CHAPTER - 1

INTRODUCTION

1.1 Background of Study

Nepal is situated in the South of Asia continent and covers 0.03% of the earth and 0.3% of Asia. She is land-locked country between republic China in the North and democratic India in the rest three directions. Nepal covers the area of 147181 km^2 and spreads over 885 km East-West length and 193 km North-South width; distance from the nearest sea (Indian Ocean) is 1126 km. Geographically, Nepal is divided into three regions; Mountain (35%), Hill (42%) and Terai (23%) at the altitude varying from 60m to 8848m above the mean sea level. There are 7 States and 77 administrative districts; States are further divided into Metropolitan city, Sub-metropolitan cities, Municipalities and Rural Municipalities. . There is 2598970 hectare cultivable land and 973722 hectare irrigated land in Nepal.(*International Forum, 2004: 5-7*).

As per the census of 2011, total population of Nepal is 23151423 with compounded annual growth rate of 2.24%. Out of the total population, 49.87% is male and remaining 50.13% is female. The average density of population is 157 persons per square kilometer and average literacy rate is 53.74% out of which literacy rate of male is 65.08% and that of female is 42.49%. The average life expectancy rate is 59.7 years and little over half (i.e. 58.2%) population of working age reported usually economically active. The consumer price index of Nepal is 142.1 (*CBS, 2011: 3-12*)

Nepal is among the poorest countries in the world: about 31% people of the total population are below the poverty line. The annual per capita GDP of Nepalese of F/Y 2004/05 is US$297. The aggregate economic growth rate in the economy is 2.7% out of which growth rate of agricultural GDP is 3.0% and that of non-agricultural sector is 2.1%; economic growth of the country has not improved

markedly over time to overtake the population growth. (*Economic Survey, 2006; 5-9*).

Nepal is a country where most of the people are under the poverty line. Geographically, it is the combination of terai, hill and mountain. Most of its parts lie on hill and mountain region Nepal is divided into various watersheds. There are numerous management and development problems to be solved within this watershed. These problems are solving through Soil Conservation and Watershed Management programs followed by the different agencies. Among them, Department of Soil Conservation and Watershed Management is playing the crucial role in this field. This department had started the works since 1974 AD in Nepal. It works under the Ministry of Forest and Soil Conservation. It had opened the District Soil Conservation Offices in 55 districts to implement various soil conservation and watershed development activities. But, none have studied about the impact and influence of these implemented programs. Its study seems now in shadow.

My study has try to answer the research questions related on the watershed area, mainly the Ghurmikhola Sub-watershed in Siraha district. It has addressed the problems of selected wards of two Municipalities and two Rural municipalities i.e. Mirchaiya, Kalyanpur and Naraha, Bishanupur . The findings will be generalized all over the country in the similar fields of study.

1.2 Statement of the Problems

In Nepal, various programs have been implemented through different GOs and NGOs. Among all, District Soil Conservation Office is one of them. Through different Soil Conservation Office, watershed development activities have been implemented. Various GOs and NGOs have given financial support for the implementation of programs. I think it is necessary to see and evaluate the impact and participation level on the SCWM programs in the whole watershed. More money was expended in the name of development within the watershed of different districts of Nepal. Ghurmikhola sub-watershed within the Siraha district can be taken among them. The study will answer the following research questions-

- What is the volume of activities implemented within the watershed?
- What are the socio-economic characteristics of the people within the watershed?
- How did people face the problems relating to SCWM programs within the watershed?
- How did you find the impact of individual program implemented within the selected research area?
- Why do you want to evaluate the SCWM programs?
- Do you know the participation? What is the condition of people's participation on the programs?
- Is there gender equity in the society?
- What do you say about conservation of natural resources and distribution of benefits?

1.3 Objectives of the Study

On the whole, the general objective of the study is to identify, describe and evaluate the programs which are implemented by the SCWM sectors in Ghurmikhola Sub-watershed. The specific objectives are as follows-

- To identify the present socio-economic status of the community in the watershed.
- To study elements of successful watershed management e.g. level of people's participation, gender equity, and conservation of natural resources and distribution of benefits.
- To summarize the socio-economic impact of programs within the Ghurmikhola sub-watershed in Soil Conservation and watershed management.

1.4 Importance of the Study

GOs and NGOs made the implementation strategies and invested more money in the field of Soil Conservation and Watershed Management programs. But people could not get the fruit of development. None tried to evaluate them. So the significance of the study can be point out as:

- To find all the lacking in the field of SCWM programs.
- To find out the effect as well as their relevancy applying through study.
- To see the participation of the people in changing society and
- To fulfill the partial need for M.A degree in Sociology.

1.5 Structure of the Study

This study is presented into the following six units & the report has been prepared.

Unit –1 Introduction

In this section, introduction, research problem, objectives, importance & structure of the study are included.

Unit - 2 Literature Review

Here, I have tried to present the pertaining literature to my research citing the book, articles, journals, etc.

Unit – 3 Research Methodology

In this unit, research pattern, selection of study area, universality & sample selection, method of data collection and interpretation of data are included.

Unit – 4 General Introduction of the study area

Ghurmikhola sub-watershed lies within Siraha district, Province - 2 of Nepal. This watershed is drains to Ghurmi river in the far south. Geographically, it lies within a latitude of 28°14' and a longitude range of 80°59'.

The study area, Ghurmi sub-watershed, is situated 1 kilometer east from Mirchaiya Municipality. Its total area is near about **67.2623** sq. km (**6726.23** Ha).This

becomes 2.744% of the total area of the district (**2451** sq.km). It comprised of two municipalities and two rural municipalities i.e. Mirchaiya , Kalyanpur and Naraha ,Bishanupur. It covers all 9 wards of Municipality Mirchaiya ,8 wards (2-9) of Municipality Kalyanpur, 4 wards(1-4) of Rural Municipality Naraha and 2 wards (1-2) of Rural Municipality Bishanupur. The total household within this watershed is 101807and total population is 137258.The male and female population is 49.35% and 50.65% respectively.

Topographically, the Ghurmikhola watershed is mountainous in the northern part bordering by Siraha district and gently sloping valley in the south. The maximum elevation within the sub-watershed is about 2200 meter. in the northern side and minimum elevation is only about 600 meter. towards the valley. The climate ranges from sub-humid, sub-tropical to humid cool temperate.

Most of the Soil Conservation and Watershed Management (SCWM) programs have implemented in this area. GO/NGO has lunched various activities also. So many activities have implemented but none know what results came in the community / watershed area. So my study will focus on the impact and socio-economic changes brought by these implemented programs.

Unit – 5 Presentation and Analysis of Data

In this unit, the data collected from field survey are presented and analyzed with the different statistical tools such as tabulation, average, percentage and pie-charts etc.

Unit – 6 Summary, Findings and Conclusion

This is the last unit of my research work where the concise summary, findings from data analysis and conclusion drawn are presented.

CHAPTER - 2

REVIEW OF LITERATURES

2.1 Theoretical Review of Soil Conservation and Watershed Management

In the context of theoretical reviews, the theories related to soil conservation and watershed management are described for the clear concept of the related topics. The theories give the chain of ideas for the researchers. Here, the theories related to this topic are described.

2.1.1 Conservation

The concept of conservation is necessary before describing about soil conservation. Conservation means looking after something, saving it from destruction and telling people about it. Conserving of environment should be the main aim which consists of the trees, the soil, the water, the animals, the birds, the insects, the fish and other various creatures and plants. It is necessary to conserve these things because these resources are in short supply, mainly due to over exploitation. If we don't look after and use them wisely, they will soon disappear. If we don't conserve them, there will be no soil left for crops, the water supply will be dry up or flood or land slide will occur and food supply will disappear. Everyone will suffer as a result. There are several kinds of conservation, such as improved agriculture, using resources in modernization and not wasting or over exploit ting them; not cutting to many trees, specially on hill sides, on stream banks and around water source; and preservation and protection from fire. How conservation carried out? In this context, by making the people realize the need of it, so that they will be activated to carry out conservation measures themselves. This is done by exploitation, using film shows, wall charts, and the written words, by discussion, and above all by practical demonstration. Radio programs are a useful means for helping to get the message across, and so are articles in papers, but basically conservation extension entails a lot of leg-work and getting out meeting the people. Every people of society as a group, individual, club or school

can take part in the conservation programs. There are so many benefits from the conservation works. Flooding will be reduced and there will be fewer landslides. The soil will not dry out so much and be swept away as dust, and the soil will be more fertile. Plenty of good water will be available, and there will be sufficient fuel and fodder. Soil will not be lost by erosion, and deserts will not increase. The conservation is not necessary only for us but for their children and grand children. Their future depends on what peop0le do today to the natural resources-destroy them or conserve them. (*DSCWM/WMCEP/FAO, 1983*)

2.1.2. Soil Conservation

Soil conservation is the erosion control and maintenance and/or improvement of soil fertility.

2.1.3 Watershed

Watershed is water parting or divide. It is a line that divides two adjacent river systems. Watershed, water parting, divide is a kind of: line - a spatial location defined by a real or imaginary one-dimensional extent.

A watershed can be defined as the drainage basin or catchments area of a particular stream or river simply put, it refers to the area from where the water flows to a particular drainage system, like a river or stream, comes from.

Kinds of watershed, water parting, divide:

Continental divide - the watershed of a continent (especially the watershed of North America formed by a series of mountain ridges).

Great Divide, Great Dividing Range - that part of the continental divide formed by the Rocky Mountains in the United States.

A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. John Wesley Powell, scientist geographer, put it best when he said that a watershed is: "that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water

course and where, as humans settled, simple logic demanded that they become part of a community."

Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. No matter where you are, you're in a watershed!

2.1.4 Soil and its Classification

Soil conservation is the erosion control and maintenance and improvement of soil fertility. Watershed management is the application of soil conservation measures in the watershed as working unit. The rationale of watershed management is - to increase the storage capacity of the soil mantle in the watershed area so that the water from it will be gradually released in the form of spring and evapotranspiration loss increased thereby reducing run-off, and to use the land according to it's capability or suitability so that soil erosion and consequently the sediment delivery to the river will be reduced. Role of vegetation is one of the most important contributions of watershed management in flood control (*Sthapit, 1998*).

Soil classification is the branch of soil science which deals with the systematic categorization of soils based on distinguishing characteristics developed during soil formation as well as criteria that dictate choices in land use and soil management.

Marlin Cline ("Basic principle of soil classification", Soil Science, 2:81-91, 1949) stated the basic rationale behind utilitarian classification:

Civil engineers classify "soils", or more properly earthy materials, as foundations or building material. These technical systems are designed to predict the engineering properties and behavior of a soil based on a few simple laboratory or field tests. The most common is the Unified Soil Classification, with three major groups: (1) coarse grain (2) fine grain, and (3) highly organic. The first two groups are then subdivided as follows:

Coarese grain: gravels, sands

Fine grain: silts, clays, organics silts & clays

These are then subdivided according to their plasticity (for fine soils and coarse soils with some fines) and homogeneity (for coarse soils).

Soil classification remains a contentious subject, from the structure of the system itself, to the definitions of classes, and finally in the application in the field. The essential problem is that soils do not reproduce or have DNA like living organisms, so no "objective" criteria can be used to choose among classifications. The most qualified specialists in the world can and do spend hours during a field trip at each soil profile, arguing about the classification.

2.1.5 Soil and Soil Erosion

A type of weathering in which surface soil and rock are worn away through the action of glaciers, water, and wind.

Erosion, general term for the processes by which the surface of the earth is constantly being worn away. The principle agents are3 gravity, running water, near-shore waves, ice (mostly glaciers), and wind. All running water gathers and transports particles of soil or fragments of rock (formed by weathering), and every stream carries, in suspension or rolling along its bottom, material received from its tributaries or detached from its own banks. These transported particles strike against the bedrock of the stream channel, literally grinding it away and eventually settle out along the channel or find their way to the sea. The Mississippi River is being reduced by erosion at the rate of 1ft. (30cm) in about 9000 years. Seacoasts are eroded by ocean waves, which detach loose or nonresistant material. Waves wear the rock by both the force of their own impact and the abrasive action of the detritus they carry. Ice can erode rocks by a freezing-thawing cycle; and ice in the form of glaciers erodes by plucking off loose rocks, by its abrasive action on the surface over which it passes, and by glacial melt water rivers and streams. In deserts and along beaches, wind transports sand, eroding one area and depositing in another. The wind can also drive and other particles against rocks, abrading them. Before human modification, landmasses were probably eroding at rates close to 1 inch (2 to 3 centimeters) per 1,000 years; now rates have doubled. In the United States 30% in natural erosion, while 70% is because of human intervention. Suspended sediment from erosion is one of the world's greatest

pollutants. Sediment can fill reservoirs and navigable waterways, impair wildlife habitats, increase flooding and water treatment costs, and deplete valuable topsoil. It can also concentrate harmful chemicals and bacteria. The continuous washing away of the fine rich topsoil of farmland due to poor agricultural practices is a problem in many parts of the world. Accelerated erosion from removal of acres of trees and vegetation, which diminishes the natural erosion protection, is becoming increasingly common in populated areas, Strip mining also removes vegetation and can be a localized cause of erosion. Among the methods of preventing soil erosion are reforestations, maintenance of fallow strips, terracing, under draining, ditching, deep plowing, and plowing across slopes rather than up and down.

Erosion is the displacement of solids (soil, mud, rock, and other particles) by the agents of wind, water, ice, movement in response to gravity, or living organisms (in the case of bio-erosion). Although the processes many be simultaneous, erosion is to be distinguished from weathering, which is the decomposition of rock. Erosion is an intrinsic natural process, but in many places it is increased by human land use. Poor land use practices include deforestation, overgrazing, unmanaged construction activity and road or trail building. However, improved land use practices can limit erosion using techniques like terrace-building and tree planting.

A certain amount of erosion is natural and in fact healthy for the ecosystem. For example, gravels continually move downstream in watercourses. Too much erosion, however, can cause problems clogging streams with gravel, filling reservoirs with sediment, reducing soil fertility and water quality. What causes erosion to be severe in some areas and minor elsewhere? It is a combination of many factors, including the amount and intensity of precipitation, the texture of the soil, the gradient of the slope, ground cover (from vegetation, rocks, etc.) and land use. The first factor, rain, is the agent for erosion, but the degree of erosion is governed by other factors.

The first three factors can remain fairly constant over time. In general, given the same kind of vegetative cover, you expect areas with high-intensity precipitation, sandy or salty soils, and steep slopes to be the most erosive. Soils with a lot of

clay that receive less intense precipitation and are on gently slopes tend to erode less.

The factor that is most subject to change is the amount and type of ground cover. When fires burn an area or when vegetation is removed as part of timber operations, building a house or a road, the susceptibility of the soil to erosion is greatly increased.

Roads are especially likely to cause increased rates of erosion because, in addition to removing ground cover, they can significantly change drainage patterns. A road that has a lot of rock and one that is "hydrological invisible" (that gets the water off the road as quickly as possible, mimicking natural drainage patterns) has the best chance of not causing increased erosion.

Understandably, many human activities remove vegetation from an area, making the soil easily eroded. Logging and heavy grazing can reduce vegetation enough to increase erosion. But changes in the king of vegetation in an area can also affect erosion rates. Different kinds of vegetation effect infiltration rates of rain into the soil. Forested areas have higher infiltration rates, so precipitation will result in less surface runoff, which erodes. Instead much of the water will go in subsurface flows, which are generally not erosive. Leaf litter and low shrubs are an important part of the high infiltration rates of forested systems removing these can increase erosion rates. Leaf litter also shelters the soil from the impact of falling raindrops, which is a big agent of erosion. Vegetation can also change the speed of surface runoff flows, so grasses and shrubs can be instrumental here as well.

One of the most serious and long-running water erosion problems on the planet is in China, on the middle reaches of the Yellow River and the upper reaches of the Yangtze River. From the Yellow River, over 1.6 billion tons of sediment flow each year into the ocean. The sediment originates primarily from water erosion in the Loess Plateau region of northwest China.

In materials science, erosion is the recession of surfaces by repeated localized mechanical trauma as for example, by suspended abrasive particles within a

moving fluid. Erosion can also occur from non-abrasive fluid mixtures. Cavitations are one example.

2.1.5.1 Erosion Process

Gravity erosion

Mass wasting is the down-slope movement of rock and sediments, mainly due to the force of gravity. Mass wasting is an important part of the erosion process, as it moves material from higher elevations to lower elevations where transporting agents like streams and glaciers can then pick up the material and move it to even lower elevations. Any perceptible down-slope movement of rock or sediment is often referred to in general terms as a landslide.

Slumping happens on steep hillsides, occurring along distinct fracture zones, often within materials like clay that, once released, may move quite rapidly downhill. In many cases it is simply the result of poor engineering along highways where it is a regular occurrence.

Surface creep is the slow movement of soil and rock debris by gravity which is usually not perceptible except through extended observation. However, the term can also describe the rolling of dislodged soil particles 0.5 to 1.0 mm in diameter by wind along the soil surface.

Water erosion

Splash erosion is the detachment and airborne movement of small soil particles caused by the impact or raindrops on soil. Sheet erosion is the result of heavy rain on bare soil where water flows as a sheet down any gradient carrying soil particles. Where precipitation rates exceed soil infiltration rates, runoff occurs. Surface runoff turbulence can often cause more erosion than the initial raindrop impact. Gully erosion results where water flows along a linear depression eroding a trench or gully.

Valley or stream erosion occurs with continued water flow along a linear feature. The erosion is both downward, deepening the valley, and deadward, extending the

valley into the hillside. In the earliest stage of stream erosion the erosive activity is dominantly vertical, the valleys have a typical V cross section, and the stream gradient is relatively steep. When some base level is reached the erosive activity switches to lateral erosion which widens the valley floor and creates a narrow floodplain. the stream gradient becomes nearly flat and lateral deposition of sediments becomes important as the stream meanders across the valley floor.

In all stages of stream erosion by far the most erosion occurs during times of flood when more and faster moving water is available to carry a larger sediment load.

Shoreline erosion

Shoreline erosion, on both exposed and sheltered coasts, primarily occurs through the action of currents and waves, but sea level change can also play a role. Sediment is transported along the coast in the direction of the prevailing current (alongshore drift). When the up current amount of sediment is less than the amount being carried away, erosion occurs. When the up current amount of sediment is greater, sand or gravel banks will tend to form. These banks may slowly migrate along the coast in the direction of the alongshore drift, alternately protecting and exposing parts of the coastline.

Ice erosion

Ice erosion is caused by movement of ice, typically as glaciers. Glaciers can scrape down a slope and break up rock and then transport it, leaving moraines, drumlins, and glacial erratic in their wake typically at the terminus or during glacier retreat. Ice wedging is the weathering process where water trapped in tiny rock cracks freezes and expands, causing the breakup of the rock. This can lead to gravity erosion on steep slopes. The scree which forms at the bottom of a steep mountainside is mostly formed from pieces of rock broken away by this means. It is a common engineering problem wherever rock cliffs are alongside roads and morning thaws can drop hazardous rock pieces onto the road.

Wind erosion

Wind erosion, also known as eolian erosion is the movement of rock and/or sediment by the wind. Windbreaks are often planted by farmers to reduce wind erosion. This includes the planting of trees, shrubs, or other vegetation, usually perpendicular or nearly so to the principle wind direction. The wind causes dust particles to be lifted and therefore moved to another region. Wind erosion generally occurs in areas with little or no vegetation, often areas where there is not enough rainfall to support vegetation. (*World Bank 2001: China: Air, Land, and Water*).

Influence of human activity

Erosion is the main factor for soil degradation and is due to several mechanisms: water erosion, wind erosion, chemical degradation and physical degradation.

Erosion is strongly related to human activity. For example, roads which increase impermeable surfaces lead to streaming and ground loss. Agriculture also accelerates soil erosion (increase of field size, correlated to hedges and ditches removal). Fertilization by mineral manures rather than organic manure gradually destructure the soil. Many scientists observed a gradual decrease of soil organic matter content in soils, as well as a decrease of soil biological activity (in particular, in relation to chemical uses). Lastly, deforestation, in particular, is responsible for degradation of fore4st soils. Agriculture increases the risk of erosion through its disturbance of vegetation by way of: overgrazing of animals, planting of a monoculture, row cropping, tilling or plawing, crop removal, land-use conversion.

Consequences of soil regression and degradation

Yields impact: Recent increases in the human population have placed a great strain on the world's soil systems. More than 5.5 billion people are now using about 10% of the land area of the Earth to raise crops and livestock. Many soils suffer from various types of degradation that can ultimately reduce their ability to

produce food resources. Slight degradation refers to land where yield potential has been reduced by 10%, moderate degradation refers to a yield decrease from 10-15%. Severely degraded soils have lost more than 50% of their potential. Most severely degraded soils are located in developing countries such as Asia and Africa.

Natural disasters: mud flows, floods responsible for the death of many living beings each year's deterioration of the water quality: the increase in the turbidity of water and the contribution of nitrogen and of phosphorus can result in eutrophication. Soils particles in surface waters are also accompanied by agricultural inputs and by some pollutants of industrial, urban and road origin (such as heavy metals). The ecological impact of agricultural inputs (such as weed killer) is known but difficult to evaluate because of the multiplicity of the products and their broad spectrum of action.

Biological diversity: soil degradation may involve the disappearance of the climax vegetation, the decrease in animal habitat, thus leading to a biodiversity loss and animal extinction.

2.2 Theories on Watershed Development Programme

People and their environment are interdependent. Any change in the surrounding environment directly affects the people living therein. A degraded environment results in a degraded quality of life of the people. Thus efforts to reduce poverty and improve the standard of living of the people must aim at improving the environment they live in.

The environment does not recognize people determined administrative boundaries. A watershed provides a natural environmental unit for planning a developmental initiative.

Watershed development refers to the conservation, regeneration and the judicious use of all the resources- natural (land, water plants, animals) and human - within a particular watershed. Watershed management tries to bring about the best

possible balance in the environment between natural resources on the one side, and human and other living beings on the other.

2.2.1 Components of Watershed Development

Following are the components of the watershed development:

(a) Human Resources Development (Community Development) (b) Soil and Land Management (c) Water Management (d) Crop Management (e) Afforestation (f) Pasture/Fodder Development (g) Livestock Management (h) Rural Energy Management (i) Farm and non-farm value addition activities

All these components are interdependent and interactive.

2.2.2 Watershed Development Programme in India

The objectives of watershed development program is to mitigate the adverse effects of drought on crops and livestock., to control desertification., to encourage restoration of ecological balance and to promote economic development of village community.

How the Programme is Being Implemented? -The watershed programme I being carried out in desert, drought prone and rain fed area. DRDA/Zilla Parishad selects the villages for development of watershed projects.

Who are the Intended Beneficiaries? - People living in the watershed are the beneficiaries of the programme.

Where and with whom information is available? -About this programme, the detailed information is available with DRDA/Zilla Parishad and Agricultural Department at District level and Panchayat Samiti at block level.

What is the Beneficiary Supposed to Do? - The watershed development programme is peoples centered programme and people's participation in the programme has been made mandatory. The people have to form a watershed association and watershed committee for each watershed project. Watershed

association is in existence comprising of all adults residing within a watershed project area. The committee is responsible for planning and development of watershed project for its area while developing the plan for the area, the committed has to take technical assistance from project implementation agency. Besides, the beneficiaries of the programme have to give voluntary donations/provide contribution in terms of labour, raw material, cash etc. for development activities and for operation and maintenance of assets created.

Who Funds the Programme? - The ministry of Rural Areas and employment, Government of India, funds watershed development schemes under Drought Prone Area Programme (DPAP), Desert Development Programme (DDP) and Integrated Watershed Development Programme (IWDP).

What are the Activities Undertaken? - Land Treatment - (a) Soil and Moisture Conservation: Land leveling, graded binding, contour bonding, vegetative bonding, contour cultivation, drainage line treatment, gullies stabilization, gully plugging, percolation tanks and farm ponds. (b) Afforestation: Tree plantation in degraded forests, Panchayat lands, community lands, private land etc. (c) Pasture Development : In village community lands, pasture lands with suitable grass and fodder pieces.

Production Activities

Cropping Pattern - (a) Introduction of suitable crops, improved crop varieties, inter-cropping, contour cultivation and crop management practice; (b) Sericulture; (c) Horticulture; (d) Live tock development fodder cultivation, milch cattle distribution, establishment of milk co-operatives; (e) Integration of other activities such as sheep rearing, fisheries, piggery, poultry, bee keeping etc.

Employment Generation Activities

(a) Creating more employment through land based and productive activities; (b) Raising backyard nurseries; (c) Cottage industries based on bamboo, wood craft, cane craft etc. (d) Wage earning through community assets creation such as community buildings, village roads etc.

Role of Panchayats

The role of Panchyat was to provide adequate information about the local resources and help in planning of watershed programs. This will help the beneficiaries in the follow-up activity in maintaining the assets created and developing their lands with future prospects. With regard to afforestation and pasture development activity in community lands, Panchayats can help the agency in selecting the species, of their choice for plantation and pasture development.

Panchayat should take the responsibility for assisting in constituting user / beneficiary committee in the watershed for their direct participation in the execution of the project. Panchayat should shoulder the responsibility of the assets created in the watershed area, such as gully structure, check dams, community forestry and p0asture lands, Panchayat can adapt a well defined system on lines of Joint Forest Management. (*Jaiswal 1997, Panchayat Unnati, Newsletter, NIRD, Hyderabad*)

Indo-German Watershed Development Program

The Indo-German Watershed Development Programme is an integrated environmental regeneration programme implemented in the State of Maharashtra, by Village Self-Help Groups, accompanied and mobilised by NGOs. It is a bilaterally assisted programme which was initiated in 1989 by Fr. Hermann Bacher, S.J., the moving spirit behind the Programme. The Programme was operationalised in December 1992. It has two phases i.e. capacity building and full implementation. In capacity building, necessary skill and capabilities was developed by the fund provided German Agency for Technical Co-operation. In full implementation phase, the watershed activities and programs were undertaken by the fund provided by German Development Bank. The works were implemented through 'qualified' village self-help groups (VSHGs), Village Watershed Committees (VWCs) and Non Governmental organizations (NGOs). The watershed projects were lunched in Maharashtra and Andhra Pradesh of various watershed. So far, WOTR has undertaken implementation of 39 watershed projects covering an area of 34,831 ha in Maharashtra. WOTR is implementing 17 watershed projects in the Narayanpet Mandal of Mahabubnagar district covering

an area of 8429 ha. and a population of 31333. 8 of these projects are under the Andhra Pradesh Rural Livelihoods Program (APRLP), 6 under DPAP and 3 under the Employment Assurance scheme of the Govt. of AP. The Government of Maharashtra introduced the concept of 'Mother NGO' in 2001 in order to provide support to implementing NGOs and village communities under the Drought Prone Areas Programme (DPAP). Based on the role played by WOTR as a capacity building agency in IGWDP, the task of the 'Mother NGO' was defined to support implementing agencies for community organization, training, monitoring and coordination with other agencies. This government-funded watershed development programme (DPAP) has adopted the following aspects of WOTR's approach:

Greater emphasis on area treatments - Ridge-to-valley area treatment for in situ soil moisture conservation, Participatory Net Planning (PNP), Community/farmer contribution, Participatory implementation and monitoring.

2.3 Gender & Women's Role

2.3.1 Gender, Gender Mainstream and Women's Promotion

Regenerated natural resources should respond the immediate household needs such as water, fuel, fodder and food. Hence the involvement of women requires special attention. Women involvement in community affairs increases the socio-economic well-being and status in society. Formation of SHGs and also includes activities reduces the drudgery and enhancing their economic status.

2.3.2 Role of Women in Watershed Management for Poverty Alleviation

Watershed management in India was first started in the Damodar Barakar Bain under Damodar Valley Corporation (1949-50), while watershed technologies were first demonstrated in actual field settings through operational research projects on watersheds at Sukhomajri (Haryana) ad Nada (Haryana). The people's participation was the key to the success of these projects. In the context of national are source management, the gender related issues are quite focused and

viewed under the existing socio-economic perspective of the rural economy. According to the estimates (*NSS, GOI, - 1991*), 84% of the economically active women are involved in contribution toward agriculture in India which accounts for 87% of India's GNP. Thus, women play a pivotal role in agriculture development and the management of natural resources and their involvement is indispensable for the effective implementation and equitable distribution of the benefits of watershed management. The main problems identified to hinder the social and economic development of women are: involvement in less remunerative activities; loss of access to common pool Resources; denial of land ownership rights; inconsideration to gender differentiated impacts of forest protection and lack of technical expertise. Some of the important measures required to strengthen the position of women in watershed manage3ment are: 1) preparation of watershed plan with an understanding of gender needs and implementations; 2) developing watershed plans on the basis of existing use and dependence pattern; reformulation of watershed guidelines to specify mechanisms for institutional arrangements for invo9lvement of poor and women; development of micro-credit / self help- groups; shifting focus from watersheds to livelihood development and organizing gender sensitization programmes. The above interventions if implemented would bring poor women to centre stage as key participants in decision making as resource users and help in poverty alleviation.

2.4 Soil Conservation and Watershed Management in Nepal

2.4.1 Department of Soil Conservation and Watershed Management

Nepal's landscape is predominantly composed of hills and mountains, covering about 83% of the total area of the country. These hills and mountains have formed a large number of watersheds and countless number of sub watersheds. Mid-hills are characterized by subtropical to temperate climate and represents highest number of species of many floral and faunal groups. At high elevation, number of

species decrease but it is important to note that high number of endemic species occur in the high mountain zone.

Most of the watershed areas are facing problems of accelerated soil erosion and watershed degradation and loss of biodiversity on site. In Nepal, the strategy for soil conservation and watershed management is to utilize all means of conservation, which will reduce pressure on the natural environment, imp-rove the productivity, generate income and enhance the livelihoods of the local communities. The DSWM implements this strategy through the development and extension of integrated resource management plans at the sub watershed level with people's participation.

Contributing in meeting the people's basic needs for forest and food products by improving the productivity of the land through the conservation and management of watershed resources, assisting in maintaining ecological balance by reducing pressure from natural hazards such as floods and landslides are the aimed objective of the SCWM component to mitigate the problems.

2.4.2 Soil Conservation and Watershed Management Programmes

In order to implement SCWM activities in line with the poli9cies, strategies and objectives formulated thus far, the department has incorporated a number of programs as follows:

Land Use Planning - Land use plans are the basis for the rational utilization and management of watershed resources. These plans are prepared by using scientifically analysed land capability. The following three types of activities are carried out under this programme. 1) Watershed management planning, 2) Sub-watershed management planning, 3) Technical service for land use development.

Land Productivity Conservation - These programmes are designed to restore and improve the productivity of private and community lands. Included under this programme are mostly biological conservation measures such as on farm conservation practices, fuel, fodder, fruit tree plantation ; grass plantation, grass plantation, greenbelt/shelterbelt development, agro forestry, nursery operation and conservation plantation.

Infrastructure Protection - These programmes include those measures, which protect and stabilize basic development infrastructures such as reservoirs, irrigation systems, roads and others with the aim of improving the economic life of the infrastructures. Bioengineering measures are usually used for slope stabilization, roadside erosion control, trail improvement, irrigation canal improvement.

Natural Hazard Prevention - These programmes are intended to help reduce damage to life, property and valuable natural resources caused by different types of natural hazards. Gully treatment, landslide treatment, torrent control, stream bank protection and degraded land rehabilitation activities using various structural measures are include. Construction of check dams, retaining walls, diversion chain.

Community Soil Conservation and Extension - In order to combat conservation problems, the Department has given equal emphasis to conservation extension and education as well as regulatory preventive and rehabilitative measures. This is because these programmes play a key role in mobilizing people and in generating conservation awareness. The broad packages developed for this are: conservation demonstrations, extension education, training and study tours, support to community development groups strengthening and institutionalization process, exhibitions, competitions and conservation technologies transfer.

Income Generating Activities/Measure: The capacity of land resources to sustain the population is limited. Population in the hills of Nepal has reached the "saturation point", so conservation efforts without parallel effective population control measures and diversification in economy will be less effective if not unless. To relieve the pressure on the marginal lands, diversification of economy through

income generating activities become essential. Bee keeping, private nursery, duck farming, mushroom growing, vegetable growing, sericulture, chicken raising, fish farming, rabbit farming are some of the IGA programs related to land and water use. The individual household is considered as working unit and the activities will be lunched as an incentives and demonstration programs. These activities are linked with other conservation measures. Subsidized minimal support to initiate the programs and technical backing stopping will be the main efforts from the soil conservation and watershed management offices. Emphasis will be given to formulate user groups among the participating households, so that the group can make an effort to sustain and expand the activity in the area.

2.4.3 Policies and Strategies for Soil Conservation and Watershed Management

Ensure proper land use by rational land use planning; Implement integrated package programmes that include vegetative, agronomic and water management measures to tackle erosion problems taking the sub-watershed area as the unit of planning and management; Ensure the multiple use of land and water to fulfill diverse needs; Operate soil conservation and watershed management (SCWM) programmes in line with the integrated watershed management approach and on the basis of watershed conditions.

Establish linkage and networking with all other related sectors like forestry, agriculture, livestock, water and land resources; Ensure people's participation by developing appropriate technologies and through conservation extension education and demonstration; Adopt ways and means of minimum damage to the environment during the construction of development infrastructures; Protect watersheds near hydroelectric dams, irrigation systems and riverbanks through plantation the other conservation techniques; Expand and institutionalize SCWM services in all districts of Nepal and Focus on conservation activities in the Siwaliks and other marginal lands.

2.4.4 Soil and Watershed Conservation Programme in 9th Five Year Plan

A. The Policies and Implementation Strategy in 9th Five year plan was:

i. Under soil and watershed conservation programme, services being provided in 55 districts will be expanded to 77 districts by determining priority on the basis of evaluation of the deteriorating condition of sub-watershed areas.

ii. In other to provide support to the prerequisites of development the activities of integrated watershed management will be give high priority

iii. Watershed management programme will be carried out with priority in order to mitigate the negative impact that may be caused by the destruction of resources in the watershed areas of big hydroelectricity and irrigation projects.

iv. Integrated resource management and mobilization will be carried out through people's participation in the functional watershed areas of 15 to 25 sq. km

v. Conservation of Siwalik area, which is very fragile, will be carried out in order to maintain the recharge capacity of ground water reserve by giving priority to the soil and water conservation programmes.

vi. To protect the land from the potential calamities of flood and landslides, policies and implementation strategies such as affiliating the bases of upper watershed with conservation, establishing participatory watershed management training center, conservation and exhibition sites and watershed laboratories, mobilizing people's participation in watershed management and developing human resources at the local level will be adopted.

B. Programme Targets of 9th Plan

i. Soil conservation service extension - 77 districts

ii. Community based integrated watershed management - 100 sub - watershed area

iii. Productivity conservation, land utilization development and exhibition and publicity -extension - 77 sub-watershed areas.

2.4.5 Soil Conservation and Watershed Management in 10th Five Year Plan

Tenth Plan has given emphasis on integrated watershed management with strong participation of people. The districts where the SCWM program lunched will be divided into the sub-watershed having its area 15 to 25 sq. km. To protect surface and stream bank erosion, perennial crops will be shown with the local technology and local people participation. For management of sloping land, sloping Agriculture Land Technology (SALT) will be adopted with the co-ordination related agencies and with the participation of farmers groups. The programs will be conducted with the collaboration of NGOs and local users Groups. Emphasis will be given on integrated watershed management programs in Chure region mainly Uppallo Chure Region.

2.5 People's Participation in Soil Conservation and Watershed Management

The environment is a living space on which the human community living within that area depends on for its livelihood. When the economic condition of a community deteriorates it leads to over-exploitation and degradation of natural resources which, in turn, further exacerbates poverty. It is thus necessary for people to see the relationship between their poverty and the degraded environment they live in.

Thus, just as human beings and their activities are the cause of environmental destruction, it is only they who can restore to health the ruined environment. Hence there can be no sustainable natural resources management unless it involves the participation of all the inhabitants of the concerned environment/area in an active manner.

His Majesty's Government has realized that soil conservation and watershed management activities can never be sustained without people's participation. It has been envisaged that all activities related to soil conservation and watershed management programmes should aim for sustainability be developing and

designing social and community initiatives and self-reliance mechanisms. It is in this context that the Government enunciated the policy of people's participation. This policy provides for the formulation of user groups to mobilize people to carry out all soil conservation and watershed management activities and to implement them through the local user groups. The level of participation varies depending upon the nature and scale of works, Based upon this policy, the department have developed the following elements for people'[s participation in soil conservation and watershed management programmes.

Identify activities that are conservation as well as need oriented, and profitable to the farmers. Plan and identify the activities at grass root levels. Make the budget and government policy transparent to farmers. Develop extension programmes so as so generate awareness and know-how about conservation and its benefits, and people involved in all stages of program planning, implementation etc.

2.6 Case Study of Elements of Successful Watershed Management inside and outside Nepal

2.6.1 Case of Participatory Watershed Management at Ralegan Siddhi, India

An overview of people's participation in natural resource management in India Recent prominenet initiatives of people's participation in resource management. The case of people's participation in watershed management in Ralegan Siddhi.

In recent years the notion of sustainable development has emerged as a reaction to the highly technological and centralized processes that have governed thinking on development, the green revolution being a classic example the process of sustainable development. Some initiatives in India have grappled successfully with this complex process, and different models of people driven development have emerged. Perhaps the most notable of these is the remarkable work of Mr. Annasaheb Hazare in Ralegan Siddhi village. When he first returned to his village in 1975 it was extremely degraded village. There was large scale migration, ill health, low productivity and a flourishing business in the illegal distilling of alcohol, resulting into violence especially against women. Today Ralegan is unrecognizable. Productivity has increased manifold. There is a sense of

community and sharing among all the people, and complete self-sufficiency in food grains. Ralegan only demonstrates what village people can do when they take control of their own development. It serves as a testimony to community interest taking precedence over self-interest. This miracle was achieved by:

The emergence of local leadership: Annasaheb Hazare is from the village and his intimate knowledge of the community, its culture and traditions and his exposure to the outside world enabled him to play the role of a catalyst and a bridge.

i. Underpinning of moral sanctions: He recognized the conflict in development between old and new, traditional and modern, violent and peaceful. His intervention gave space to the traditional leadership to reassert their moral authority and lay the foundation for a moral just and human social order. The basis of Annasaheb Hazare's intervention is a moral and voluntary code of conduct which has been adopted by the entire village community. This is a six point program that includes: ban on open grazing, ; ban on tree felling ; ban on dowry; ban on consumption of liquor; family planning ; and donation of labor (Shramdan).

ii. Involvement of all section of society, especially the weak and vulnerable: Right from its inception, the Ralegan village participation process involved women and lower castes (Harijans) in all planning and implementation.

iii. Identification of people's priorities: Annasaheb Hazare being a son of the soil was able to identify water development us the primary need of the village, and that helped to mobilize popular opinion in his favor.

iv. The use of simple but effective technology: Annasaheb recognized that merely providing strong moral basis would be insufficient to motivate people towards construction change. His intervention to manage rain-water run off through watershed development was cheap, local, and maximized their use of local resources especially labor.

v. Holistic and sustained development: Having started with water management, Annasaheb Hazare went on to include community work to prevent erosion and to promote widespread aforestation. The holistic impact of these

measures began to be felt within a decade. It is note worthy that the villagers have been working continuously on this process for the last 20 years by now. Thus, long term continuity is a vital ingredient in the strategy for sustainable development.

vi. The primacy of the village assembly (Gram Sabha): Although Annasaheb has taken the leadership in Ralegan, all major decisions are taken in the Gram Sabha, which has institutionalized a democratic style of functioning. An overview of people's participation in natural resource management in India.

2.6.2 Case Study of Watershed Management in Wuhua County, China.

Wuhua county is located at the mid eastern part of Guangdong Province, China. The county has serious erosion and watershed degradation problem. Population density is 280/km2, and the average arable land per capita is only 0.1 ha. Soil and water erosion in the county is responsible for weak geo-morphology, poor soils and vegetation, hydrological problems, irrational land - use and many socio-economic problems.

Although the soil and water conservation work in the province began in 1949, this sector received high priority only since 1982. Accordingly the provincial Government passed many related resolutions to effectively execute soil and water conservation program in Wuhua county. Comprehensive management system of small watersheds (5-40km) has been very popular in Wuhua county. At present, the county has 62 small watersheds under the comprehensive management system. Planning and selection of these watershed were carried out by a multidisciplinary team of technicians, NGOs, village leaders and farmers, Under this system, local county Government and farmers provide financial support, where as Provincial Government provides necessary materials, tools and equipments to implement the program at a small watershed level. People's participation in land management is through various contractual arrangement such as Family contract system, collective or group contract system, sub-lease contract system, professional contract system and specialized contract system. Because of these systems of people's participation, soil and water conservation works in China have

been carried-out successfully. These systems have significantly improved the rural economy and standard of living of farmers of Wuhua county. This is achieved by soil and water conservation techniques which give quick economic benefits.

The concept of small watershed based development is practiced successfully in Wupi river watershed of Wuhua county. The overall plan for the management of a small watershed emphasizes on comprehensive erosion control measures including measures for hill slope and gully stabilization, regulating river system and rearranging farm lands. Principles of soil erosion control have been further developed by combining soil erosion control measures with the optimum utilization of biological measures. Under these principles, short-term, medium-term and long-term objectives have been formulated. Short-term objective is to upgrade agricultural production, medium-term objective is to increase fruit production and long-term objective is to develop forestry and eventually to combine ecological and economic benefits. The focus on economic benefits is based on the fact that the people would participate activities in soil erosion control works only if it results into quick economic benefits to them.

2.6.3 Case Study on Incentive Based Mechanisms for Watershed Management

In the context of application of methodologies for the assessment of values of biodiversity and its functions, the relationship of upstream and downstream communities in the same watershed has been explored for the use of natural resources especially in the terms of land use pattern such as grazing lands in an ongoing project on "Developing incentive-based mechanisms for watershed protection services and improved livelihoods" in Himachal Pradesh in India. The project is a part of the Implementation phase of the India country

Study under the international project: "Developing markets for watershed protection services and improved livelihoods" undertaken by an NGO, Winrock International India, based in New Delhi.

The project explores the innovation approach of valuing biodiversity resources associated with the land use patterns such as grazing land in the context of its

ecosystem value by controlling the resource degradation and economic value by evolving mechanisms to provide incentives for the upstream communities from the downstream users and the major beneficiaries of the watershed.

The project is a learning initiative that engages across-country and across-region policy learning in the Caribbean, India, Indonesia, South Africa, Bolivia and China, with the purpose of increasing understanding of the potential role of market mechanisms in promoting the provision of watershed services for improving livelihoods in developing countries. This approach is designed to complement regulatory and participatory approaches, in case where these have not achieved adequate provision of watershed services, and in such a way, that livelihoods are improved.

One of the aspects of the project where many upstream communities, who are stewards of watersheds, are poor and neither the resources nor the incentive to maintain or enhance watershed services that are used by downstream users. Quite often they are dependent on the same resource for their livelihood e.g. livestock grazing. On the other hand, people in downstream areas who benefit from these services may contribute nothing towards better management upstream areas. Thus, there is a need to explore alternative approaches through which receivers of the service can compensate the suppliers for changes in land use and management practices upstream to secure watershed protection services. Incentive-based approaches offer a solution that can be tried in conjuction with the other existing approaches.

This approach of linkage of upstream and downstream users with the natural resources of the watershed catchments is been explored in the changer region, Himachal Pradesh, India. Two sub-500 hectare catchments have been selected in the water scarce Changar area of Kangra District, Himachal Pradesh. Located in the Shiwalik hills in the southern part of Kangra district, the Changar region has typical altitudes in the 500-1200 m range. Unlike the relatively better irrigated northern reaches of the district, where agriculture is sustained by hundreds of gravity-fed irrigation channels which divert water from snow-fed streams, the Changar region is characterised by drinking water scarcity and limited irrigation coverage. After a review of ten sites in the state, two mini-micro watersheds were

chosen in the Changar area. They are the Kuhan catchment and the Bhodi-Suan catchments.

The Kuhan catchment is located about 55km from the town of Palampur. It includes three villages namely Oach Kalan, Uperala Kuhan and Kuhan Khas, all of the Kuhan panchayat. Oach Kalan lies in the upper catchment and Kuhan Khas is downstream, with the smaller Uperals Kuhan in the middle. Habitations are spread out in small hamlets: there are seven in Oach Kalan and six in Kuhan Khas. The total catchment area is 343.47 ha. and the altitude ranges from 540 to 750. Less than a third of the area is cultivated. The main stream, Gulana Khad, eventually, drains into the Beas river. The Indo-German Changar Eco Development Project (EGCEDP) has supported various agriculural and common land interventions in the catchment, including plantation and soil conservation works, since 2000.

2.6.4 Case Study of People's Participation in BTRT Watershed Management in Nepal

The Begnas Tal (lake) and Rupa Tal (BTRT) watershed area is located at about 10km. east of Pokhara in Western Nepal which is about 200km. west of Kathmandu. The watershed covers an area of 173km2 of two main lakes begins and Rupa and three other minor lakes. There are seven Village Development Committees (VDC) in the BTRT. About 31000 people inhabit in the BTRT area.

For the last ten years, the BTRT Project has been concentrating its efforts on watershed management using participatory approaches. Hence, it is thought to be the best area for studying participatory approaches in watershed management in Nepal. In the BTRT Project area, participatory approach is mandatory for all activities at all stages, today. Local people are actively involved in planning, implementing, follow-up, and maintaining community watershed resources. The role of watershed management technicians is relegated to that of technical facilitators.

Communities are organized in order to ensure peoples' participation. Community Development Conservation Committees (CDCC), instead of users' groups, are the organizational unit. A CDCC serves a community as a natural socio-ecological

unit. It is not defined by a VDC or a VDC hamlet (called ward in Nepal) boundary. Each household in the community is represented in the CDCC. At the project's initiation, a CDCC analyzes its problems using a participatory community approach and then presents its conservation needs to the project office. As of the end of 1994 there were 100 CDCCs in operation in the BTRT area.

The BTRT Project's push for agricultural diversification has minimized the risk of crop failure and enabled farmers to earn income throughout the year. Nowadays, an average farmer grows about six kinds of fruits, five types of fodder and local grasses, as well as cultivates cereal crops.

The project has handed over the responsibility for managing natural forests near villages to the local users. This is resulting into denser forests. Women's CDCCs are especially keen on managing forests. The use of traditional farm management technology is common and farmers manage their land very well. Terrace slopes are within the prescribed limits and in general in good condition.

The project identified the need for quality agricultural inputs and support services needed for utilizing marginal lands. Many groups of farmers are involved in the marginal land improvement agro-forestry program initiated with the help of the project. Farmers are not only ready to pay for fruit saplings, but they also convince their neighbors to participate in the program so that there will be a larger group fund.

Local women are very active in forest management and conservation farming activities and are fully involved in the decision making process. The major factors facilitating women's participation in CDCC proceedings were: a clear prospect of benefit sharing, support from their families and the small size of the group area served.

Many conservation farmers have adopted improved agricultural practices and share these experiences with their neighbors. They have setup demonstrations on their farms and have converted many followers, who are monitored by the conservation farmers themselves. In this way improved farming practices were spread throughout the area. Homestead agro-forestry plots were established and kitchen gardens introduced to great economic benefit. The sale of coffee,

pineapple, orange, cardamom, broom grass, and other varieties of fruits and vegetables in generating cash income for the farmers.

A community Development Board, which operates at the village level, was formed to foster communication between the CDCCs and the VDCs. All ward members of a VDC and the chairmen of the CDCCs in a VDC are the members of the board. Technical staffs in the VDC serve as advisors and facilitators of farmers' groups/organization.

In sum, an overall impression about the factors that contributed to the success of people's participation (PP) in the BTRT watershed management are outlined as follows:

Clear and transparent decision making procedures by project management.

Clear and simple guidelines, and flexible operational procedures to facilitate PP in watershed management.

Well defined programs, budgets, plans, implementation procedures and benefit sharing mechanisms.

Integration of a wide range of diversified watershed management activities and guarantee of benefits.

Strong motivation among project staff.

Nature of the problem

The residents of Kuhan Khas have long wanted to utilise the substantial flows in the perennial Gulana Khad to expand irrigated areas in their village. An informal irrigation user group has now installed and is managing a small lift irrigation scheme in Kuhan Khas village since year 2000-2001, with IGCEDP support. The cost of the lift irrigation system (small dam, pump, pipes) was shared between the IGCEDP (75%) and the community (25%). Substantial productivity gains have been made in the recently irrigated area and fifteen farmers are doing vegetable cultivation on a small scale and selling part of their produce locally. Some farmers in the downstream Kuhan Khas have also started vermi-composting, with IGCEDP facilitation. Compost-based vegetable farming has now expanded to a large group

of farmers. The compost approach has also meant that these farmers have avoided the costs of chemical fertilisers and likely increased their returns.

The residents of Kuhan Khas view the lift irrigation scheme as a critical component in their agricultural economy. But high rates of siltation of the small reservoir, from where the water is lifted, have been observed in the first year of its operation. Members of the user committee have donated their labour to partially clean the reservoir. However they recognize that annual cleaning is not sustainable and a long-term sustainable solution to the problem would involve reducing the silt load in the stream. They feel that reduced grazing, protection of common lands and increasing vegetation cover in the upland catchment could help in reducing the silt load. (This claim will be investigate4d further through a land use study at the site). In addition they plan to identify and critical areas that are a disproportionate source of erosion. They are willing to consider compensating the upstream residents for their support in upstream catchments protection.

A key upstream user group that is likely to be affected by a land use change is families predominately dependent on open grazing based animal husbandry. There are seven or eight such families in Uperala Kuhan. Oach Kalan has a larger area under common lands, and concomitantly many more families who depend on common lands for their livelihood.

Proposed activities

The primary activities at this site are intra and inter village facilitation; to develop a transaction based mechanism to secure watershed protection services. Meetings will be held as required. The mechanism will include facilitating the stakeholders in developing verifiable direct or indirect indicators of watershed services, identifying suitable payment mechanisms, the institutional framework in which it would operate, an internal and/or external audit mechanism, as well as a method to adjust the various aspects [payment, delivery, verification] of the mechanism.

Evaluating the environmental benefit of agricultural conservation practices-The status of our knowledge.

The soil and water conservation society (SWCS) is taking on a project to document the status of our knowledge regarding the effect of agricultural conservation practices on environmental quality. The primary purpose of this project is to construct the scientific foundation for the USDA Conservation effects Assessment Project (CEAP) by summarizing what is known and what is not known about the environmental effects of conservation practices. The first stage of the 5-year project focuses on conservation practices used in cropping systems.

Environmental management-improving soil, water, and air quality, conserving water, and enhancing fish and wildlife habitat on agricultural land while sustaining production is now the primary purpose of USDA conservation programs. The foundation of environmental management is predicting the positive or negative environmental effects produced by conservation practices applied to the land. This project is designed to document the current state of scientific knowledge regarding the magnitude and direction of those environmental effects. The final report will document what is not known as well as what is known about the environmental effects of conservation practices. Recommendations will also be formulated to guide efforts to assess the environmental benefits of conservation programs and to set priorities for research to fill knowledge gaps.

The first stage of the project will focus on the effects of conservation practices used in cropping systems on water quality, soil quality, water conservation, air quality, and fish and wildlife habitat. In succeeding stages, the project will address the effects of conservation systems applied to grazing land and other land uses. (*Rabin Bogati*)

2.6.5 Case of People and Resource Dynamics Project about Watershed Management

Although most watershed projects have been scientifically and technically well designed, the implementation process has not really been able to cope with local problems. Many projects looked at macro-level problems and neglected the local inhabitants' needs and capabilities. Macro-level designs tend to ignore small farm considerations.

Many projects have been designed to cope with the whole watershed system. They are integrated and interdisciplinary but tend to overlook small-scale farming systems that also need to be given priority. A design prepared for a whole watershed cannot be applied thoroughly. Technologies are designed with the expectation of a major impact on the whole watershed system, but cannot be applied to small-scale farming systems in which farmers tend to prioritize their own basic needs rather than those of the environment or the ecosystem in general.

Very often academic and policy makers take about forests, watersheds, and ecosystems in highly technical language which farmers do not understand. Farmers do not give priority to larger issues as they do not directly solve their basic problems, Individual small farmers need to fulfill their basic needs and outsiders need to develop technologies and approaches that help solve farmers' problems not the whole watershed issue.

The way of looking at a problem and the design of a project or programme by university people or government officials tend to overlook the basic principle of people centered community development. Working with rural people is not a matter of technology or of management schemes but how to make people feel that their problems are the problems identified by implementing agencies.

Most project components have focused on environmental issues rather than on the community with its social, economic, and cultural issues. Many watershed management projects cannot implement the whole design. How can the project try to improve the watershed ecosystem of a mountain while there are farmers and their farming systems scattered throughout the mountains, valleys, and watersheds and their economy or general livelihood should be improved?

Reforestation or regreening projects tend to work on communal land. Implementing agencies are also willing to achieve the target of the area to be covered. Usually, farmers will not take on responsibilities for caring or managing common properties or government-owned land if the productivity of their own farm does not improve.

In an attempt to avoid/overcome such problems, ICIMOD's people and resource dynamics project (PARDYP) is

A three-year watershed management research and development project involved in the field of co-operative rural participation, hydrology and meteorology research, soil erosion and fertility studies, conservation activities, rehabilitation of degraded areas, and agronomic and horticultural initiatives;

Approaches watershed dynamic and research through a holistic methodology, adopting a nested approach to examine initial differences and subsequent changes in surface water flow, soil erosion and fertility, sedimentation, farming systems, and land use and land cover characteristics in sub-watersheds of differing physical and social attributes;

Funded by the Swiss Agency for Development and Co-operation (SDC), the International Development Research Centre (IDRC - Canada), and ICIMOD;

Oprates through focal research institutions and government departments in the collaborating countries ;and is actively supported by institutions both in the collaborating regional countries as well as institutions further a field - especially the University of British Columbia in Canada, the University of Bern in Switzerland, and the Swiss National Hydrological and Geological Survey.

The people and resource dynamics project officially began on October 1, 1996. Currently it is being implemented in China, India, Nepal and Pakistan at the following sites

China

The Xi Zhuang watershed - The watershed selected for PARDYP -China is called the Xi Zhuang watershed. The watershed is characterised by a rural agrarian population, steep slopes, karstic geology, small patches of degraded land, and extensive areas of scrub forest areas.

Nepal

The Yarsha Khola Watershed - The Yarsha Khola watershed, covering 5338 ha. in Kavre District, is the new watershed in the PARDYP - Nepal programme.

The Jhikhu Khola Watershed - Research and development work in the Jhikhu Khola watershed (11,141 ha.) has been undertaken for the past 6 years by ICIMOD in collaboration with University of British.

Columbia. Work in the rehabilitation of degraded lands has also been carried out by ICIMOD at two other sites in Jhikhu Khola since 1992.

India

Bheta Gad Garur Ganga Watershed - The Bheta Gad-Garur Ganga watershed covers a total area of 8481 ha. Studies have initially concentrated on the smaller Bheta Gad Watershed (2,230 ha). The watershed is near Kausani and is characterized by several areas of degraded land, different land use patterns and forest types, several major different soil types, favorable hydrological and meteorological sit, and several possibilities for twin catchment arrangements. In addition it is easily accessible.

Pakistan

The Hilkot - Sharkhu Watershed - The Hilkot - Sharkhul watershed is considered to be an ideal and most interesting watershed in which to implement the PARDYP activities for physical, social, and economic reasons, and it complements the selected watersheds in the other countries.

Some expected outputs from PARDYP

Generation of information in the fields of hydrology, meteorology, soil erosion, and fertility improved understanding of natural resource dynamics in selected watersheds of the HKH aronomic initiatives to combat decline in soil fertility conservation initiatives to combat soil erosion and land degradation improved

understanding of the role of communities in watershed management and planning trained and experienced international field research teams strengthened partnerships between local and international collaborators. More details of PARDYP phase II (1999-2002) can be found at pardyp. (*icimod.org*)

To develop micro watersheds, the focus has been on enhancement of the ecological basis of production and sustenance systems in order to create adequate and sustainable livelihood opportunities for all in the area thus mitigating the impact of drought and alleviation of poverty. Some of these activities are now also known as watershed plus activities. In addition to mechanical control measures to check soil and water erosion, we have now developed a new set of activities to enhance the biological fertility status of soils for sustainable land productivity. Some of the important conventional activities of watershed management are:

Soil and water management: Development of natural resources on watershed basis has led to significant improvements in soil moisture regime.

Crop Management: To make best use of limited water availability we have introduced a programme for providing the requisite inputs of technology, awareness raising, capacity building and enabling environment.

Value Addition in Agriculture: To reduce the chemical fertilizer use has also enabled farmers to harvest organic food. The market for pure organic food after preliminary processing has given substantially higher returns to the farmers.

Energy Management: Over exploitation of vegetative cover (fuel wood) and use of animal dung for energy needs in village society have been the critical stress areas. The watershed development programme has an inbuilt component for solving the energy need problems of the community.

Animal Husbandry: Traditionally animal husbandry has been primarily dependent on fodder from pasturelands. The watershed development programme has provided support for sustainable level of natural resource availability through pasture development.

Empowerment of Women and SHGs

The women in rural areas suffer from double disadvantage. Being born in poor families, they work hard to earn and contribute to the family income and being women they are responsible for all household chores. Women empowerment is a necessary condition for attaining equity. The strategic goal of increasing women's control over their productive and reproductive lives is yet to be achieved. The foundation has undertaken a large programme supported by NABARD to form SHGs as an institutional arrangement for promotion of thrift and credit activities by women. In our efforts to link credit from banks, the attitude of bank managers at branch level has become a big constraint. Despite 100 percent recovery for all the loans advanced so far many bank branches are still reluctant to give credit to the self help groups.

Over 100 groups have been formed with over Rs.20.00 lakhs savings. The inter loan i.e. the amount given as loan to members has already crossed multiple of three times of their savings. Since most of the members are illiterate, we have found that in many groups maintenance of records and accounts have not been proper. In the present system the biggest problem is related to the information of net amount each member has in the group at any point of time. To overcome, this, recently a new accounting system has been developed and members are been trained.

2.6.6 Watershed Management: A People Matter

On the occasion of World Environment Day on June 5, M.S.S. VARADAN writes on the need for people's participation in successfully implementing watershed activities.

IN Urban India today, it has become a symbol of culture and refinement to talk about and to support environmental causes. But not so in the rural areas where farmers are trying desperately to make both ends meet. Environmental problems in urban areas have received much attention and action while the rural areas, home to 70 per cent of the National population continue to deteriorate. Victims of the whimsical monsoons and fickle market prices, these poor farmers have very little control over their destiny. Furthermore, due to increasing pressure of

population, there is demand for more land for agricultural and non-agricultural use. Unhealthy practices on available land have resulted in creation of vast stretches of wastelands due to soil salinity, water logging, and desertification and soil erosion.

In fact, according to the Ninth Five Year Plan Document, soil erosion is contributing to degradation in about 45 per cent of the cultivable area of the country. The estimates of wastelands range from 76 million hectares to 175 million hectares. In a densely populated country like India, one cannot afford to let so much land remain idle. To make this land cultivable, the productive approach is through watershed development.

A watershed (or catchments is a geographical area that drain to a common point, which makes it an ideal planning unit for conservation of soil and water. The idea is really quite simple and is perhaps as old as the history of farming. But, the benefits are manifold. It changes the entire landscape of an arid area making the land fertile, making growth of trees possible and checking soil erosion and water logging.

Therefore, the government is giving high priority to holistic and sustainable development of rained areas based on the watershed approach. A large number of projects for productivity enhancement are being implemented based on the watershed approach. This is being done through centrally sponsored schemes of the Government, externally aided projects and private initiatives of local communities and NGOs.

The watershed programmes are implemented by the Zilla Panchayat through watershed associations. A project implementing Agency (PIA), which may be a Government Department or an NGO, is assigned about 10 micro watersheds, each micro watershed covering about 500 hectares. The PIA forms a watershed development team that interacts with the watershed associations and provides technical assistance to the watershed association in the planning and implementation of the watershed programme. The residents of the area covered by the watersheds are also organised into self-help groups and user groups. In fact, these user groups are the beginning point as well as the end point for

watershed Development programmes. Their initiative is crucial to the success of the programme and they are the ultimate beneficiaries.

Evaluation reports have shown that watershed projects cannot succeed without full participation of project beneficiaries and careful attention to issues of social organization. This is because their success depends on consensus among a large number of users. Moreover, collective capability and action is required for management of existing as well as new structures created during the project beneficiaries and careful attention to issues of social organization. This is because their success depends on consensus among a large number of users. Moreover, collective capability and action is required for management of existing as well as new structures created during the project. Otherwise, the costs and benefits of watershed interventions are location specific and unevenly distributed among the people affected.

The unfortunate truth today is that most projects have failed to generate sustainability because of the failure of government agencies to involve the people. Up to the end of the eighth plan period, 16.5 million hectares of rain fed/degraded land have been developed under different schemes. However, this does not get reflected in the data for Net Shown Area, which has remained almost stagnant at around 142 million hectares for the last 30 years. This indicates that there was no sustainability of efforts made.

This lack of sustainability can be attributed to a number of practices followed by the Government in the implementation of the watershed development programmes. Strict orientation to achieve physical and financial targets discourages the project authorities to promote people's participation. There is considerable pressure to spend substantial resources by a fixed deadline leaving no room for pursuing participatory approaches. It is imperative for the successful implementation of the watershed projects that people participate in the planning and execution of the project from the beginni9ng. This would inculcate a sense of ownership among the people. Fostering a sense of ownership will undoubtedly go a long way in ensuring the success of watershed programmes.

There is no arrangement for handling over of structures and maintenance of plantation after a project is completed.

In the present form, schemes are planned and executed by district level officer who have very limited capacity to do so. So, there is a need to train both the government officials and functionaries of agencies, which take up watershed projects.

Little evaluation of the programme is done after it has run for a couple of years as it is taken for granted that once money has been spent, physical progress automatically results. But, this is far from the truth. (*www.answers.com*)

CHAPTER - 3

RESEARCH METHODOLOGY

3.1 Selection of Study Area and its Justification.

The study area is Ghurmikhola Sub-watershed which is located at Siraha district of Nepal. It is comprised of four two Municipalities and two Rural Municipalities i.e. Mirchaiya, Kalyanpur Municipalities and Naraha, Bishanupur Rural Municipalities (as detail given in general introduction unit). Most of the Soil Conservation and Watershed Management (SCWM) programs have been implemented within this watershed. But none studied them. I feel it is necessary to evaluate the impact of these programs. I want to list the point why I select this watershed as my study area-

- Professionally, I have been working at that field as a soil conservation assistant and I have collected more experience. It helps me gather the required data with the consultation of user group (CDG) of District Soil Conservation Office, Siraha. It also helps to concise the thesis in good manner.
- Study side is near from my working office. I will able to meet the respondents if it is needed. Omission of information will be solved immediately with consultation of the respondents in the field.
- I have little money and time, it will meet my requirement as well.

3.2 Research Design

In this chapter, a brief discussion of research methodology employed to acquire relevant data analysis is presented. This chapter focuses on how the research design and sampling procedure was formulated and how the different tools and techniques of the data collection and analysis used. Similarly the procedure of data tabulation, presentation and analysis was presented. The limitation of the study, the time and resources/material used in Research was also described.

The general purpose of developing a research design is to get answers of research question as validly, objectively, accurately and economically as possible. Research design is the plan, structure and strategy of investigation conceived so as to obtain answer to research questions and to control variance. (*Kerlinger, 1973: 300*)

A researcher properly answers the questions like - what is the specific topic of the proposed study? What is the research problem to be answered? What will be the objectives, assumption and limitations of study? What are the findings of past research study pertinent to the purposed study? What will be the population of study, where the required data are available? What will be the appropriate sample, technique of sampling and sample size of the study? What will be the appropriate data collection methods, techniques and procedure for the study? How time and money resources will be used for the study? (*Adhikari, 2003: 168*)

Research design is the overall plan of proposed research. The general descriptive and exploratory design method has been used in the present study. It is exploratory design in the sense that it aims to explore the impact of SCWM programs implemented within the Ghurmikhola Sub-Watershed. It is also descriptive design because it describes socio-economic status, people's participation, gender situation, status of conservation of natural resources and benefit distribution in the program implemented within this GhurmiKhola watershed area.

3.3 Nature and Sources of Data

Nature of data during the survey is both quantitative and qualitative. Quantitative data mainly represents numerical facts on educational status, economic status, population and household size. The qualitative data represents feelings, livelihood patterns, social exclusion which will be obtained, observed and noted during the field survey.

Sources of data for this study are both primary and secondary. Secondary data are taken from related agencies i.e. censes data, data from Rural Municipality and Municipality and DDC profile of related field, planning reports, industrial survey, human development reports, field survey report, field manuals, journals, articles, newspapers, etc.

Primary data are collected with the interaction of the Community Development Groups (CDGs) members from related community. Researcher, myself, collect the primary data by applying different tools and techniques such as questionnaire technique, interview technique, observation, focus group discussion etc.

3.4. Universality and Sample Selection

Ghurmikhola sub watershed is my study area and its total household number i.e. 1807 is universe for the study. The population of total households is 9450. The area of study is comprised of two Municipality and two Rural Municipality i.e. Municipality Mirchaiya and Kalyanpur, Rural Municipality Naraha and Bishanupur as described in general information. The randomly selected 55 households out of the total households are taken as the samples for the study. Each household is provided a copy of questionnaire in order to collect the primary information.

3.5 Methods of Data Collection

In order to generate both qualitative and quantitative data related to study topic, I used the following tools and techniques -

3.5.1 Interview Schedule

Data related to socio-economic conditions of people within the Ghurmi- Khola Sub-watershed was collected by interviewing heads of households using semi-strucutred interview. This helped to collect data regarding personal identification, demographic information, educational status, economic activities and other socio-cultural information of the study area. This tool also employed to generate the required data on personal experiences, attitude towards soil conservation and watershed management programs implementing within the Ghurmi- Khola Sub-watershed during the project period.

3.5.2 Observation

Observation is a most effective primary data collection technique in the field of research. Observation is a systematic and deliberate study through the eye of examiner spontaneously at the time of occurrences of events (*Young 1960: 233*). I used observations method to study settlement pattern, family structure, socio-cultural activities of the people within this watershed, physical aspect of the programs implemented within the watershed as much as possible.

3.5.3 Focus Group Discussion

I used this method of data collection to understand the collective reaction of villagers toward the programs implemented within the watershed during the NARMSAP (Natural Resources Management Sectoral Assistance Program) project by DANIDA. It became helpful to cross check the data/information collected from individual households.

3.5.4 Key Informant Interview

I used this technique to collect the collective through towards the soil conservation and watershed management programs implemented during five years period by the DANIDA-NARMSAP Project. It helped me to generate the idea about the socio-economic impact of SCWM programs in the watershed. The selected CDCIS members, teachers and motivators were team as key informants.

3.6 Limitation of the Study

The study will be conducted for the partial fulfillment of the requirements for the Master Degree in Sociology. The researcher myself have not the experiences of social science research, so the findings may liable to be weak. The detailed study would not be possible due to lack of resources within the short span of time. A comparative study of similar project is not possible in short time also. Only 3% sample households of total households couldn't represent the whole population's reality actually. The findings and conclusion of the study may or may not represent all over the nation in similar fields.

3.7 Data Presentation and Analysis

Data do not speak themselves unless the researcher categories, manipulates and deposits them in certain order so as to make them easily understandable condition. Data were processed, analyzed and interpreted using both the quantitative and qualitative techniques of data analysis. The collected quantitative data were analysed using simple tools of statistics such as coding, tabulation, average, percentage. Pie chart is used to show the tabulated data more meaningful. The data were analyzed on the basis of inference drawn from the processed qualitative data were basically analyzed and interpreted by grouping them in the different thematic heading and describing them in the appropriate context.

3.8 Study Period and Used Materials

The thesis materials used in study are thesis format provided by campus, thesis proposal submitted in campus, camera, household survey format, computers and other stationary. The research period for thesis was from August to November 2020.

3.9 Reliability and Validity of Data

The collected data are objective because the researcher myself have visited the study area and gathered the primary data. I have taken the information related to Geographical, Social, Economic status, the participation level of community in the development programs, Gender related data and information related to the thesis objective were gathered myself with individual, group and key persons of the study watershed. The secondary data were collected from the published books, Journals, different manuals published by authorized publication and publisher, so I declared that both secondary ad primary data gathered and used during research period are reliable and valid.

CHAPTER - 4

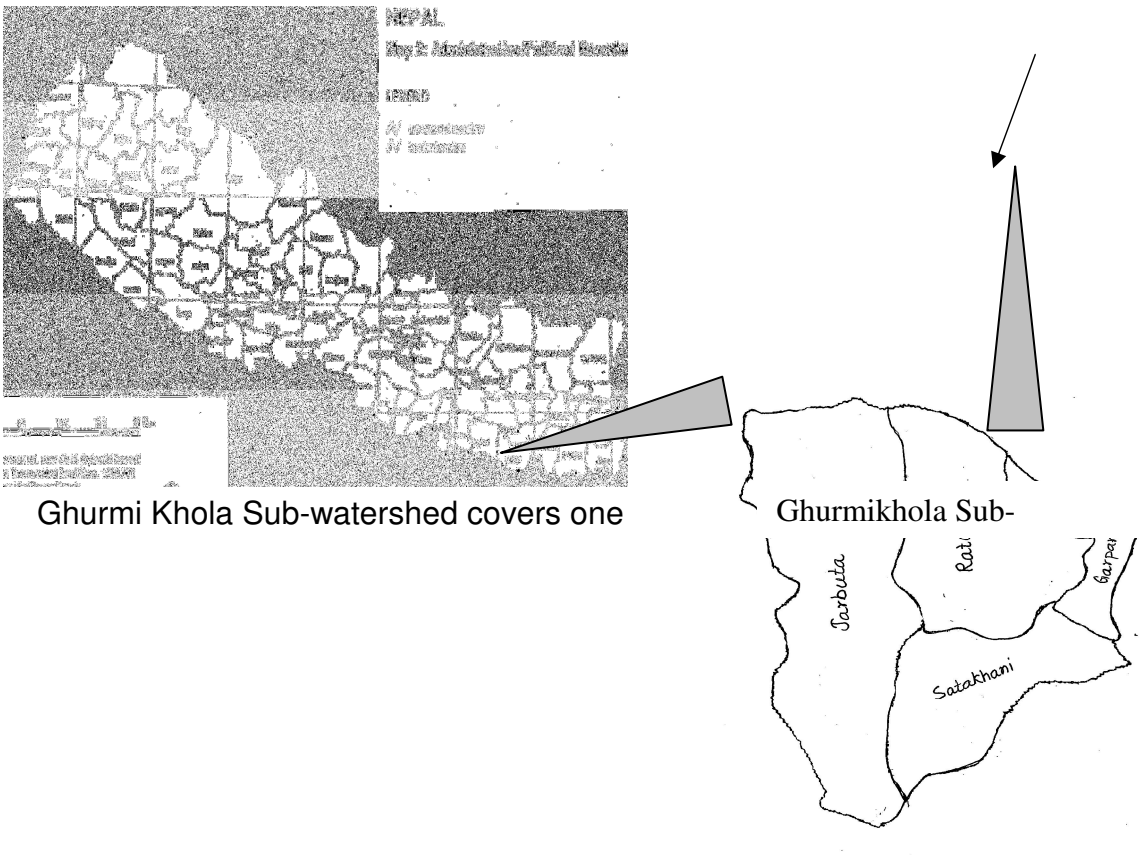
GENERAL INTRODUCTION OF STUDY AREA

In this Chapter, a brief description of study area and its location, its natural resources situation, ethnological status, development infrastructures, climatic condition, the religion and culture of people and at last its demographic composition has been presented.

4.1 Physical Location

Ghurmi- Khola Sub-watershed lies within Siraha district, Province -2 of Nepal. This watershed is drains to Ghurmi river in the far south. Geographically it lies at latitude of 28°14" to 28°58" and longitude of 80°59" to 82°02". The location map of Ghurmi- Khola is given as:

Figure 4.1 *Physical Location of Study Area*



Ghurmi Khola Sub-watershed covers one

Municipality two and Rural Municipality two completely and other partially. The extent of this sub watershed is given in table 1.

Table 4.1 *VDCs and their Coverage within the Ward*

S.N.	Name of the Rural Municipality and Municipality	Ward No.	Remark
1.	Mirchaiya	1 and 2	Partially
2.	Kalyanpur	1,2,3 and 4	Partially
3.	Naraha	2-9	Partially
4.	Kalyanpur	1-9	Completely
Total	4 Local Government	23	

Source: Ghurmi-khola Sub-watershed Development Plan

4.2 Natural Resources

Ghurmi-khola Sub-watershed is rich in natural resources. Forest resource is one of the major resources. It is conserved and managed by forestry user groups and their organizations. This watershed has some spring sources which are the main sources of drinking water. Ghurmi-khola is a main stream flowing on heart this watershed. It is the main sources of irrigation water on either sides of settlement. A master drinking water supply project is now in running to supply water for siraha. This watershed has much resources like stone and sand. These are used for construction of building, bridge and other construction project outside the watershed mainly at headquarter of Siraha district. Municipality Mirchaiya and Sitapur community forests are the protected forest within the watershed. People's daily using material like fodder, fine wood, grasses for domestic animals, are supplied from these forests.

4.3 Ethnic Composition

This watershed is characterized by a diverse ethnic composition consisting of the people of both Mongolian and Indo-Aryans. The indo-Aryans dominate the area. Properly Yadav and Mahato are the dominating caste in the sub-watershed area and other caste are Mushar , Paswanand Chamar.

4.4 Development Infrastructures in Study Area

This watershed is near the Municipality Mirchaiya, Siraha district. It is atleast 12 km. far from Siraha headquarters. Its location is described earlier. But it is remote in transportation. Only two trails are constructed. Higher Secondary Schools and basic schools are facilited. Health facilities are provided by the sub-health post situated at the centre of these 2 Rural municipalities and 2 Municipalities area.

Drinking water availability is high because most of projects have implemented the water supply and spring source protection schemes. The electricity facility is reach at all wards of four local administration.

4.5 Climate

The climate of Siraha district ranges from sub humid, sub tropical to humid cool temperate. All these three types of climate is found at that watershed due to the topographical diversity. High topographic relief and propounded wet and dry monsoon seasons are responsible for climatic variations. The mountains provide temperature zonal and also complex patterns of precipitation throughout the year. About 80% of total precipitation falls from May through September. Annual precipitation is greatest in the southern planks and is greatly reduced in rain shadow of the Northern planks. Variation in temperature might be because of the effects of great mountain ranges .

Table 4.2 Average Monthly Precipitation (mm) Record of Mirchaiya,Siraha in 2005

Jan	Feb	Mar	Apri	May	June	July	Aug	Sep	Oct	Nov	Dec
30.2	25.9	31.1	26.6	74.2	225.5	462.8	434.3	213.4	44.7	8.8	21.5

Table 4.3 Average monthly masx and min temperature (°c) of Mirchaiya,Siraha in 2005

	Jan	Feb	Mar	Apri	May	June	July	Aug	Sep	Oct	Nov	Dec

Max	18.68	21.66	27.2	32.5	33.96	32.56	30.12	30.36	29.3	27.86	24.43	20.93
Min	3.58	7.03	10.86	16.22	19.9	22.5	23.0	22.86	20.86	15.63	9.35	5.32

4.6 Demographic Composition

There are total 1807 households in the 2 Rural Municipalities and 2 Municipalities of research area and total population of the area is 137258 out of which population of male is 67523 and that of female is 69736. The distribution of population in 2 Rural Municipalities and 2 Municipalities ,according to structure of local administration,advocate Nirmala Sitaula, Municipality Mirchaiya 50079, Municipality Kalyanpur 49288, Rural Municipality Naraha 19369 and Rural Municipality Bishanupur 18522.

4.7 Religion and Culture

The majority of people in the research area are Hindu and about 20-25 households are Om Shanti. Dashain, Tihar, Tiz, Janai purnima etc. are the major festivals of Hindu and Maha Shivratri is the major festival of Om Shanti.

CHAPTER - 5

PRESENTATION AND ANALYSIS OF DATA

5.1 Analysis of General Social Attributes

In this section of the analysis, it is tried to analyze the general social and cultural attributes of the society in the research area. The data in this analysis are collected from respondents representing different community development group in the 2 Municipalities and 2 Rural Municipalities of research area. The data are primary data collected by questionnaire. The general social attributes are analyzed under following sub-heads.

5.1.1 Family Structure and Size

For the analysis of family structure of households in research area, family structure is classified as nuclear family, joint family and extended family. Among the 55 households of the area under study, 39 households (i.e. 70.90%) are nuclear family type, 16 households (i.e. 29.10%) are joint type and none of the family is extended type. Figures show that the traditional extended type of family is now completely avoided.

We are more concentrated, here to the family size of household of the respondent. The total population of the selected household is 330 persons. The proportion of population to each household comes to be persons. Hence the average family size of the research area is 6 persons per household.

5.1.2 Types of Houses

For the purpose of this analysis, houses in the research area are classified as RCC roofing, CGI steel roofing, thatched roofing and simple hut. As per the respondents, 4 homes (i.e. 7.27%) are RCC roofing homes, 9 houses (i.e. 16.36%) houses are CGI roofing, 41 houses (i.e. 74.54%) thatched roofing and remaining 1 house (i.e. 1.81%) is simple hut. The available data show that most of the houses are thatched roofing which implies the lower economic strength of the people in the research area.

5.1.3 Caste and Ethnicity

Table 5.1 *Caste and Ethnicity*

Caste	No. of Respondents	Remarks
Mahato	19	
Mandal	9	
Yadav	22	
Dalit	5	

Source: Field Survey2020

Above table shows that there are four types of caste in the research area. 19 households (i.e. 35%) are Mahato, 9 households (i.e. 16%) are Mandal, 22 households (i.e. 40%) are Yadav and remaining 5 households (i.e. 9%) are Dalit. There is no any ethnic group in the research area.

5.1.4 Literacy

In order to analyze the literacy level in the research area, respondents are classified as Illiterate, Just literate, primary education, secondary education and above S.L.C. Out of the total respondents, 10 respondents (i.e. 18.18%) are illiterate, 14 (i.e. 25.45%) are just literate, 9 (i.e. 16.36%) have primary level education, 19 (i.e. 34.54%) have secondary level education and remaining 3 respondents (i.e. 5.45%) have education above S.L.C. among the small number of respondents, 18.18% are still illiterate which shows unsound socioeconomic status of the people, because education is crucial for measuring the socio-economic status of the people. None of the respondents is graduated in the research area.

5.1.5 Occupation

For the analysis of occupation of people in the research area, occupation is classified into, agriculture, service, business and other among the total respondents, 51 respondents (i.e. 92.72%) belong to agriculture, 4 respondents (i.e. 7.27%) belong to business, 2 respondents (i.e. 3.67%) belong to service and none of the respondents belong to other profession. Too low percentage of respondents in service sector shows the inaccessibility of people to the respected occupation in the society. This compels us to realize the unsatisfactory socio-economic status of the people in the society. Lower percentages in the business sector implies that the people are depended to the urban area i.e. district

headquarter for business activities. To be depended on urban area regarding various matters, is not better because urban areas utilize more resources of rural areas for very little return to the rural. This phenomenon of urban deteriorates the socio-economic status of people in the rural areas. Most of the people are engaged in agriculture sector. Although 92.72% of people are engaged in agriculture, they have inadequate agriculture products for sale and even for their self-consumption.

5.1.6 Marital Status

The responses of the respondent show that none of the respondent is unmarried i.e. 100% of the respondents are married. All of the respondents are of age more that 26 years and all of them have children more than one. It can be realized from the responses that marriage of some of the respondents occurred so fast that they produced more than one child in the age of 26 years.

5.1.7 Land Ownership

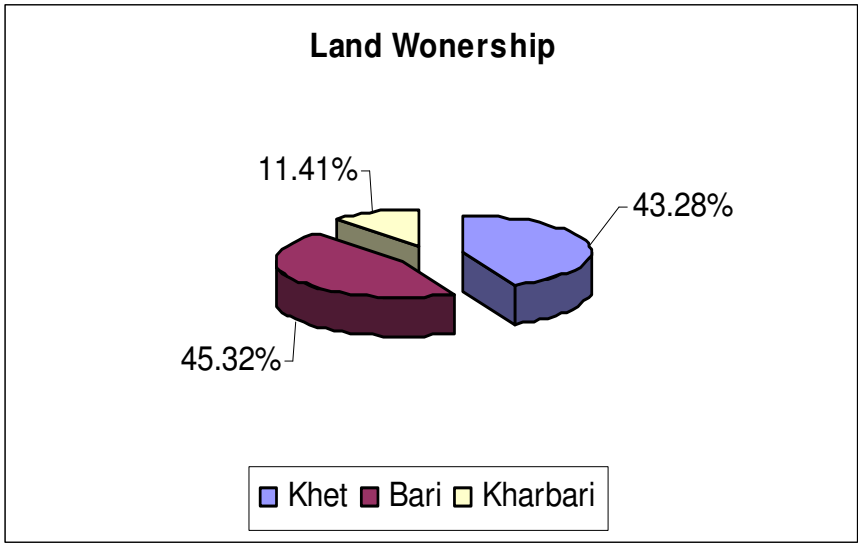
Table 5.2 *Land Ownership*

Land Type	Total Area (Kattha)	Average Area Per Household (Kattha)
Khet	679	12.35
Bari	711	12.93
Khar Bari	179	3.25
Total	1569	

Source: Field Survey2020

From the above table, it is seen that total area of land covers 1569 kattha in the study area. Out of the total area of land, 679 kattha is khet, 711 kattha is bari and 179 kattha is khar bari. The distribution of land can be shown as follows in the pie chart-

Figure 5.1 *Land Wonership*



Above figure shows that there is 43.28% of total land is khet, 45.32% is bari and remaining 11.41% is kharbari. Percentage of distribution shows that there is majority of bariland in the study area. Bariland is generally used to produce crops other than rice. Bariland gives several cash crops which is favorable to uplift the economic status of the people. Although rice is the major crop of people, insufficient availability of khet causes people suffer from food deficiency.

Distribution of land to each household is 12.35 kattha of khet, 12.39 kattha of bari and 3.25 kattha of kharbari. The average family size in the project area is about 6 persons per household. The land available to each household seems to be insufficient for the supply of food during the year.

5.1.8 Production Adequacy for Consumption

As per the primary data collected from respondents in the research area, 26 households (i.e. 47.27%) replied that they can consume their production during entire year. Remaining 29 households (i.e. 52.73%) replied that they have to suffer from inadequacy of food supply for the whole year. The production is sufficient for 1-3 months for 2 households, 4-6 months for 9 households, 7-9 months for 18 households and 9-12 months only for 1 household.

5.1.9 Monthly Income Level

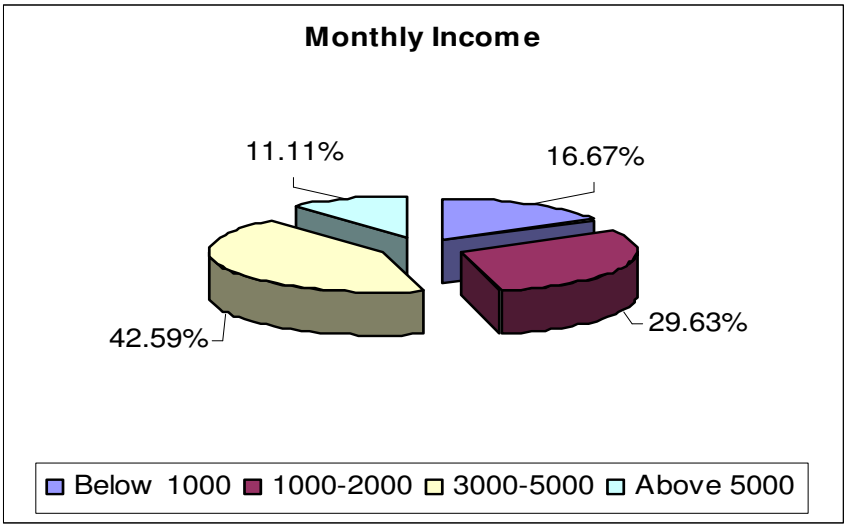
Table 5.3 *Monthly Income Level*

Income Level	Number of Household	Remarks
Below 1000	9	
1000-2000	16	
3000-5000	23	
Above 5000	6	

Source: Field Survey 2020

Above table shows the monthly income distribution of people at research area. Out of the 55 households, 9 HHs have income below NRs.1000, 16 HHs have between NRs.1000-2000, 23 HHs have between NRs.3000-5000 and remaining 6 HHs have more than NRs.5000. Majority of the people have monthly income more than NRs.3000 and less than NRs.5000. There is very few number of households which have income more than NRs.5000. The percentage of people having different income levels can be shown in pie chart as follows-

Figure 5.2 *Monthly Income*



In the above pie-chart, 16.67% of total household have monthly income less than NRs.1000, 29.63% have between NRs.1000-2000, 42.59% have between NRs.3000-5000 and remaining 11.11% households have more than NRs.5000. Distribution of income shows low level of monthly income of the majority people. Regarding the basic needs and general price level in the market, income of the people at research area is low and inadequate. Lower income of the people causes their lower economic status.

5.1.10 Monthly Expenditure Level

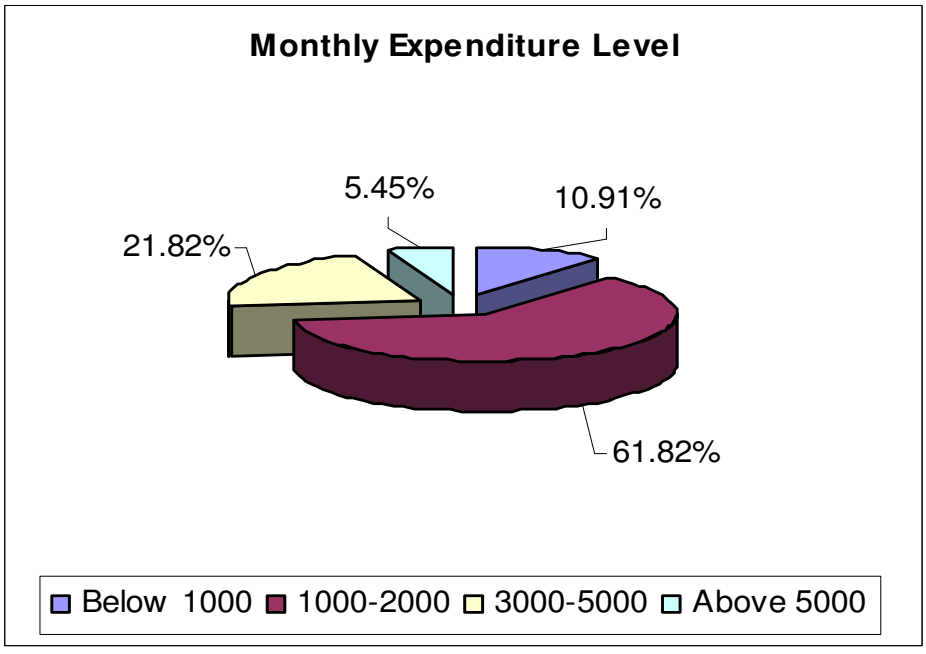
Table 5.4 *Monthly Expenditure Level*

Expenditure Level	Number of Household	Remarks
Below 1000	6	
1000-2000	34	
3000-5000	12	
Above 5000	3	

Source: Field Survey 2020

Above table shows the monthly expenditure distribution of people at research area. Out of the 55 households, 6 HHs have expenditure below NRs.1000, 34 HHs have between NRs.1000-2000, 12 HHs have between NRs.3000-5000 and remaining 3 HHs have more than NRs.5000. Majority of the people have monthly expenditure between NRs.1000 and NRs.2000. There is little number of households which have expenditure more than NRs.5000. In the income distribution table, there is majority of people having income between NRs.3000-5000 and here majority of the people have monthly expenditure between NRs.1000 and NRs.2000. This shows that the people in the research area have surplus income. The percentage of people having different expenditure levels can be shown in pie chart as follows-

Figure 5.3 Monthly Expenditure Level



Above pie-chart reveals that 10.91% of total households have monthly expenditure below NRs.1000, 61.82% have between NRs.1000-2000, 21.82% have between NRs.3000-5000 and remaining 5.45% of the total households have more than NRs.5000.

5.1.11 Available Housing Facilities

Table 5.5 *Availability of Housing Facilities*

Types of Facilities	Number of Household	Percentage of Household out of Total
Television	21	38.18
Radio	49	89.09
Telephone	3	5.45
Toilet	30	54.55
Bathroom	9	16.36

Source: Field Survey 2020

Above table shows that out of the total households of the study area, 21 households (i.e. 38.18%) have television, 49 households (i.e. 89.09%) have radio, 3 households (i.e. 5.45%) have telephone, 30 households (i.e. 54.55%) have toilet and 9 households (i.e. 16.36%) have bathroom. One positive aspect in the table is that most people at the study area have access to at least one media of the communication. It is pitiful to say that there are only 3 households which have telephone service. Most of the people are far from the access to communication service. It is obvious that 54.55% households have toilet facility and remaining 45.45% households have not and hence they use public places such as trails, forests and other places for the purpose of toilet. Such activity of people reduces the sanitation status. Good sanitation is necessary directly or indirectly for the betterment of social and economic status. The lower percentage of households having bathroom implies the weaker economic status of the people at research area.

5.2 Analysis of Social and Physical Infrastructure Available

5.2.1 Road Linkage

By observation of this watershed, it is found that there is road facility only for Municipality Mirchaiya and Kalyanpur respectively. In the Rural Municipality Bishanupur the road facilities is up to the Bishanupurchowk ie ward no 1 and 2 of Rural Municipality Bishanupur. In Rural Municipality Naraha the road facility is up to ward no 1 to 3.

5.2.2 Education Center

There are more than 100 education centers in research areas.. Among of them there are 63 Basic Level schools, 12 secondary schools,15 private secondary schools and 10 Basic Level Schools. If we see the education status of these research areas, there are so many community based schools .Among of them, there is few community based schools which run continuously. Among of them have watershed , and good facility of drinking water.

5.2.3 Health Care Center

There are 35 sub health posts ,4 health posts and 10 private clinics. All of them have good watershed facilities. But it is not enough because it cannot provide adequate facilities for cure the sick persons within the Watershed. People have to come to the nearby headquarter and Lahan hospital for additional health support.

5.2.4 Water Supply and Sanitation

There is slightly drinking water problem in upper parts of Watershed i.e. Municipality Mirchaiya 7 and Municipality Kalyanpur 8 and 9. Other parts of watershed have 27 protected spring sources altogether. Eighteen have been yielding their sources year by year due to the surrounding vegetation. The soil conservation and watershed management program have supported for the greening and source protection work through District Soil Conservation Office, Siraha.

5.2.5 Communication Facility

Nowadays, There are so many Public Call Center (PCO), mobile phone and different kinds of ICT Facilities in the research area. There are available in research areas of the district. It can not serve all the households and population of the research area. There is no any communication problems in research areas.

5.2.6 Market Situation

The major market of the research areas are Mirchaiya, Kalyanpur, and also different kinds of small markeks. The nearest place of research area is 5 km and the farthest place is around 30 km far from the district headquarter. Very small shops are in around 100 numbers in the area where very basic products such as salt, noodles, biscuits, cigarettes etc are available. People have to go Mirchaiya and Kalyanpur to sell their agricultural products buy other requirements.

5.2.7 Industry Availability

Table 5.6 *Industry Availability*

Types Industry	Number of Industry	Remarks
Sugar Mill	1	
Cement factory	2	
Cottage industries	-	
Animal breeding	-	
Cooperative	-	

Source: Field Survey 2020

Above table shows that there are no any physical infrastructures rather than one sugar mill. It is situated in Rural Municipality of Naraha. There are two cement factories .They are situated in Rural Municipality Naraha and Municipality Mirchaiya in Siraha district. Mirchaiya and Kalyanpur for the consumption of other services. Co-operative is very famous there days and it is found most places over the country. Absence of any cooperative in the research area compels us to tell that there is weak unity and integrity among the people for the social work. Rearing of domestic animal is one of the major sources of income for the rural people and they need proper animal breeding services in the locality in order to make animals healthy. But in the research area, there is no any animal breeding enter. Cottages industries are very much families in the rural areas and they are powerful means

for the strengthening of economic status of the people. Absence of any cottage industry in the research area has curtailed the income source of the people in the area.

5.3 Analysis of Socio-economic Development Activities

5.3.1 Gender Equity/Equality

As common in Nepal, in this watershed also women have to do household work rather than external jobs, business and others. There are not so much beneficial opportunities available within the watershed. People do their regular works which earn no wages and salary in the local area, as a result of which there is no question of wage discrimination. Because of traditional and feudal society, there are still some superstitions and discriminations regarding women's behaviors. Still women are separated from their family and food accessibility during the menstruation period and still there is prejudice among son and daughter for opportunities and facilities.

5.3.2 People's Participation

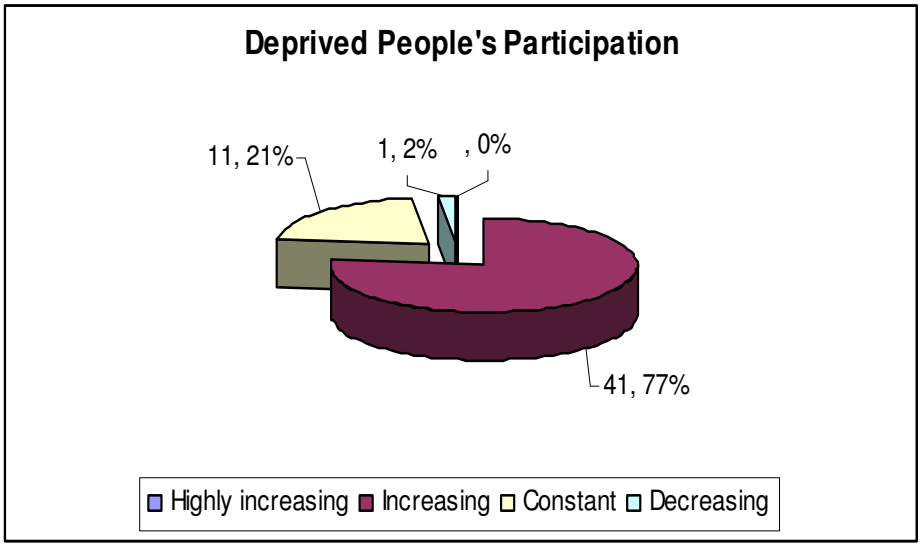
Table 5.7 *Participation of Deprived People*

Status of Participation	No of respondents	Remarks
Highly increasing		
Increasing	41	
Constant	11	
Decreasing	1	

Source: Field Survey 2020

Above table shows the status of participation of deprived people in decision making over last five years period. In the table, we can see that there are no any respondent who responded that there is highly increasing participation of deprived people in decision making. 41 respondents argued that the participation of deprived people is increasing over the period. 11 respondents told that there is constant participation of deprived people, and remaining one respondent answered decreasing participation of deprived people in decision making over the last five year period. We can exhibit the status of participation in the following pie-chart.

Figure 5.4 *Deprived People's Participation*



In the above pie-chart, we can see that 0% of total respondent responded that there is highly increasing participation of deprived people in decision making, 74.54% argued for increasing participation 20% argued for constant participation and remaining 18.18% responded decreasing participation of deprived people in decision making. It is more favorable and good aspect that most of the respondent argued for the increasing participation of deprived people in the decision making over last five year period. People's participation is the most important pillar of the development and social inclusion. Socio-economic status of the people can not be uplifted without social inclusion in the society.

Table 5.8 *Participation of Women*

Status of participation	No. of respondents	Remarks
High	8	
Medium	47	
Low	1	
Not at all	0	

Source: Field Survey 2020

Above table shows the participation of women in watershed management programme run by the DSCO in the research area. In the table, it can be seen that 8 respondents responded that there is high participation of women in the programme, 47 respondents argued that participation of women is medium, only one responded low participation and none of the respondent argued that there is no participation of women in the watershed management programme. The

proportion of respondents arguing different level of women participation can be presented in the following pie-chart.

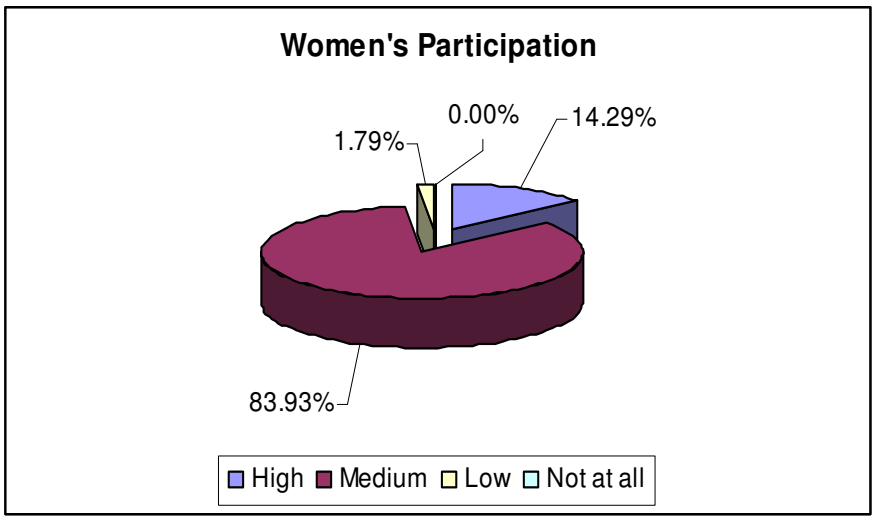


Figure 5.5 *Women's Participation*

In the above pie-chart it can be seen that 14.54% of the total respondents argued for high participation of women in the programme, 85.45% argued for medium participation, 18.18% argued for low participation and 0% of the respondent argued for no participation of women in the watershed management programme. It is positive aspect that majority of the respondents argued that there is medium level of women participation in the programme. Women participation can not be neglected for the social inclusion and hence social development. It will be imperfect attempt for development without the participation of women. High women participation shows the better status of women in the research area.

5.3.3 Social Inclusion

In the research area, there are total four types of caste which are Yadav, Mahato, Mandal and Dalit. As we have discussed in people's participation sub-heading, all peoples with different caste are included in different social activities in the society. Women and deprived sector people's participation is also seen in planning, implementing and benefit sharing. They are also included in frequent meeting and decision making in the society.

5.3.4 Community Development Groups

There are 40 Community Development Groups within the Watershed. They are formed in 2000 AD and registered in Chief District Office Siraha. The soil conservation & Watershed Management Activities have been implemented through these CDGs. They own CDG plan to implement such type of SCWM activities. The technical and financial support is provided them from DSCO.

5.4 Analysis of Soil Conservation and Watershed Management Activities

5.4.1 SCWM Programme Implemented

SCWM activities have been implemented through USCO since 1975 AD on this watershed but they were very few in quantity. Large scale SCWM activities have been implementing since 1998 AD when NARMSAP program was lunched. This program was launched through District Soil Conservation Office (DSCO), Siraha. Two type of program were lunched. They are physical activities and income generating activities.

***Physical activities*:** Irrigation canal improvement, trail improvement, gully control stream bank protection, landslide control, tree plantation, etc. fall under physical activities. The budget for these physical activities is fixed household wise tabulated as below.

Table 5.9 *Physical Budget Per Household*

Years	1998/99	1999/2000	2000/01	2001/02	2002/03	Total HH	Total Budget (Rs.)
Budget	550	1150	1150	1150	550	1807	82,21,850

Source: District Soil Conservation Bulleti, Siraha

***Income Generating Activities*:** Small cottage industries vegetable farming, goat farming, pig farming, poultry farming, NTFP activities, Napier, Bamboo plantation are fall under this heading. The budget for these IGA activities is fixed household wise tabulated as below.

Table 5.10 *IGA Budget Per Household*

Years	1998/99	1999/2000	2000/01	2001/02	2002/03	Total HH	Total Budget (Rs.)
Budget	200	300	300	300	200	1807	23,49,100

Source: District Soil Conservation Bulleti, Siraha

The activities under this program were implemented through community development group i.e. (COG). The budget for the implementation of these activities was managed household wise in the CDGs which are tabulated as the above two tables.

The total expenditure of physical and IGA activities during last five year period is tabulated as below-

Table 5.11 *Total Expenditure for Physical and IGA Activities*

Activities	Approved Budget	Total Expenditure
Physical	82,21,850	82,21,850
IGA	23,49,100	23,49,100

District Soil Conservation Bulleti, Siraha

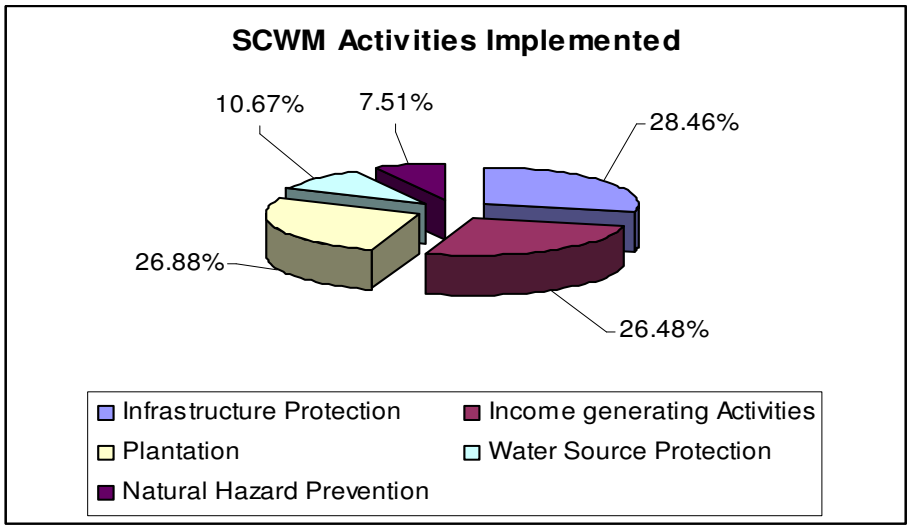
Table 5.12 *Total Physical and IGA Activities Implemented under Budget*

Type of Soil Conservation Program	Number of Activities	Remarks
Infrastructure Protection	72	
Income generating Activities	67	
Plantation	68	
Water Source Protection	27	
Natural Hazard Prevention	19	
Total	253	

Source: Field Survey 2020

The above table shows total physical and IGA activities implemented within watershed management program in the research area during last five year period. The above 253 activities are carried out by 40 community development groups of the watershed. The portion of implemented activities can be presented in the pie chart as follows-

Figure 5.6 *SCWM Activities Implemented*



The above chart shows that there is 28.46% infrastructure protection activities, 26.48% income generating activities, 26.88% plantation activities, 10.67% water source protection activities, 7.51% natural hazard prevention activities. It can be seen that there is the greatest percentage of infrastructure protection activities implemented in the watershed. It shows that the primary need and desire of the people in watershed is infrastructure protection i.e. trail and irrigation improvement. The 7.51% percentage is in natural hazard prevention (i.e. land slide protection, gully control, torrent control and stream bank protection) which shows the least priority on it.

5.4.2 Successfully Implemented SCWM Activities

There are forty community Development Groups (CDGs) within the sub-watershed. They have implemented physical as well as IGA activities within the SCWM program. Among these activities, the successful activities implemented are listed CDG wise as below-

Table 5.13 *Successfully Implemented SCWM Activities*

S.N.	Activities	Number of Activities	Remarks
1	Land slide control	4	
2	Trail improvement	13	
3	Plantation	5	
4	Vegetable farming	2	Seasonal and off-season vegetable

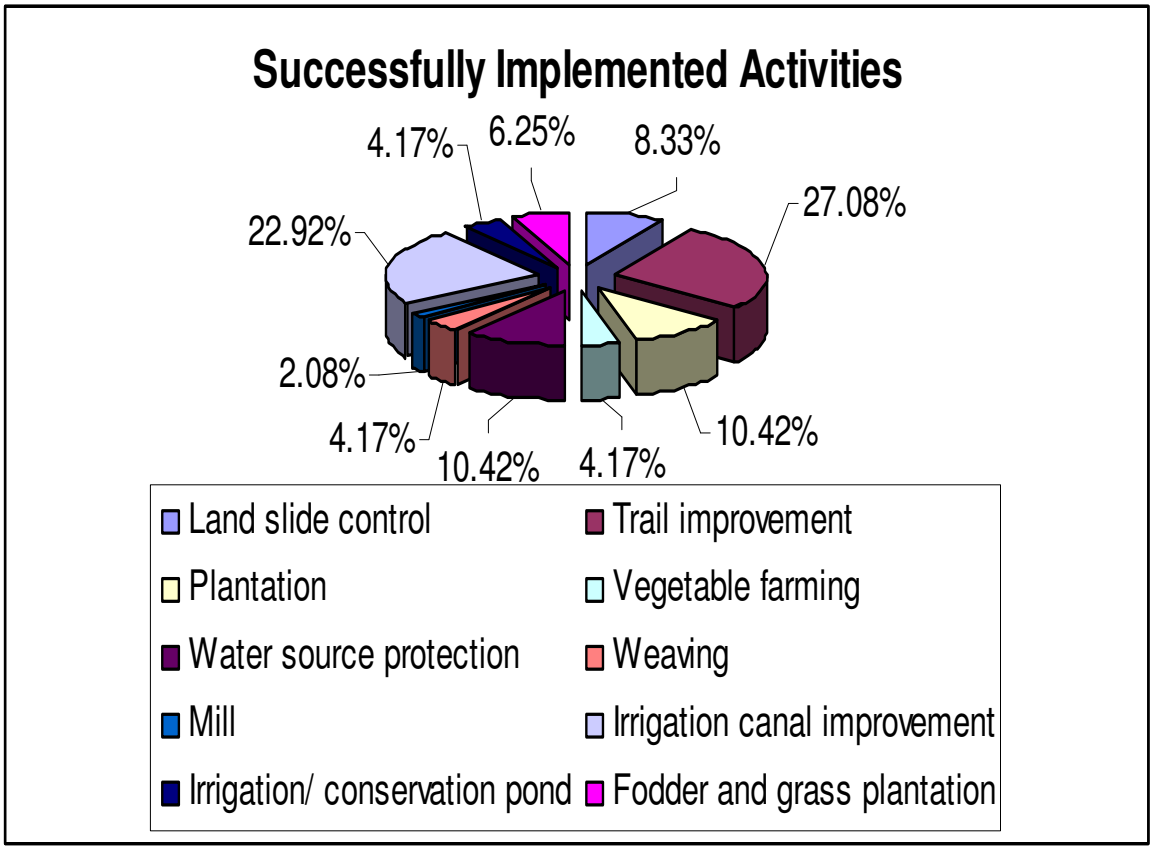
Contd.

S.N.	Activities	Number of Activities	Remarks
5	Water source protection	5	Yield of sources, facilities for fetching water
6	Weaving	2	
7	Mill	1	
8	Irrigation canal improvement	11	Drip irrigation
9	Irrigation/ conservation pond	2	1 conservation and next irrigation pond
10	Fodder and grass plantation	3	
Total		48	

Source: Field Survey 2020

The proportion of successfully implemented watershed management activities can be presented in the pie-chart as follows-

Figure 5.7 *Successfully Implemented SCWM Activities*



The above pie chart shows that the higher percentage is in trail improvement and least is in mill.

5.4.3 Local People's Sensitivity and Efforts

Local people have keen interest in soil conservation and watershed management activities. They very cheerfully adopt new programs related to prevent soil erosion. People in the research area hopefully look for various programmes offered by I/N/GOs and other authorities. People use to work in unity forming different sub-user's group within the CDG. They tackle with common problems in coordinated manner. Community forest is the common practice in Nepal in order to minimize land erosion and protection of forest resource. The 48 successful activities are the evidence for good effort of the people in research area.

5.5 Impact Analysis of Soil Conservation and Watershed Management Activities

5.5.1 Eroded Land Before and After Launching Programme

Table 5.14 *Eroded Land Before and After Launching Programme*

Time	Eroded Area (in Ha.)	Remarks
Before implementation of SCWM Program	33	
After implementation of SCWM program	27	

Source: Field Survey 2020

In the above table it is seen that the area of eroded land before implementation of SCWM program was 33 hectares. It is reduced to 26 hectares after the implementation of the program. It is able to minimize the decay of land in the research area; erosion of land is minimized by 18.18% in the area. Still there is erosion of land by 7 hectares and hence there is necessity of further precautionary activities for reduction or prevention of land erosion.

5.5.2 Impact of SCWM Programme

Various soil conservation and watershed management activities were implemented within the watershed. The table 5.12 shows the total physical and IGA activities where as table 5.13 has shown the successfully implemented activities.

Development infrastructure activities i.e. trail and irrigation canal improvement has provided the facilities to the people for easy transportation and irrigation water for

crop and vegetable production respectively. The production seems increasing in comparison of last 5 years period.

Degraded and deforested land has rehabilitated by small scale civil engineering structure as well as vegetation. Tree, fodder and grass have planted there. These has increased the granary and protected the degraded land. The availability of fodder and grass for domestic animals seems sufficient in comparison of last 5 years period.

The protection of gully & land slide has controlled the problem related to land slide and mass wasting every year. Protection work has improved the soil fertility and increase the ground recharge also. Spring sources are increasing their yield every year.

Some IGA activities have implemented there. Weaving, nursery, mill, vegetable farming, goat farming, pig farming are the examples of that activities. These have supported people in increasing their income in short period.

The above mentioned activities have reflected the positive impact on watershed management. To sum up the impact influenced by the SCWM activities, it can be said that trail has provided transportation facilities where as irrigation canal has provided irrigation water for crops and vegetables. Plantation has added the greenery and help in yielding the water sources.

People of that watershed are happy and eager in implementing such mentioned type of activities every year. They are seeking fund for further implementation of above mentioned SCWM activities. The people of that area are demanding the program related to SCWM activities. NARMSAP has implemented such type of programs in this watershed in last 5 years.

The conducted extension and awareness activities within this watershed have further added the knowledge to the community people.

CHAPTER - 6

SUMMARY, FINDINGS AND CONCLUSION

6.1 Summary

Nepal is situated in the south of Asia continent. It is land locked country between republic China in the North and democratic India in the rest three directions. It is agro-based country; about 78% people of total population rely on agricultural profession. Nepal is a country where most of the people are under the poverty line. Geographically, it is the combination of terai, hill and mountain. Nepal is divided into various watersheds. There are numerous management and development problems to be solved within this watershed. These problems are solving through Soil Conservation and Watershed Management programs followed by the different agencies. Among them, Department of Soil Conservation and Watershed Management is playing the crucial role in this field. This department had started the works since 1975 AD in Nepal. It works under the Ministry of Forest and Soil Conservation. It had opened the District Soil Conservation Offices in 77 districts to implement various soil conservation and watershed development activities. But, none have studied about the impact and influence of these implemented programs. Its study seems now in shadow. So in this study, Ghurmikhola sub-watershed of Siraha district is taken to study the impact and influence of SCWM program. It covers the 2 Municipalities and 2 Rural Municipalities ie Mirchaiya, Kalyanpur and , Naraha,Bishanupur. The total household within this watershed are 1807and total population is 137258.The male and female population is 49.35% and 50.65% respectively.

This study has answered the research questions on activities implemented within the watershed, socio-economic characteristics of the people, impact of individual program, condition of people's participation, gender equity, and conservation of natural resources and distribution of benefits and so on related on the Ghurmikhola Sub-watershed in Siraha. The main objectives of the research are to identify the socio-economic status of people, to study elements of successful

watershed management and to summarize the socio-economic impact of programs in the study area.

The literature related to SCWM programs have been reviewed theoretically. The soil conservation and watershed management activities are carried in different watershed within and outside the country. The main finding of study of BTRT watershed is the participation of people in planning, implementing, follow up and maintaining the community's resources. The focus of study was in conservation practices used in cropping system and it was found successfully implemented. PARDYP has lunched programs like empowerment of women, energy management and soil & water management in four countries. This project succeeded significantly. Mrs Varadan has written about people's participation in evaluating the Zilla Panchayat Watershed program. She found that watershed project cannot succeed without full participation of project beneficiaries and careful attention. A study on incentive based mechanism for watershed management in India shows that the projects related to SCWM activities are succeed in various agricultural and common intervention in catchments including plantation and soil conservation work. A study of successful watershed management in Guangdong china shows that people participation is essential for implementation of soil conservation and watershed management and it has focused on small watershed concept. A study participatory watershed management at Ralegan Diddhi India concludes that people's participation is essential for sustainable development and it is also a tool which can only identifies the problems and priorities.

The study is based on primary and secondary data. Random sampling method was adopted for sample selection in the study. Fifty five household's members are taken as sample respondent at least one from forty CDGs of Ghurmikhola watershed. Interview, field observation, focus group discussion and key informant interview are the methods of data collection. The collected data's are reliable and valid because they are collected from books, journals, manuals, magazine of authorized publication.

From the analysis of primary data, it is found that there are 70.90% nuclear and remaining 30.10% are joint family. The 70.54 % people have thatched houses. Kshetri and Brahani are the dominant castes which are 40 and 35% respectively.

Out of 55 respondents, 18.18% are illiterate. The main occupation of people of that area is agriculture which is 92.7%. Regarding the land ownership, the higher percentage is in Bari i.e. 45.32% which shows that thy have agricultural production other then rice. The people having income Rs.3000-5000 are 42.59% and income below 1000 are 16.67% which shows that people are in increasing trend of income. The people have 89.09% radio, 38.18% have TV and least 85.45% people have telephone. It shows that the watershed area is forward in telecommunication. There is problem of market accessibility, road and health care because they are in few numbers within the watershed.

DSCWM activities like development infrastructure, Natural Hazard prevention control activities, water source protection, tree and grass plantation and others IGA activities are implemented there. The total activities implemented are 253 and succeed giving good impact are 48 among them. The people's participation is increasing by 41.77% from the very beginning of program planning, implementation, benefit sharing and maintenance of these activities. The deprived, back warded people as well as women are participating in the meeting and decision making. This is in increasing trend due to the lunched NARMSAP- SCWM program. Men and women have equal wages. Social discrimination on deprived dalit and women is reducing by the awareness program lunched by this DSCWM program also.

Development infrastructure activities i.e. trail and irrigation canal improvement has provided the facilities to the people for easy transportation and irrigation water for crop and vegetable production respectively. The production seems increasing in comparison of last 5 years period. Degraded and deforested land has rehabilitated by small scale civil engineering structure as well as vegetation. Tree, fodder and grass have planted there. These has increased the greenery and protected the degraded land. The availability of fodder and grass for domestic animals seems sufficient in comparison of last 5 years period.

The protection of gully & land slide has controlled the problem related to land slide and mass wasting every year. Protection work has improved the soil fertility and increase the ground recharge also. Spring sources are increasing their yield every year. Some IGA activities have implemented there. Weaving, nursery, mill, vegetable farming, goat farming, pig farming are the examples of that activities. These have supported people in increasing their income in short period.

The above mentioned activities have reflected the positive impact on watershed management. To sum up the impact influenced by the SCWM activities, it can be said that trail has provided transportation facilities where as irrigation canal has provided irrigation water for crops and vegetables. Plantation has added the greenery and help in yielding the water sources. People of that watershed are happy and eager in implementing such mentioned type of activities every year. They are seeking fund for further implementation of above mentioned SCWM activities. The people of that area are demanding the program related to SCWM activities. NARMSAP has implemented such type of programs in this watershed in last 5 years. The conducted extension and awareness activities within this watershed have further added the knowledge to the community people.

6.2 Findings

On the basis of primary and secondary data analysis in the research, following are the major findings-

- The structure of family is 70.90% nuclear type and remaining 30.10% is joint family. The 70.54 % people have thatched houses the remaining houses are RCC roofing, CGI sheet roofing.

- Yadav and Mahato are the dominant castes which are 40 %and 35% respectively. Out of 55 respondents, 18.18% are illiterate. The main occupation of people of that area is agriculture which is 92.7%.

- Regarding the land ownership, the higher percentage is of Bari (unirrigated land) i.e. 45.32% which shows that they have major agricultural production other than rice. The people having income Rs.3000-5000 are 42.59% and income below 1000 are 16.67% which shows that people are in increasing

trend of income. Income and expenditure pattern of the people shows the surplus monthly income.

- The people have 89.09% radio, 38.18% have TV and least 85.45% people have telephone. It shows that the watershed area is forward in telecommunication. There is no problem of market accessibility, road and health care because they are in few numbers within the watershed.

- The total activities implemented are 253 and succeed giving good impact are 48 among them. The people's participation is increasing by 41.77% from the very beginning of program planning, implementation, benefit sharing and maintenance of these activities. The deprived, back warded people as well as women are participating in the meeting and decision making. This is in increasing trend because of NARMSAP-SCWM program lunched in the area. Gender inequality and social discrimination are reducing by the awareness program lunched by this DSCWM program.

- The SCWM program is able to minimize erosion of land by 18.18%, maximize water yield by about 30%, greenery is raised by about 40%. The IGAs are increased during five year period and these activities supported to raise the economic status of the people.

6.3 Conclusion

The field research work and analysis of data lets me to conclude that the implemented DSCWM program has supported the people of Ghurmikhola sub-watershed in various ways. IGA activities have helped to raise the income level. Infrastructure development activities have provided the facilities for transportation and irrigation water for crops. Natural hazard prevention works have protected the land slide, surface erosion & gully control. Plantation of tree, fodder and grasses have added greenery in the locality, supported for erosion control and grass for domestic animals. To sum up, the DSCWM program has its positive impact on the society of the research area. Such type of program is necessary for the overall development of the community within the Watershed.