CHAPTER I
INTRODUCTION

1.1 Background

There has always been something of a love hate relationship between human and nature. Early man lived on nature's boundary, but nature also held danger, which could threaten human, had developed some new social systems, customs, tools and technique for their comfortable livelihood (Jeffery and Miller 1982). Biodiversity means the diversity of life. Usually, biodiversity concerns, the vast range of plants and animals species (Kumar and Asija, 2000). The concept of biodiversity conservation in the Sikkim Himalayas is very ancient (Lepcha, 2005). The name of many places in this region commemorates saints who came here to meditate and to the many plants, animals and birds found abundantly here. Some of these forests are still regarded as scared groves of *Devithans* (Goddess Temple) and one a source of life giving water. Sikkim is very rich for flora and fauna of all varieties tropical to the Alpine. It is claimed that 4500 species of flowering plants, 36 species of Rhododendron, 550 species of birds, 33 species of reptiles, 48 species of fish, over 600 species of Butterflies, 150 species of mammals are found with in the state (Verma, 2001). Sikkim has set the highest proportion of area under vegetation and wildlife protections. It has almost 40.65% of the total area within the parks and sanctuary. Kanchanzonga Biosphere Reserve (2619.19 sq.km.), Singba Rhododendron Sanctuary (42 sq.km), Fambonglo Wildlife Sanctuary (57.876sq.km), Maenam Wildlife Sanctuary (35.34 sq. km), Kyongnosla Biosphere Reserve (31 sq. km) and Barsey Rhododendran Sanctuary (104 sq. km) are the most important among parks and sanctuaries of Sikkim.

Before the establishment of Barsey Rhododendran Sanctuary (BRS), there was no restriction for the local to use resources from it. Local people used to collect the fuelwood, timber, herbs or even poaching the wild animals. The local surrounding community had their different types of sheds *(Goth)* with in the area such as cowshed or sheepherd or yak sheds. There were total control of resources by the local communities and they had their monopoly over it. But in the 1996s, the area was named as the Rhododendron Sanctuary. It occupies an area of 104 sq. km. covering area of East West Sikkim surrounded by 9 GPUs such as Soreng, Shreebadam, Singling, Okheray, Burikhop, Mangmo, Begha, Sangkhu, and Uttary. In Barsey 6 species of Rhododendron are found out 36 species of Rhododendron found in Sikkim. Barsey is locally known as *Guras Kunj* (Garden of Rhododendron).

After the establishment of BRS, the forest department of the Government of Sikkim took the total control of natural resources and wildlives. The department took initiative for the removing of sheds *(Goth)* from the area. It has resulted directly in the reduction of the number of the live stock within the area. Local people also claim the problems of crop destruction by wild animals. Therefore, the establishment of BRS has not only resulted the local people to reduction on their livestock but also face crop destruction by wildlives. To compensate the local people sanctuary and the government started to provide to certain facilities to the local people, such as tourism development, trail improvement and other infrastructure development. Therefore, the establishment of Barsey Rhododendran Sanctuary has directly as well as indirectly affected the local community's day-to-day life.

1.2 Statement of the Problems

The conservation of sanctuary plays vital role in the ecological balance as well as to conserve the endangered species of flora and fauna. The protection and maintenance of the sanctuary provides sustainable flow of natural resources, products and service to meet the communities' needs of the people. On the other hand, the conservation of the sanctuary also results the conflicts between surrounding human population and the sanctuary. Basically it comes through wildlives which destroy the crops and livestock of the local people. Therefore, the local people has a tendency to kill, trap and chase the wildlives form their area to reduce the intensity of their harassment. Therefore, the sanctuary puts positives as well as negative impacts to the local people of the surrounding area. As a result, the establishment of the sanctuary may directly as well as indirectly affect the socio-economic condition of the local people. However the conservation through sanctuary has local to regional positive impacts too. Nowadays nobody is unaware of the conservation of the natural resources. Therefore, it is a burning issue from the perspective of the present day. In this context, the present study seeks to answer the following questions:

- What are the socio-economic impacts of the BRS on the surrounding local communities?
- What is the role of the local community in conserving the Rhododendran sanctuary?
- What are the status and dynamic of the natural resource in the study area?

1.3 Objective of the Study

The overall objective of the study is to analyze the impact of Barsey Rhododendron Sanctuary to the surrounding local communities. However, the specific objectives are:

- to analyze the socio-economic impacts on the local people;
- to find out conservation strategies of local people
- ; and
- to evaluate the status and dynamics of natural resources with in the area.

1.4 Significance of the study

Conservation of the sanctuary plays vital role for the protection of existing flora and fauna. Besides this, it also help in environmental preservation, which is essential because there is no alternative in the earth for our existence. Now a days, it is common conserved that environment is degrading in high frequency due to the effect of global warning. Therefore, to preserve the environment and to maintain sustainability, conservation is very necessary. In this context, the present study is an effort to know the impacts of BRS on the local community. This study seeks to highlight the socio-economic impact of BRS on local people, and the role of local people in conservation of Rhododendron Sanctuary as well as other Flora and Fauna.

1.5 Limitation of the study

All the research works have their own limitations on their purposes. No study can be made beyond the limitations. The present study covers Singling GPU of west Sikkim as its study area. This is the first research in Singling GPU concening the socio-economic impact of the sanctuary. The information is based on field survey and secondary sources. Data collection is quite limited because of time factor. Basically the study only covers the conservation strategies adopted for the Rhododendron Sanctuary and evaluation of the status and dynamic of natural resources within the Singling GPU.

CHAPTER II

REVIEW OF LITERATURE

The conservation practices definitely affect to the surrounding communities. It may have both positive and negative impacts. Generally, better livelihoods may be taken as positive, which could includes un living standards, better income, health facilities, safe drinking water and other welfare facilities. Similarly, increasing conflicts between management authorities and local communities can be taken as negative impact. The main causes of conflicts, may be due to livestock loss, crop damage by wildlife animals, and conflicts in resource uses.

Literature and research paper are not sufficiently available on Barsey Rhododendron Sanctuary. However, some researcher have already done some works in order protect parks and sanctuaries. The present study covered some of the relevant studies.

2.1 Review of literature on the impacts of Sanctuary/parks on socio economic condition of adjoining areas

Conservation is an ethical relationship between people, land and resources, it means wise use of land and resources so that they continue to function properly and serve human kind in the future.

Rai and Rai (1994) in their book “Trees of the Sikkim Himalaya” has written about the trees found in Sikkim. They mentioned that *Rhododendron arboreum* is the best known species among the Rhododendron, and the local term is “*Laliguras*”. Rhododendron applies for both flower and tree. Rhododendron is soft wood basically use for

firewood but the natives have its use as a material for making pack saddles, plates, dishes and also to prepare "*Khukuri*" handles. The flowers are used in temples and sometimes to make a kind of a jelly or a native wine.

Verma (2005) in his book "Sikkim: A Guide and Handbook" has mentioned that Barsey Rhododendron Sanctuary which lies in the west corner of Sikkim contains a vast variety of Rhododendrons. During the period of Blossom the Rhododendron provides a riot of color to the 104 sq. km. area of the sanctuary.

Loksam (2003) studied about nature conservation practices and its impact on sustainable development taking Kanchanjunga Conservation Area, Taplajung, Nepal as a case study. Has studied the condition of forest resources as well as the expectation of local people from the project. The researcher also studied about the conservation program which was useful in uplifting the socio-economic conditions of local communities. Similarly, the study has also identified the major problems and prospects of the nature conservation in KCA region.

Rayamanjhi (1994) carried a research on management of natural resources: through the assessment of the forest conservation program conducted by the Annapurna Conservation Area Project (ACAP) in Ghandruk VDC, Nepal. The study was confined in three areas such as Ghandruk, Besi and Chomzong which had different forest coverage. The study also covered on how people have managed these forest resource including the supply and demand of these resources together with the peoples perception towards this conservation project.

Upreti (1994) has made a study in Bardia National Park and also mentioned human impact to the park as well as impacts of park to the local communities. The author concluded that the surrounding communities could impact to the park by poaching and hunting, fishing, firing, and through attracting more tourists. A park as the social infrastructural project may impacts through the improvement of the park environment, loss of life and injury by both carnivorous and herbivorous animals at the immediate vicinity of human habited parts of the park area.

Subedi (1998) has studied the park and people conflict and mentioned crop damage by wildlife in the vicinity of Chitwan National Park. He also mentioned the perception of local people about the wildlife conservation. In his study, he mentioned the major causes of conflict between park and people residing in the area basically it is due to the crops damaged by wild animals due to lack of barriers between park and village farmland. He suggested to manage wall, fencing, electric fence and graving management particularly for control the crop damage by wild animals. The study advocates that almost are 50 percent of people in the study area are against of the conservation of wildlifes.

Regmi (1998) has studied park people conflict, livestock grazing and their impact on wildlife habitat in western section of Gola and Manau area of Bardiya National Park, Nepal. The author stated that crop damage by the wild animal along the immediate periphery of the park was common phenomena. Little qualitative information on crop loss or damage was available from the villagers but the damage was significant. The main predators of their area were elephant, wild bear, deer, rhino and blue hull. The frequency and pressure of these animals were different in

different VDCs. Bardiya Gola VDC received the largest wildlife pressure among the four VDCs. Local harassment was a serious and critical problems in the area. It was caused mainly by the wild elephants, which destroyed people's house and sometime killing of the people. People were compelled to graze their livestock inside the national park due to the lack of grazing land in and around the VDCs, and due to no enough fodder for animals. Which used to disturb wildlife in the grazing spots which ultimately compete for forage with wildlife, destroy breeding coverage of the birds as well as other animals and alter species composition and diversity.

Khanal (1993) carried a study on park people relation in Dhorpatan Hunting Reserve. The author tried to show about the main cause of conflict, which are livestock loss, crop damages by wildlife and conflicts in resource use. According to him wolf, leopard etc are livestock predators whereas wild boar, porcupine, black bear, deer etc. are crop destroyers. In case of resource use, mainly over grazing of the livestock, do not considering the size of trees while cutting for fuel-wood or fences, and lopping fodder were major means for over exploitation. Similarly, the local community also uses pasture for their livestock, fuel wood, fodder and leaf litter. However, occasionally they were also economically benefited by park personnel as well as security personals.

Adhikari (2000) carried a case study on the problems and prospects of park people program in Chitwan National Park. He concluded that the park-people conflict depends on the economic status of local people. The conflict increase with economic status up to certain level than start to decrease.

Shrestha (1994) has studied park people relation in adjoining settlements of northeastern boundary of Chitawan National Park. The author mentioned bi-dynamic competition between human and wildlife before 1973 and a mono-dynamic domination of wildlife after 1973.

Kashhu (1996) studied of the park people conflict in the Parsa Wildlife Reserve. According to him the conflict results between local people and reserve authority due to negative effects of each other. Local are effected by reserve sites and regulation, loss of crop and livestock by wild animals. While the reserve is affected by hunting and poaching of wild animals, and due to collection of firewood and fodder fishing, though collection of *Tama, Tarul,* stone and forest fire, which impacts nature conservation negatively.

Limbu (2001) has studied Kanchanjunga Conservation Area from the eco-tourism perspective and identified problems and prospects. In this study he also mentioned the necessity and listed condition of physical infrastructure. According to him, varied natural and cultural heritage, peaks for mountaineering, different tourist spots, biodiversity, trekking routes and availability of hotel and lodges are the prospects of eco-tourism development. Socio-cultural impact, environmental impact, lack of information center and advertisement, transportation and communication, natural hazards, fuel-wood dependency, rubbish and garbage problems, sanitation problems, scarcity of health safety and security, lack of trekking rules and regulations are the main problems to develop eco-tourism within the area.

2.2 Review of literature on dynamics of natural resources in adjoining area of park and sanctuary

Land use pattern is a dynamic phenomenon because it changes with time as well as geographical units. The term “Land use” related to the human activities or economics function associated with a specific piece of land and other term “Land cover” relates to the type of feature present on the surface of the earth (Floyd and Sabins, 1978). Land use deals with the spatial aspect of all human activities on land. Land use pattern is the arrangement of different types of uses i.e. cultivated land, forest, built up area etc. It is an expression of men's interaction with his environment. Land is a basic natural resource to human beings, which is available at every corner of the geographical units of the earth; it fulfills the basic needs of the living being. Therefore, the whole life of living being depends upon land resource. Land use is the surface utilization of land, at a given time and space.

Sen (1886) studied the land use pattern in the hills of Uttar Pradesh, India. The author has divided the land use pattern into three major categories i.e. pasture land, cultivated land and forest. The author concluded that the agriculture land use practice in the hills of Uttar Pradesh had disturbed the ecosystem of the area. As the result the existing land use pattern was more of abuse than the use.

Shrestra (1975) studied the change in land-use pattern in developing countries. According to the author, the forces driving the land use change were growth of population, migration of people, development project and programs under the economic policy of the state.

Regmi (1997) tried to show the land use change in Chitwan district of Nepal. The researcher has concluded significant increase in agricultural land over the period was from grazing land and forest land. The caste and ethnic dimension in land holding was also important. The author concluded that the upper Hindu caste had larger size of holding than the lower ethnic groups in general.

Dhital and others (1993) have made the assessment of land use change and their impacts. The authors had studied land use is continuously changing and the agriculture land is increasing at the cost of forest land. These processes of land use change increase with the employment, accessibility specially along the newly construct roads which occasionally has acted landslides in the area.

The reviewed literatures suggest that there are lack of studies with issues of socio-economic relation, conservation strategies and dynamics of natural resources within and around the natural parks or sanctuaries. It is obvious that lack of research or studies in BRS as it is newly developed sanctuary. In this context, the present research aimed to carry a research within the BRS area to fulfill the research gap.

CHAPTER III
METHODOLOGY

Methodology is one of the important aspects of any research work. The following procedures are followed to meet the required objective of the present study.

3.1 Selection of the Study Area

All five units of Singling Gram Panchayat Unit are chosen as the study site. This is situated on the west district of Sikkim under the Soreng constituencies. It covers five units they are Upper Singling, Ogang, Lower Singling, Phuncheybung and Khundrukey.

3.2 Nature and Source of Data

Primary as well as secondary data have been used in this study. To meet the objective of the study, required data were collected from both primary and secondary sources.

3.3 Tools of Primary Data Collection

The following tools were used to collect the required and relevant primary data from the surveyed households.

3.3.1 Questionnaire

A set of questionnaire were prepared intending to capture the information about socio-economic impact of the local people, impact of sanctuary and the perception of the local people on the establishment of BRS. Household head were selected to interview though those structured

questionnaires. In case of absence of heads, other senior family members were interviewed.

Table: 1

Sample Framework

Wards	No. of households	Sample size	Percent
1. Upper Singling	69	12	20
2. Ogang	68	11	18
3. Lower Singling	74	13	21
4. Phunchenbung	69	11	18
5. Khundrukey	79	14	23
Total	**359**	**61**	**100**

Source: Field Survey, November 2007

3.3.2 Observation

Observation may be the another important source of information concerning any phenomena. This is the most reliable method for gathering information concerning the observed phenomena. With the helps of this method the activities, settlement pattern, conservation strategies, life styles were observed.

3.3.3 Key Information

During the field study, the researcher choose one person from each units, as a key informants, and discuss regarding the impact of BRS to the local community daily life, as well as their role for the conservation of environment and their perception towards the BRS as well.

3.4 Secondary Source of Data

Besides primary source, secondary source of data have also been used wherever relevant to complete the study. Such secondary source data and information have been collected from different offices such as Land Revenue Department, Block Development Office, Panchayat Record Books. In addition, different books, reports, theses and journals have been consulted from different libraries such as State Library Gangtok, Sikkim, Central Library T.U., and Library of the Central Department of Geography. The relevant literature whatever and wherever were available have been studied and the relevant information were used in this report.

3.5 Technique of Data Analysis

Information collected from questionnaire converted into a master sheet and raw data were formulated based on master sheet. The information of the master sheet were converted into different tables as per the requirement of the objectives of the study.

CHAPTER IV

STUDY AREA

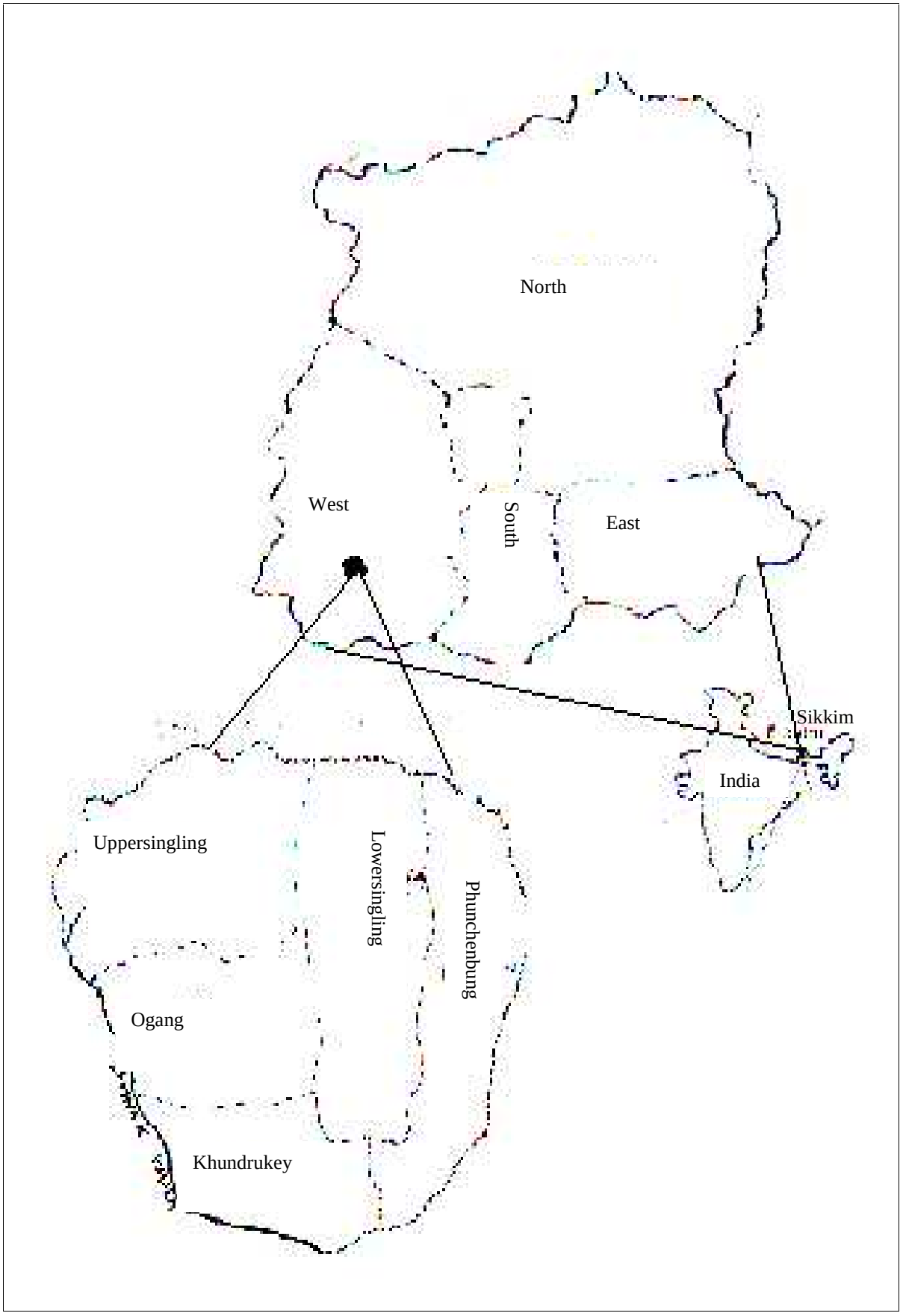
4.1 Physical setting

4.1.1 Location

Sikkim, the 22nd state of India came into existence with effect from 16th may 1975. Earlier, it was a kingdom and protectorate country. It is bounded on the north by China, east by Bhutan, west by Nepal, and south by Darjeeling district of West Bengal. It is a mountainous state of India, which is famous for its natural beauty, and many varities of flora and fauna. Sikkim covers an area of 7096 sq. km. and population of 5,40,493 (Population Census, 2001).

There are four districts in Sikkim. Among those four districts, this study has focused only Singling Gram Panchayat Unit of west district (Fig. 2). It lies on the northwestern part the district. The Gram Panchayat Unit lies between 27^0 10’ 00” to $27^0$11’15”N atitude and $88^0$11’15” to $88^0$12’30” E longitudes. It has an area of 557.0140 hectares (Sikkim Land Revenue Department Statistical Profile, 2006- 2007).

Figure :2
Location Map of Study Area



4.1.2 Relief and Vegetation

The relief of the study area varies from 1985 meters to 2600 meters above the mean sea level. About 20 percent of the area is covered with dense and moderate forest. Cultivation and settlement are present in almost all the places. The major vegetations are grown here such as Chilaune (*Schima Wallichii*). Uttish (*Alnus Nepalensiz*), Katoos (*Catanopsis Indian*), Mahawa (*Engellardition Spicate*), Lampate (*Duabanga Grand flora*), Sour (*Betula Aluides Buch-ham*), Bamboo (*Arundinaria Species*). Rhododendron (*Rhododendron Arboretum*), etc. The other important herbs and grasses such as Shishnu (*Urticadioca*), Titepati (*Artemisia Vulgarism*) and Amliso (*Thysanolcreun Maxima*) are also grown in this area.

4.1.3 Climate

In general, Sikkim has sub-tropical to Alpine climatic condition. Climate is different from place to place due to the altitude variation. In the study area, the climate is warm and temperate type. The high altitude area experience cool climate compared to the lower area. The maximum temperature is recorded during the month of June and August and varies between 22^0C to 28^0C. The winter months i.e. November to January are cool months with temperature variation between 4^0C to 12^0C. In remaining months moderate climate condition prevails. The study area receives heavy rainfall during summer months as compared to the winter months. It is unevenly distributed and about 80-85 percent of the rainfall occurs during the summer monsoon and rest of the days receive relatively low rainfall (Verma, 2005).

4.1.4 Drainage System

Drainage system plays a vital role in the study area for the agriculture. This area is drained by perennial and non-perennial streams (Khola and Kholcha). The major river and the stream are Ghanti Khola, Rhothak Khola and Changay Khola. This Kholas are perennial and their tributaries are non-perennials. Both Stream or Khola and Kholcha flows towards southward direction area and ultimately these drains to River Rangit which separate Sikkim from West Bengal.

4.1.5 Soil Fertility

Subba (2006) identified five broad physiographic units in the State as summit and ridge, side slope of hills, escarpment, valley and glacial zone. Generally Sikkim is a state of rocky mountain and hill composed of different types of soil. In the context of the study area, basically two types of soils are found. In the upper parts red and brown soil is common where as in the lower part black soil, consisting of sand and alluvial materials are present. This type of soil is very suitable for all types of crop production. On account of fertility, the layer of the soil of the study area is fertile but varies organically. Specifically, the fertility of soil maintains the economy of the area as almost all the people depend on agriculture activities.

The fertility of soil response to increase the agricultural activities or production. The soil fertility has decreased for a number of reasons such as; i) transformation of forest to agricultural lands, ii) fragmentation of land-holding size has left no scope of crop rotation and also forced farmers for intensive cultivation from fragile upland, iii) practice of crop

combination and iv) breakdown of traditional soil fertility maintenance practices.

4.2 Socio-Economic Setting

4.2.1 Agriculture

There is no family without involving agriculture activities. More or less, most of local people have taken agriculture as main occupation in this area. Every day they emphasized food production like maize, potato, millet etc. but now horticulture department emphasized the vegetable production such as radish, cabbage, cauliflower etc. due to the demands in the urban areas. In this area large cardamom are widely practiced as a cash crop. Cardamom cultivation is increasingly practiced in this area, due to the good market and price. Its selling price in local market is about Rs. 5000 to 6500 per 40 kg. It is easier to cultivate than food crops. It also controls the soil erosion and reforestation in cultivated land is helpful to nature conservation too.

4.2.2 Land Type

There are two types of land in the area, which are mentioned bellow:

i) Sukhabari (Dry land)

ii) Pakhabari (Slope land)

i) Sukhabari (Dry land)

Sukhabari refers to the dry land were the people prefer to cultivate food crops like maize, potato and millet and vegetables such as cabbage, radish etc.

ii) Pakhabari (Slope Land)

Pakhabari refers to the slope land where pulses, and cardamom are produced.

4.2.3 Livestock

Livestock is also one of the major sources of income within the area. In the study area, people keep domestic livestock for their own needs. The domestic animals products such as milk is carried to near by co-operatives, milk dairy and the local people consume other products like cheese and butter. Cattle, pigs, goats are the common animals which are helpful to raise the economic condition of the local people. Few people keep a pair of oxen to plough their land.

4.2.4 Population Characteristic

The total population of the study area is 1752. Among them 1566 adults, 68 were above 60 years and 118 were below 5 years (Panchayat record 2007). The population density differs from place to place due to topography and climatic condition. The larger number of population is concentrated in the lower parts. The major caste and ethnic groups are Rai, Limboo, Gurung, Sherpa, Tamang, Bhutia, Brahmin, Chhetri, and Newars.

Table: 2

Households and Population Distribution in Singling, GPU

Name of the units	HH	Total pop^{n}	M	F	Adults	Over 60 yrs	Below 5 yrs
Upper singling	69	348	134	174	308	15	25
Ogang	68	322	143	138	281	12	29
Lower singling	74	348	162	156	318	09	21
Phunchebung	69	335	153	142	295	18	22
Khundrukey	79	399	184	180	364	14	21
Total	**359**	**1752**	**776**	**790**	**1566**	**68**	**118**

Source: Panchayat Record Book 2007

Note: HH-Household, pop^{n} –Population, M-Male, F-Female, Yrs-Years.

4.2.5 Labour

These days labor occupation has also positive impacts with in this area. Daily wage is common in this area were they earne Rs. 100 per day. But labor demand is only seasonal mainly in cardamom needing, and harvesting season. Similarly, in maize or potato cultivation also needs labour. Now a days, there are also small projects such as road, foot trial to BRS, tourist spot and shed at sanctuary area, drinking water etc, which offers the local people partial opportunities for wage labour. The

establishment of BRS project has helped the local people to gain something through labouring.

4.2.6 Business

Due to smaller population and remoteness business activities are not so important as other activities. Most of the local people are involved in agricultural activities where they grow food grains and vegetables. The food grain are only for domestic use. However, the vegetables are used to sell in near by markets. Therefore, very few people of this area are involved in business. Before the announcement of the BRS, the local merchants are involved in the export of animals products such as wool, *Churpi* and ghee etc together with herbs. After the BRS declaration, animals products are reduced which also affected the economic condition of the society.

CHAPTER V

SOCIO-ECONOMIC IMPACT OF BRS ON LOCAL PEOPLE

During the period of project of BRS, how much benefits where gain or loss by the local community and change their livelihood. It is important factor to assess, as impact of BRS establishment. It influences local's perception about BRS and determined the conservation success. If impact is positive i.e. well being, then local people participation may increased and the successful conservation. And if the impact is negative then local people participation may decrease. Thus, it makes conversation difficult. Therefore, the main determinants of livelihood are discussed as follows.

5.1 Impact of BRS on agriculture activities in Singling GPU

5.1.1 Agriculture

Impact of BRS on agriculture has seemed to be less than that of livestock. Agriculture is the backbone of the economic status of the Local community. The primary livelihood options of the study area are mixed farming. The people are based on rural character and the main source of livelihood in from land and consequently agriculture, horticulture and animal husbandry. The system of multi-cropping is gradually gaining ground, land is a retarding factor for increasing the food grains forest is slowly shrinking and all other productive resources are vanishing. Hence, agriculture came under main source of income but the agriculture production is not sufficient for the fulfillment of all their needs. Geographically the location of the cultivated land area is hilly slope and only a few portion of land is favorable for farming purposes. The agriculture pattern of the study area is based on the Decreasing Return to

Scale (DRS). If the output increases less than proportionate change in output than production function exhibit-decreasing return to scale. The main causes of decreasing return to scale is “diminishing return to management”, i.e., increasing difficulties of management, co-ordination and control. Another drawback of failure of crop is primitive way of farming. But now-a-days, they are practicing terraced land and apply different scientific techniques of farming in a study area. Both male and female equally participate in the agriculture activities.

In fact there has been some change occurred after the establishment of BRS. There is positive as well as negative impact of BRS on agricultural activities within the study area. Negative impact such as crop destruction by wildlives which are not noticeable at the moment. It seems in near future it might be larger due to the increasing in the number of wildlives. As for positive impact after the establishment of BRS, the local people were forced to domesticate their livestock as a stall-feeding which is helped to increase the manure to their farm directly by compost or indirectly by fodder and grass an cow dung as well. The compost and cow dung are prominent source of farm fertility, which helps to increase in crop production. However, it was not possible to identify the percentage of crop production that has been increased by these processes. The respondents were not able to quantity exactly the difference. The replies came in three forms. Some said the crop and vegetable have increased, some responsed it is constant and some were in opinion of decreasing production (Table 3). Similarly, many respondent were in conclusion that the increase in forest cover in the vicinity resulted in increasing as permanent sources of water.

Table: 3

Perception of respondent households on crop production

Increasing	Constant	Decreasing	**Total**
34	18	9	**61**

Source: Field Survey, November 2007

The table 3 shows that 56% of the total respondents feels increasing of crop production compared to the past. After the establishment of BRS, there is increasing in manure due to the stall feeding and the farmers realized that increasing in their crop production is due to increase in land fertility. The respondents who were in the opinion of decreasing crop production points out the reduction of livestock numbers which effected on manure to their farmland.

5.2 Livestock

Livestock are very important for the human beings and are reared by the human beings. There reared and domestic and used for various purpose such as milk, meat and other products. In the study area there is no one without having livestock.

Table: 8

Livestock

Types of animals	No. of sample HH	No of animals	Ratio
Cow	30	40	1.3
Oxen	10	26	2.6
Pig	15	20	1.3
Goat	7	35	5
Sheep	5	25	5
Total	**67**	**146**	

Source: Field Survey, November 2007

Note: HH-Household, %-Percentage

The table 8 shows the number of animals and households keeping livestock. Cows and goats are the major animals found within the area. Majority of informants claims of installed feeding to their livestock. The information collected through in depth interview suggest that the trend of livestock keeping activities is on decreasing in this area. The main cause for decreasing trend in livestock is lack of grazing and pastures land due to the establishment of the BRS. Therefore, the establishment of BRS negatively affected to the livestock numbers ultimately affected in the economic status of local people.

5.3.2 Pattern of Feeding Livestock in Sigling GPU

Table: 9

Pattern of Feeding Livestock in Sigling GPU

Pattern of feeding/ Wards	1	2	3	4	5	Total	Percentage
Grazing	2	0	1	3	2	8	14
Stall-feeding	9	12	7	10	6	44	75
Both	1	0	2	3	1	7	11
Total	**12**	**12**	**10**	**16**	**9**	**59**	**100**

Source: Field Survey, November 2007.

The table 9 shows the pattern of livestock feeding in Singling GPU. Out of 61 respondents, 59 had kept livestock. Among the 59 respondents 75% of the respondents are practicing stall-feeding to their livestock. Likewise, 14% of the respondent grazed, their livestock (animals) mostly at their own land occasionally in buffer zone area. The figure also shows the highest number of stall-feeding animals was in ward no, 1, 2, and 4.

5.3.3 Decrease in Animals Products

The older people says that in Sigling GPU most of the people used to depend on the animals and animals product earlier. However, now a days it is decreasing day by day because of the unavailability of fodder and BRS's policy is to conserve the vegetation. The production of the farmers *"churip"* hard cheese and butter of cattle, yak's and sheep which are very expensive in the market are decreasing due to the banning of free

grazing areas. Most of the respondents complaints about the decreasing of their animals as well as animal products.

5.3.3 Animals Pressure

Since the development human being, animals are domesticated and reared for different purposes. Therefore, not only the human beings put the pressure and the environment but also the animals create serious problems to imbalance the environmental phenomena. Out of the sample households 60% belive that forest land is increased and there is decrease on livestock numbers. Similarly, 33% believed that it increased but only 7% believe that there is no change in the livestock, pasture and jungle.

Table: 10

Perception on the animals pressure on environment

	Sample Household		
	Decreased	Increased	No change
No of livestock	16	11	1
Pasture	8	10	1
Jungle	7	5	2
Total	**31**	**27**	**4**

Source: Field Survey, November 2007.

5.6 Impact of BRS on the culture of the local ethnic groups:

Culture is also one of the important social elements of a society. Cultural conservation is also one of the objective of conservation area. The objective includes cultural heritage, rivals and religious conservation etc. the main region covers cultural diversity. Particularly Limbu, Bhutia, Sherpa, Rai, Tamang and Gurung cultures are flourished with Buddhist, Kirat, and Hindu religions in this region. Thus the area is like a beautiful garden decorated with different types of colored flowers. Similarly, for heritage conservation different 'Gumbas' are reconstructed and maintained by local user's group and government. Therefore, negative impact on culture is not observed in the area due to the establishment of BRS. However, no sufficient impact is found in positive dimensions too.

CHAPTER VI

ADOPTION OF STRATEGIES TO CONSERVE THE BRS BY LOCAL PEOPLE

Generally, protected area is established to conserve the nature and natural resources from over exploitation and degradation of natural environment. Therefore, the protected areas are known as reservoir of different natural resources. BRS is established to conserve rare and endemic wild lives and plant species.

Although Sikkim government is dedicated to conserve the nature within the state the but the absence of awareness and participation of local people may disturb in the goal. It is noticed that the government initiative is not always sufficient for the conservations. So, it becomes important to let the local people play a crucial role in conserving the sanctuary. In case of BRS the following efforts have been adopted for the conservation of the sanctuary.

6.1 Conservation Committee

Now a day's local community participation approach is being popular everywhere. Development can not maintain without the local communities well being. The local communities actively participate to that level till they benefited from the project. Therefore, the local participation is necessary for the conservation. However, the successful conservation needs formal and legal procedures. Therefore, the successful and effective conservation community participation approach is used by involving them in conservation management committees. Thereafter, these local communities, themselves take responsibility in resource

management, its conservation and benefit sharing. In the community participation approach, surrounding communities are involved in the legal and formal conservation committee and handed over conservation responsibility along with conservation of forest. They also practice decision making under the guidance of conservation officials, where they themselves plan, conserve and share benefits on resource.

In case of Barsey Rhododendron Sanctuary, there are several committees and organizational set up. The eco-friendly society and the local NGOs in collaboration with the Sikkim Forest Department, WWF, Sikkim Program office and other agencies are focusing on concerned area for the conservation. The communities of ex-poachers, ex-herders and ex-medicinal plant collectors have been enrolled for assistance and are known as *Himal Rakshaks*. Their vast knowledge and skills are used for designing and implementing the conservation strategies. Similarly, these communities are involved in ecotourism as a co-guide and benefits are shared with them.

6.2 Multipurpose Nursery

Multipurpose nurseries have been established within the surrounding areas of BRS. In Singling Gram Panchayat Unit, there are three multipurpose nurseries. They are at Upper Singling, Phunchenbung and Lower Singling. The main purpose of these nurseries is to provide desired seedlings easily to the conservation committees and the local people in the plantation season. Each of those nurseries has 10,000-seedling production capacity per year and use to distributed two-three year old seedling. About 15 multipurpose tree species seedling are grown. Among them *Nebhavo, Gagoon, Lapsee*, *Duidhilo, Chanp, Aru, Hade*

Okhar, Date Okhar etc are the main seedling species. Among those species, some are local while now a day the forest department also provides some new species of seeds.

So, with the help of forest department the local people easily get the desire seedling which they plant at their own land or even at sanctuary. This approach is helpful to increase the forest cover within the VDC area and to the sanctuary area as well. The nurseries used to charge Rs. 1 per seedling to the interested other individuals where as no charge for the surrounding local communities. Finally, the collected amount is handed over to the forest department.

6.3 Conservation of Rhododendron

The field study proved that the local people were known about the importance of rhododendron for not only its use but for preserve for future generation. During the blossom season of rhododendron, it attracts tourists or outsider people as well as local people because of its scenic beauties. Because of such phenomena, now a day these places are recognized as an important tourist place or spot. It is popular as a “valley of flowers”. So, attracting more local as well as outsiders the local people are getting benefit from the tourism. These benefit led the local people more aggressive to conserve this rhododendron sanctuary. The table 7 shows the available rhododendron species within the area.

Table: 7

Types of rhododendron species available in BRS

Climatic belts and forest type	Elevation ranges	Rhododendron species
Rhododendron	3000-3600m	*Rhododendron Arboreum* *Rhododendron Barbatum* *Rhododendron Cinnabarinum* *Rhododendron Hodgsoni* *Rhododendron Campanulatum* *Rhododendron Falconeri*

Source: Forest Department, Soreng, West Sikkim

6.4 Plantation

Plantation is very important to conserve the environment which helps to save the earth from natural disasters. In Sikkim, the present government is highly dedicated for protection of environment. Through a unique and innovative environmental programme lunched only in Sikkim known as "Green Mission" the people of Sikkim are actively participating in conserving the environment by mass plantation.

Table: 8

BRS Plantation Program in 2003/04

S. No.	Program	Spot	Quantity (Number)	Participants	Species
1	Plantation	Tal region	1000	Forest deptt. and local people	*Salla species, Laligurans species Dhooppee etc*

2	Smriti Ban	Lower region of BRS	800	Forest deptt. and local people	*Chanp species, Kurlingo, Lapsee etc.*

Source: Forest Department, Soreng Branch

The forest department of Sikkim actively provides the local people knowledge about plantation and its importance in human life. Therefore, it is an inspiration for local people for forest conservation. Before the establishment of BRS, the local people were not conscious as today about the conservation. Early day's local people had there shed at Barsey region an even they illegally exploiting the forest products such as timbering, collection of firewood and even poaching the wild animals which directly caused the deforestation as well as loss of wild lives in that place. After the establishment of BRS, forest department of Sikkim actively involved with the local people and make them aware about the importance of forest resource for future generation. The forest department constantly encouraging the local people a popular slogan "*Sikkim Ko Dhan Hariyo Ban*" which means Green forest is the wealth of Sikkim. Now a day's, local people are fully participating in the plantation programme with in the BRS region with the support of the local people and the plantation programme ultimately resulted successful (Table 9).

Table: 9

Plantation Work 2003/04

S. No.	Ward	Numbers	Species
1	Upper Singling	150	*Nebharo, Gagoon, Dudhilo, Painyu, Peeplee, Okhar.*
2	Ogang	80	*Lapsee, Kabra, Nebharo, Painyu*

3	Lower Singling	56	*Nebharo, Lapsee, Painyu, Uttis*
4	Phunchebung	170	*Uttis, Lapsee, Nebharo, Painyu, Gagoon, Dudhilo*
5	Gandruke	60	*Khaniu, Kabra, Okhar, Nebharo, Arupatey*

Source: Singling Nursery Record Book, 2006

The local people adopted several other strategies to conserve the sanctuary. As all these are not possible through their capacities therefore the local people took some help from the government. Especially to fulfill the substitute of firewood, the government provided liquefied petroleum gas (LPG) for domestic use. On the demand of local people, the government provided security guards to protect the sanctuary from the outside hunters and tree cutters. Government even has passed a law to protect wildlife and vegetation. However, in case of local people they allow to cut tree for their use through a legal permission from the government. In case of any betrayal of the rules, the rule breakers should have to pay penalty to the government or to the conservation committees.

6.5 Perception of local people about the establishment of BRS

The establishment of BRS as a joint project with WWF- India aims to implement sustainable development through the integration of bio-diversity and conservation. The major plans are to conserve natural resources and promote sustainable development in the area by strengthening local community capacity to manage their natural resources and by improving their socio economic condition.

Table: 10

Perception of the Local People

S. No.	Perception of the local people	No of sample	
		Households	Percentage
1	Conflicts with BRS staffs	0	0
2	Scarcity of fuel, fodder and forage	18	30
3	Wildlife increase due to BRS	14	22
4	Land use change	9	15
5	Decreasing in livestock and products	20	33
Total		**61**	**100**

Source: Field Survey, November 2007

During the field survey, an attempt has been made to know the perception of local people on the activities of BRS. Most of the people agreed and strongly accepted the policies and programs of the BRS. They were ready to conserve the natural resource of the area. Similarly, they were also ready to co-operate the BRS staff, officials and others who were engaged in the BRS program.

The perception of the local people, favours the program of the BRS. The local people were very much eager to promote eco-tourism within the area. However, the destruction of crops by wild lives was the crucial problem in BRS region. They were quite positive to safe guard the environment and conservation of wildlife and natural vegetation. (Table 10). Contrarily, the local people were compelled to face problems of wild lives which is increasing day by day and killing the livestock and damaging the crops. Larger portion also complains about the decreasing the numbers as well as amount of livestock products.

CHAPTER-VII

Status and Dynamic of Natural Resources with in the Study Area

This chapter tries to analyze the pattern and the process of land use/land cover change of the Singling GPU for last ten years during 1996 to 2006.

Table: 11

Land Use/Land Cover Condition of 1996

S. No.	Land use Type	Area in Ha.	Percent
1.	Agriculture land	302.0	54.0
2.	Forest Area	160.1	28.7
3.	Built up area	78.2	14.0
4.	Water bodies	1.6	0.3
5.	Others	16.00	3.0
Total		**557.000**	**100**

Source: Block Development Office, Soreng, 2007

7.1 Land use/Land Cover condition of 1996

The table 11 shows the different land use in 1996. Out of the total 557.000 hectares of land under the study area, 54.0% was under agricultural use. Forestland cover comprises 28.7% of the area. Similarly, Built up area was 14.0% with small areas under water bodies. It clearly indicated the high agricultural dependency on the area. Even the areas under forest was not bad.

Table: 12

Land use/ Land cover condition of 2006

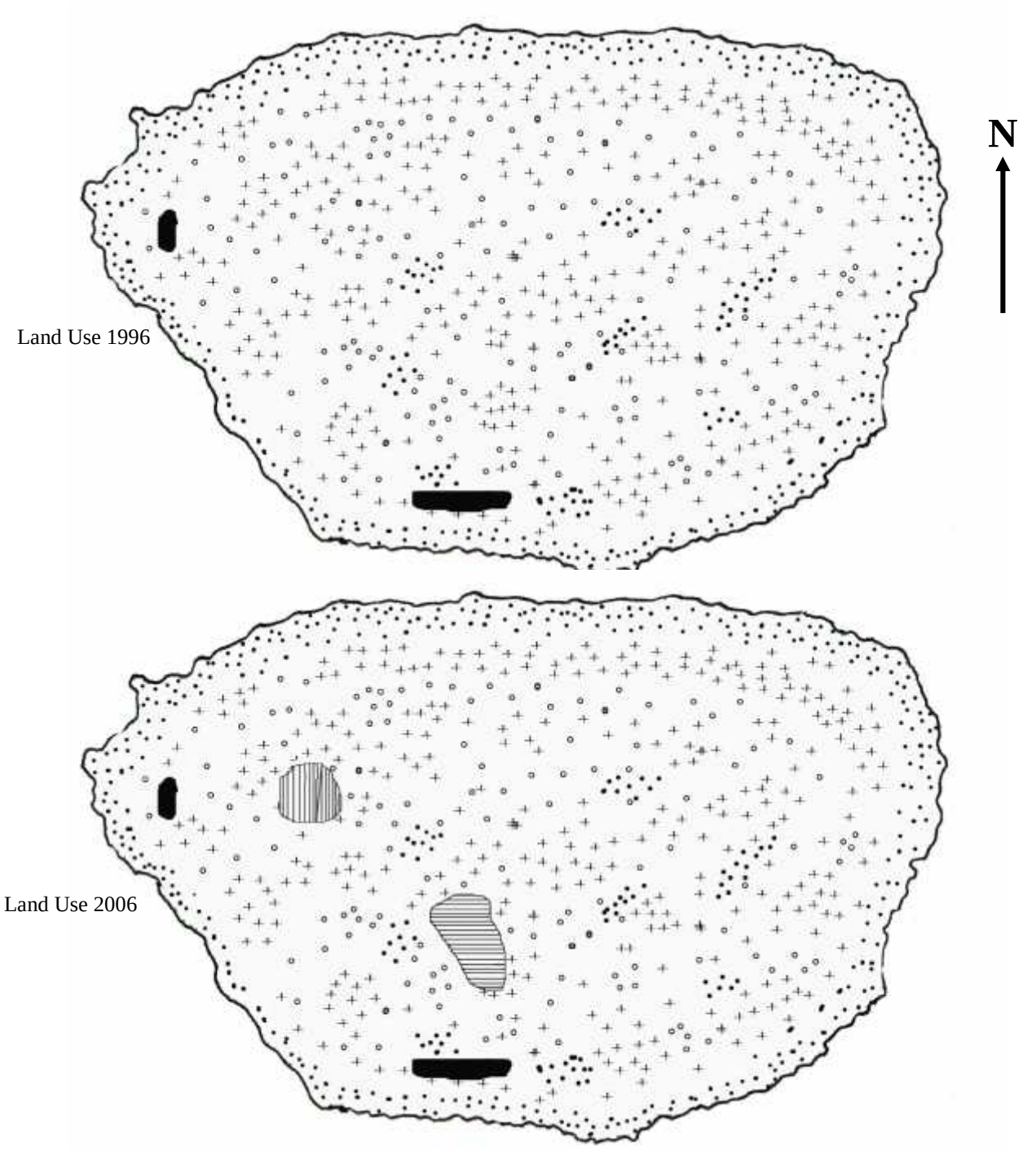
S. No.	Land use Type	Area in Ha.	Percent
1.	Agriculture land	276.7	49.7
2.	Forest area	165.1	29.6
3.	Built up area	101.3	18.2
4.	Water bodies	1.6	0.3
5.	Others	12.2	2.2
Total		**557.000**	**100**

Source: Block Development Office, Soreng, 2007

7.2 Land use/ Land cover Condition of 2006

In general, the land use land cover pattern in 2006 is similar to that of 1996. Land under agriculture comprises 49.7% of the total land area as against 54.6% in 1996. Similarly, forest area occupies 29.6% as compared to 28.7% in 1996.

Map: 2


N
Land Use 1996
Land Use 2006
2
0
2
Legend
Agricultural Land
Forest Area
Built-up Area
Water Bodies
Industry
Institution

7.3 Land use/ Land cover Change between 1996-2006

Land use is influenced by two factors, i.e. physical and cultural factors. The first includes topography, climate, soil primary and cultural factor includes change in population, socio-economic needs, institutional and technological level of occupation, which ultimately relies on the physical and cultural needs of the people and the government policies as well.

The Land use and Land cover change in the study area during 1996 to 2006 has been not so acute (Table 13). The major causes of land use change in the Singling GPU is due to the increasing practice of cardamom cultivation, infrastructural development such as construction of educational institution and industry etc.

Table: 13

Land use/ land cover change between 1996-2006

Land use/ year	1996(ha)	2006(ha)	change(ha)	percentage
Agriculture land	302.00	276.7	-25.3	-8.4
Forest area	160.1	165.1	5.0	3.1
Built up area	78.2	101.3	23.1	29.1
Water bodies	1.6	1.6	0	0
Others	16.0	12.2	-3.8	-23.7
Total	**557.000**	**557.000**		

Source: Land use/ Land cover 1996 and 2006

The agriculture land has decreased by -8.4% during 1996 to 2006. Similarly, the forest and Built up area have increased by 3.1 % and 29.1%

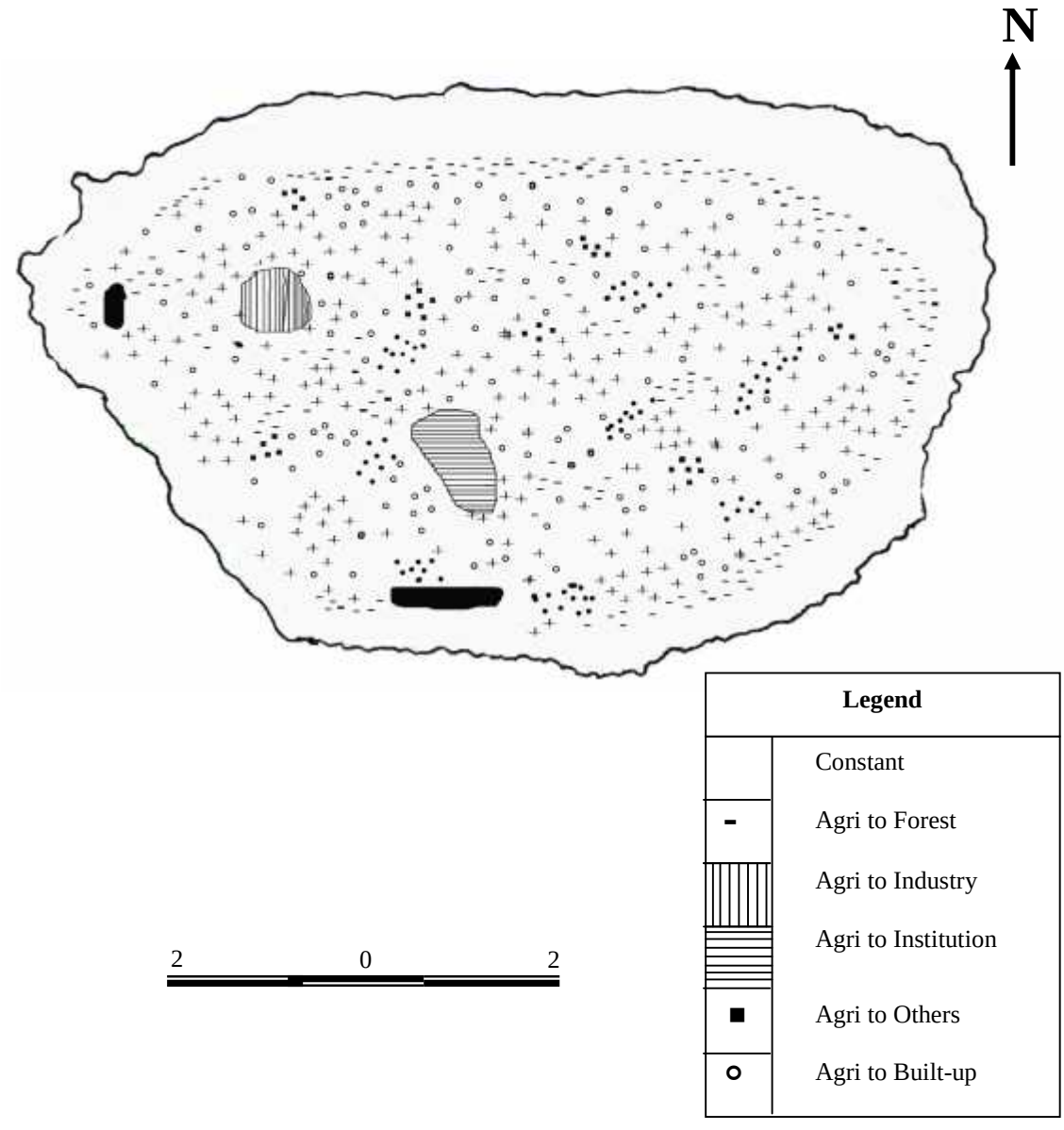
from 1996 to 2006 respectively. The water bodies remained constant. In overall, the built up and forest area has increased at the cost of the agricultural land and lands within others category.

Map:3

Status and Dynamic of Nature Resources

Landuse – Landcover Change 1996 – 2006

(Singling GPU)



CHAPTER VIII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1. Summary

Barsey Rhododendron Sanctuary is spreaded within a total area of 104 sq. km. It is situated an the west corner of Sikkim and share boundary with Nepal in the west, south by Darjeeling district of West Bengal, north and east by other Gram Panchayat Units (GUPs) of Sikkim. The altitudinal variation of 2200m to 4100m supports the wide variety of vegetation diversity from the sub-tropical forest, mixed broadleaf forest, conifer forest and alpine meadows. Regarding the vegetation, rhododendron are predominant species mixed with other species such as *Salla, Chnap, Dhooppee, Katus and Oak* etc. In case of wildlives it includes *Leopard, Leopard Cat, Himalayan Black Bear, Red Panda, Gora, and Deer* etc. Regarding the bird species, hundreds of birds species are found in this sanctuary particularly famous for three species of spectacular pheasants namely, *Satyr Tragopan, Unpejan Moral and Kaleej Pheasant* (Forest Department. Govt. of Sikkim).

The Singling Gram Panchayat Unit (GPU), touchs the boundary with Barsey Rhododendron Sanctuary (BRS). This study mainly focuses on the impacts of the sanctuary on local people, particularly socio-economic impacts, conservation strategies adopted by the local people for conserving the sanctuary and land use-land cover change in the study area.

The singling GPU, altogether 359 house -holds and 1752 population. The settlement pattern in this region are scattered to the

nucleated type. Sherpa, Bhutia, Limboo, Rai, Gurung, Brahmin, and Tamang are main inhabitant communities of this area. Large cardamom is main cash crops of this region, which helps the local people to improve income. Most of the local people are depended on the agriculture. Similarly, govverment services, livestock farming, business, labor etc are the other occupation of this area.

In case of sanctuary, it has both positive as well as negative impacts on the area and people. Due to BRS the local people are getting the labor jobs and the BRS also made the local people aware for the conservation of sanctuary for future generation. Crop destruction and decrease in numbers of livestocks are the negative impacts of the sanctuary.

8.2 Findings

As the human beings are an element of the nature, they could not exist without it. Therefore, every human society and generations are working on nature conservation and trying to make their existence possible for better future. Nature conservation provides natural resources continuously at present as well as in future, which also provide better environment. The establishment of BRS is also a step with such aims and is working actively on nature conservation and development. Some of the findings of this study are as follows:

- Local people are more concious about the plantation programme.
- Local people are aware on controlling deforestation i.e. tree cutting, firewood etc.

- Wildlife hunting is decreasing from the side of local people due to successful awareness program by the government.
- Livestock farming is also decreasing due to BRS and cardamom farming.
- Local people realized that some changes have taken place in livelihoods due to establishment of BRS.
- Due to the establishment of BRS, local people are more conscious about the promotion of tourism development with in the region.
- Large cardamom cultivation is increasing due to good market price, an easy to cultivate in comparison to food grain.
- Land use and land cover has changed during 1996 to 2006. The agricultural areas decreased at the cost of forest and built up areas.
- Due to increase in areas of private forest the dependency of local people is gradually decreasing on the forest of sanctuary areas.

8.3 Conclusions

From the analysis of the research, the following conclusions can be made here:

There should be involvement of the local people in the protection of sanctuary. The success of the BRS highlights for the importance of participatory approach linkage people and government.

However, development plans must be aimed at least on the basic needs of the local people, specially addressing the farmers, so that they do not destroy natural resource in order to survive.

Besides the agriculture the occupation of the local people should also diverted to other occupations such as small cottage industry, tourism and other means of livelihood. Government should provide the assistance or soft loan to the local people to such activities. It is because the diversification of occupation reduces the pressure/dependency on forest resources.

The involvement of local people in formulating programme would help to reduce the issue of conflicts. Their presence in analyzing the problems that both the sanctuary and local people faces could help to identify the core problems. Then it becomes easier to formulate plan as of their needs. Likewise, the implementation and monitoring of programme become effective and beneficial. Because of the participations, the local people, feel themselves accountable and responsible with their feelings of ownership.

Cardamom cultivation are increasing practiced in this region as a cash crop. The development of this cash crops brought positive change on

the local income. Similarly, the cash crop also helping to control over grazing, deforestation and soil erosion. Therefore, the eco-friendly cash crop should be promoted for sustainable development of this area.

8.4 Recommendations

The following recommendations can be made from the experience of the research.

The present research did not attempt to evaluate other types of impacts. Quantification of physical as well as socio-economic dimensions might provide a better picture of the impacts within the surrounding communities. Therefore, further research could be performed on in-depth studies of such dimensions.

Singling is raising spot for tourism development due to the Barsey Rhododendron Sanctuary. Therefore, government should pay more attention to promote eco-friendly tourism in this region. It is also necessary to lunch a awareness programme for the local people about the benefit of eco-tourism. Nevertheless, it is also necessary to develop infrastructure within the area of promote more tourism and overall development of the area.

The area is potential for the growth of medicinal plants and other non-timber forest products. So, the technical knowledge and linkage with appropriate market seem to be most essential to raise the livelihood of the local communities. BRS has been successful in conservation of the forest, however time has come to for further conservation, promotion and utilization of the forest and forest products.

BIBLIOGRAPHY

Amatya, D. (1997). *Regional Consultation on Conservation of the Kanchanjunga Mountain Ecosystem*. A Report on Wildlife Issues in the Kanchanjunga Region, Kathmandu, Nepal.

Chamling, P.K. (2003). *Our Natural Resources*, Department of Information and Public Relatives, Government of Sikkim.

Heinen, J.T. (1993). *Park People Relation in Koshi Tappu Wildlife Research, Nepal*. A Socio-Economic Analysis, IUCN: Kathmandu.

Kashu, B.B. (1996). *Park and People Conflict in the Parsa Wildlife Reserve*, Unpublished Dissertation of Master Degree in Zoology, T.U.: Kathmandu.

Khanal, D.K. (1993). *Park People Relationship, A Case Study in Tibetan Refugee Camp inside the Dhorpatan Hunting Reserve*. An Unpublished Project Paper of B.Sc. Forestry, IOF, T.U.: Pokhara.

Khanal, N.R. (1999) "Land use/ Land cover Dynamics in Nepal", The Himalayan Review, Vol.30, PP: 71-83.

Lepcha, S.R. (2005). *The Wealth of Sikkim*, Mayuk Muluk House of Treasure and City News, Gangtok: Sikkim.

Limbu, L.B. (2001). *Problem and Prospect of Ecosystem Development in Kanchanjunga Conservation Area of Taplejung District.*

Unpublished Master Degree Dissertation in Geography, T.U.: Kathmandu.

Luksom, P.H. (2003). *Nature Conservation Practices and its Impact on Sustainable Development. A Case Study of Kanchanjunga Conservation Area, Taplejung, Nepal.* Unpublished Dissertation in Geography, T.U.: Kathmandu.

Owen, U.S. (1975). *Natural Resource Conservation*: *An Ecological Approach,* Macmillan Publishing Co.: New York.

Pardhan, K.C., Sharma E, Pardhan G, and Chetteri A.B. (2004). *Geography and Environment Vol. 1*, Information and Public Relation Department: Sikkim.

Rai T.D., and Rai L.K. (1994). *Trees of the Sikkim Himalaya,* Indus Publishing Company: New Delhi.

Regmi, B.P. (1998). *Park People Conflict, Livestock Grazing and their Impact An Wildlife Area of Royal Bardiya*. *A Case Study of Wildlife and Livestock Management in Buffer Zone.* Unpublished Dissertation of Master Degree in Zoology, T.U.: Kathmandu.

Risky, H.H. (1994): *Gazettecr of Sikkim India,* Sikkim Nature Conservation Foundation Publication.

Saha, P and Chakravarty A.K. (2000). *Environmental Studies,* Allied Publishers Limited: New Delhi.

Shrestha, B (1994*). Studies on Park and People Conflict, Investigation on Resolving Resources, Conflict between Park Conservation and Adjoining Settlement in the North-East Boundary of Royal Chitwan National Park*. Unpublished Dissertation of Master Degree in Zoology, T.U.: Kathmandu.

Shrestha, R.K. (1996). *Deforestation in Nepal*. *A Case Study of Bhojad Village, Chitwan.* Unpublished Dissertation of Master Degree in Sociology/Authropology, T.U.: Kathmandu.

Subba, J.R. (2006). *Horticulture an Economically Viable and Environmentally Sustainable Driver of Socio-Economic Development in Mountainous Sikkim.* Unpublished of Horticulture Department: Sikkim.

Subedi, Y.R. (1998). *Park People Conflict: A Case Study on Crop Damage by Wild Animals in the Vicinity of RCNP*. *A Case Study of Gitanagar and Patinain VDC*, Unpublished Dissertation in Geography, T.U.: Kathmandu.

Verma, R. (2005). *Sikkim, A Guide and Handbook*, Gangtok Publication: Sikkim.

Dhital, M.R., Khanal, N.R. and Thapa, K.B. (1993). The Assessment of Landuse Change and their Impact. The Role of Extreme Weather Events, Mss Movement and Landuse Change in increasing Natural Hazards.

QUESTIONNAIRE

Impact of Barsey Rhododendron Sanctuary in Surrounding Local Communities

Socio-economic survey of household at singling GPUs

1. Data

Name of the Respondent _____ Age _____sex _____

Religious _____Caste/Ethnicity _____Education _____

Occupation _____ Marital Status _____

2. Address _____

District _____ GPUs _____ Village _____

Ward No. _____ House No. _____

3. Family Information

S.N	Name	Age	Sex	Relation to Informants	Education	Occupation
1.						
2.						
3.						
4.						
5.						

6.						
7.						

4. Do you have secondary occupation?

Yes ( ) No ( )

5. If Yes, please specifies.

_____

6. How much land you have?

_____ Acres _____ Hectares

7. How much land is operating by your family?

Landuse type Bari

Own land cultivated by self

Own land cultivated by others

Area

8. Area and production of different crops in (muri)

Crops	Area	Production	Sale	Purchase
Maize				
Millet				

Potato				
Wheat				
Cardamom				

9. Income from agriculture production is sufficient for your family?

Yes ( ) No ( )

10. If No, please mention the other source of income?

_____

11. Livestock in family

Cow	Ox	Goals	Pig	Poultry	Other

12. Income from livestock is sufficient for your family?

No ( ) Yes ( )

13. How do you feed your livestock?

Installed ( ) Grazing ( )

14. Is there any changed in last 10 years?

	Decrease	Increase	Reason
i) No. of animals			
ii) Pasture			

iii) Jungle			

15. What is your perception towards the BRS?

_____

16. Do you know why the forest conserved?

_____

17. What do you gain and lost establishing the BRS?

S.N.	Gain	Lost
1		
2		
3		
4		

18. Have you noted any socio-economic impact of BRS?

S.N.	Positive impact	Negative impact
1		
2		
3		
4		

19.

Do you think that BRS has changed your socio-economic status?

Yes ( ) No ( )

20. If Yes, than what kind of changed you have?

_____

21. What is the role of local community in conserving the BRS?

_____

22. Have you faced any problems due to BRS? If yes, what they are?

1_____

2_____

3_____

4_____

23. Key Informants

1. Environment
2. Conservation
3. Socio-economic impact of BRS

N

Map: 4


BARSEY RHODODENDRON SANCTUARY
WEST SIKKIM
88°06' E
88°12' E
27°12' N
NEPAL
WEST BENGAL
Legend
VILLAGE
PEAK
RESERVE FOREST
ROAD
SANCTUARY BOUNDARY
CONTOUR
RIVER
GLACIER
SANCTUARY
1:50,000