.0	3.4
Governance	2.3	3.2	3.7
Human resources	1.7	2.3	3.5
Participatory planning	1.7	2.3	3.4
Networking	1.6	2.7	3.3
Collaboration	2.0	3.0	3.4
Learning sharing	1.7	2.7	3.0
Resource mobilization	2.0	2.6	3.1
Monitoring and evaluation	1.5	2.7	3.2

Source: MASS Record, 2009

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