CHAPTER VI

MAJOR PROBLEMS IN THE BASIN

INTRODUCTION

The study area is situated in the mountainous tracts of the Darjeeling Himalayas. The hill slopes are occupied by lush green stretches of tea gardens, terraced agricultural lands and isolated rural settlements. Due to rugged topography of the land, infertility of soil, remoteness of villages and many such related factors, the study area confronts different problems every now and then. All this problems are very critical and needs proper attention. The problems are mainly physical, institutional and socio-economic.

6.1. PHYSICAL PROBLEMS

Physical problems deal with types and causes of soil erosion, landslides and the harm caused by their occurrences.

6.1.1. Types of Soil Erosion

The removal of soil from the surface of the earth is known as soil erosion. Since the area receives heavy rainfall, the drops of rain hitting the ground and the water moving over the land both cause severe soil erosion. Deforestation leading to thin vegetation cover also enhances the speed and effectiveness of running water causing soil erosion. The different types of soil erosion are as follows:

6.1.1a. *Splash Erosion:* The most important cause of breakup of soil clods is the impact of fast falling rain drops in a severe storm, as they posses very considerable kinetic energy and momentum. The greater is the intensity of the storm, larger is the drops and faster they fall their velocity may even exceed that for free fall because of air turbulence in the storm. The falling rain drops accelerate until the frictional resistance of air is equal to the gravitational force and then continues to fall at that velocity, called the terminal velocity (Datta, 1986).

Since the Balason basin experiences quite stormy rainfall, any

uncovered soil is exposed to series of dangers of splash erosion. This is true for cultivated areas with ploughed soils. Tea gardens with poor density of forests are also open to such threats of splash erosion. Splash erosion is seen in Ambootia and Patong Tea Gardens, where soils on slopes have been ploughed. The new plantations of tea take fine to ten years to cover the ground fully. Such new plantation is different tea gardens will get eroded for the next few years. The patches having low canopy density of tea bushes is Singel Tea Garden are also suffering from splash erosion. Younger tea plantations of Maharani, Longview, Mangarjung, Kalej Valley tea gardens are also getting affected by splash erosion. A newly cut Pumong Phatak – Dudhia road, is also affected by splash erosion. In hills, potato is harvested during July by excavation of soil. The tilted soil is exposed to the full force of the monsoon showers. Large scale splash erosion takes place in such potato fields. Vegetables such as beans, cabbage etc are cultivated after harvesting potato, but they hardly provide any protection against lashing rain strums. In Mahaldiram forest, with thin vegetation cover, splash erosion takes place along with over grazing by cattle. The soils loosened by hoofs of cattle are splashed around such degraded forests and are susceptible to splash erosion.

6.1.1b. *Sheet Erosion*: The run off takes the form of sheet flow and channelized flow; former coupled with rain drop action produces sheet erosion. Its effects are gradual and after go unnoticed until most of the top soil go unnoticed unit most of the top soil is removed. The differences in susceptibility of various soils to sheet erosion depends principally on, slops, climate and character of the soil. Steep and moderately steep hill slopes and those subjected to heavy or intense rains are likely to be the most trouble some. Areas where loose shallow top soil overlies a tight dense clay sub-soil or other impervious sub-layers are most susceptible to sheet erosion (Schwab, 1971).

In the region, from June to September 20-27 rainy days occur in each month with 5-20 days having rain fall more than 50 mm (Starkel, 1970). Such a situation makes bare grounds, poor canopy density tea

bush areas, deforested lands, over grazed lands and forest fire affected lands, quite prone to sheet erosion. Sheet erosion can be easily identified in ploughed fields where small stones and pebbles are seen lodged on small columns of soil is washed away by sheet erosion. Often farmers place small boulders on the bounds to protect the soil from getting eroded by sheet erosion. In Ghoom–Simana Reserve Forest, a patch between Lepcha Jagat and Sukhiapokhri shows appreciable amount of sheet erosion. The high rain in the areas does not spare even lands covered with scrubs vegetation. Such scrubs lands, occurring in tea garden forests, are also being sheet washed surreptitiously. Maling bamboo, which grows above 2000m altitude, gives fairly good cover but can not stop sheet washing of the soil. Patches in tea gardens in Maharani, Ringtong, Singel, Springside, Ambootia, Patong and Mangarjung and many others, having scanty tea bushes, are being sheet washed extensively. New tea plantations in Marma, Bukim and Longview Tea Garden are very susceptible to sheet erosion and needs protection by mulching. Abandoned agricultural lands in and around Sonada, Sepoydhura, Dilaram, Tung, Rungbul, Sukiapokhri, Rongbong, Saurini and Mirik Khasmahal also show signs of sheet erosion. Invisible effects of sheet erosion gives was to yet another advanced stage of soil erosion called rill erosion.

6.1.1c. *Rill Erosion:* Rill erosion is said to occur when flow channels become sufficiently large and stable. Rill erosion is considered as the advanced stage of sheet erosion and can be regarded as transitional stage between sheet erosion and gulling. On soft freshly ploughed soils, especially those of high silt content and having slopes greater then 4 to 5 percent, riling is probably the commonest form of soil erosion (Bennett, 1955). This is more severe in fallow lands and on bare hill slopes. Exposed soil horizons are vulnerable to rill erosion, which situation is commonly encountered in zones of podzolisation and yellow soils, commonly found in the study area.

Although, rill erosion is often overlooked, it is this one which erodes the soils the most (Schwab, 1971). In the study area rill erosion

is observed in fallow lands and degraded forest areas. Ghoom Pahar Forest and Mim Nagri Range are ideal locations to observe such erosion. Tea gardens like Nahori, Okas, Ringtong, Chamu, Sagmaru also show rilling in areas having low density of tea bushes. Banks of Ghatta *jhora* show rill erosion in its upper reaches. Extensive rilling is seen on the steeper slopes of Pachhim *nadi*. Rilling is seen in Molatey Tea Garden and Nagri spur where slopes are steeper with very little vegetation. Dhupi plantations contain very little ground flora and so rills develop faster in Dhupi plantations. Highly grazed lands are also prone to rill erosion. Abandoned agricultural fields between Sonada, Rangbul, Saurini, Mirik and Rongbong show copious amount of rill erosion. Rilling is predominant in all tea gardens with poor canopy of tea bushes. The rill erosion, if unchecked and not controlled in time, is succeeded by still more damaging gully erosion.

6.1.1d. *Gully Erosion:* Gully develops from rills and their development is influenced by several factors, which affect both the extent and the development of gullying. The meteorological factors affecting gullying in the study area are rainfall intensity and its duration, temperature and solar radiation. Geomorphological and pedological factors include slope, relief, soil structure, parent material, soil moisture holding capacity, degree of soil cover, aspect of the site and pattern of seasonal changes.

Recent and continuous organic uplift is main cause of gully erosion in parts of the areas and gullying is independent of other factors in such areas. Thermal changes in the lower parts of the crust or compression due to foreland/hinterland in organic belt may be reason of such uplift (Ahmad, 1973). Loams and sandy soils are most susceptible to gullying while skeletal soils suffer the least. Cultivation techniques and agricultural practices have bearing on the susceptibility of any soil, leads to gullying. Mechanism of erosion and transportation of soil particles by flowing water is of crucial significance to understand the gullying. In the study area, mostly due to presence of skeletal soil gullies are not so common. This is also because of the presence of steep slope and high permeability of soil mantle. Most of the gulllying action

in the study area is restricted to first and second stage of gully development.

6.1.1e. *Stream Bank Erosion:* Besides gullying, another important soil degradation process is stream bank erosion. The stream bank erosion is yet another form of fluvial erosion. The scouring, gonging and under cutting of banks and mud flows are major processes of bank erosion. The steam bank erosion differs from the gully erosion in that the former applies to the lower end tributaries and to the streams that have continues flow and relatively flat gradient (Michael et al., 1981). Stream bank erosion is affected by soil character, cover, size and character of floods, velocity of current, land use and stability of stream bed during floods and climatic conditions. Stream bank erosion is very severe in higher order section of rivers in the study area. Such erosion is seen in the lower reaches of Dudhia, Manjwa and Marina rivers. Bank of Balason river, from south of Nahori Tea Garden to Dudhia bridge, shows severe bank erosion. Banks of Ghatta – Hussain *khola* near Singel Tea Garden also show severe bank erosion.

6.1.1f. *Pothole and Tunnel Erosion:* Potholes develop when easily erodible parts in steam bed is more eroded that it surroundings. This is usually encountered is areas where gully passes through a stretch having great difference in levels (Datta, 1986).

6.1.1g. *Sloughing Erosion:* Sloughing is another important form of fluvial erosion. In sloughing, a natural slope, a man made cut or embankment, under certain hydraulic conditions experiences a severe reduction of strength and soil flows like a thick fluid. It is retrogressive landslide, in which the failure surface develops through tension cracks and soil liquefies under untrained conditions. Poorly graded fine sand or silt is the seat of such a failure and takes place on account of hydro-dynamic forces, erosion action of water and non-homogeneity of deposits (Patel, 1980). Soils in such location are also found to be non-cohesive and non-plastic with higher water permeability (Lakhanpal et al., 1980). In the study area, many of the bank failures are a result of combined actions of stream bank erosion and sloughing. Such failures

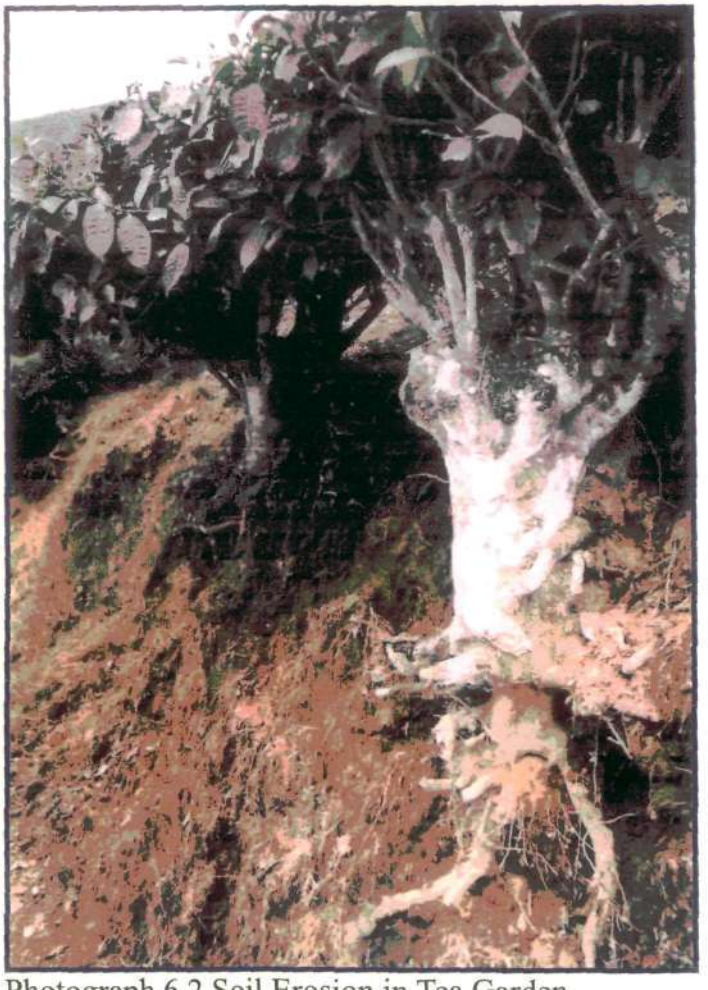
often take place during the first flooding of the season, especially if it is severe in nature.

6.1.2 Causes of Soil Erosion

Soil erosion is caused by different factors like physical, agricultural, socio-economic etc. Human activities are the main cause of soil erosion. High population pressure, leading to scarcity of food and shelter, forces people to exploit the forested land, over populate the villages, degrade the existing environment etc.

6.1.2a. *Deforestation*: Deforestation is caused due to indiscriminate cutting and felling of trees in a forested area. Deforestation leads to a number of pedological, hydrological and environmental degradation. Removal or thinning out of canopy exposes the soil beneath to the full erosivity of rain storm. This encourages various soil eroding processes and mechanisms to become active. So long top soil contains some organic matter, soil particles are not easily splashed by the impact of rain drops. The organic matter, however, does not last long. Organic molecules with low molecular weight are first to depart, others follow soon. Soluble salts and soil nutrients are leached down far quickly than the organic matter. In situations of splash erosion, fine soil particles block the pore spaces making soil impervious. Even there be elaborate root channels, water is not allowed to percolate down. Thus, volume of run off is increased with consequent effect on soil erosion. In the study area privately owned forests are well protected except for small patches in Rangbul which is getting exploited at a faster rate. In tea gardens like Marma, Bukim and Longview, forests are getting depleted at a faster rate. Existence of such forests is totally threatened by the pressure of collecting fodder and fuel wool from the forests. So forests, under tea gardens are mostly degraded. Forest areas flanked by high density of population are getting degraded faster. Forests in the northern part of the basin are getting damaged at a faster rate than the southern part due to illicit collection of fuel wood. Landslides and forest fires are also reducing the forested area in the basin.

Photograph 6.1 Deforestation



Photograph 6.2 Soil Erosion in Tea Garden

6.1.2b. *Faulty Cultivation Methods*: Tea cultivation occupies the major share of land use in the study area. But there are some pockets of agriculture in sprawling tea gardens, which are practicing faulty methods of cultivation. The ultimate result of which is soil erosion. The study area by virtue of having a very heavy rainfall generates large amount of run off from the fields. Cultivation on contour terraces act as a series of miniature reservoirs to hold excess run off and provide increased time opportunity to soil to absorbs as much water as possible (Singh et al.,1991).

From field survey, it is evident that several tea gardens have raised tea crops without proper terracing of land. In other cases, even if terraces are made, they are poorly maintained as in Singel T.G. and do not provide any protection to soil against run off. Invariably in such regions, the tea bushes are extremely sickly and this causes low yields. In Ambootia T.G., extensive soil working has been done to raise new plantation without any terracing. Though the slope is not steep and area is protected from straw mulch during rains, the soil and nutrient losses are formidable. In agricultural lands, most of the terraces are ill maintained and outwardly sloping ones. Since construction and maintenance of terraces is expensive, only wealthy farmers are able to maintain proper terraces. Outward sloping terraces are seen in and around Dilaram,Tung, Sepoydhura and Pachhim. Among the tea gardens, Cedar, Mondakotee and Nahori has outwardly sloping terraces. Large numbers of abandoned tracts of land are seen around Gorabari and Pachhim, probably, due to low fertility and presence of rock outcrop. Wherever impounding of water is done for cultivation as for paddy, landslides often result. This is also seen that no proper arrangements are made for disposal of excess water from the terraced fields. Terrace risers get broken at different places and once impounded water is released, it goes down breaking a series of them. This result in gullying, landslide and land becomes degraded and unfit for further cultivation. Cultivation in such lands become unprofitable since the top soil is being washed away turning the soil infertile.

Among the agronomic practices, cultivation of potato and maize are quite extensive in the study area. Both of these need intensive soil working during rainy season. Cultivation of maize without any soil conservation measure causes heavy erosion on the sloping land (Khybri, 1991). Both maize and potato, along with vegetables are considered as soil depleting crops as they leave little or no residue on or in the soil (Michael et al., 1981). Unscientific method of potato cultivation causes soil erosion. No crop rotation is seen as most of the agriculture is single cropped and rain fed. This leads to degradation of soil over a period of time. The fact that simply by adopting appropriate cultivation procedures, it is possible, without any great increase in cost to reduce soil erosion by up to 80 percent, is realized little by cultivators (Zachar, 1984).

6.1.2c. *Unauthorized Quarrying for Boulders: Jhoras* in the humid area carry lot of large sized boulders on its bed as it flows down. These boulders prefect the underneath soil from getting washed away by the torrential gushing waters. The boulders also act as natural barriers and reduce the velocity of the fast flowing water thus reducing the erosion power of the streams or *jhoras*. The decreased energy gradient of running water provides stability to the *jhora* banks and beds. Removal of the boulders by unauthorized quarrying, in dry season, exposes the underlying soil. Soil being weak is easily removed by fast running water during the rainy season causing severe soil erosion. As per Forest Conservation Act, 1980, boulders in hills are permitted to be brought only from a few river beds in plains. But the illegal practice of quarrying river bed boulders in the hills has increased by leaps and bounds. Being cheaper than that brought from plains, these boulders get ready market. Unauthorized quarrying is also done in the tea gardens to construct roads, culverts, bridges and building. These boulders are usually dug out from the degraded areas within the tea gardens leading to further degradation of the area. The stretch of Hill Cart Road between Gorabari to Rinchingtong has several sites of unauthorized quarrying. A site, 100m down the road from Dilaram bazaar, is

Photograph 6.3 Stone Quarrying

subjected to intensive quarrying. A *jhora* crossing Hill Cart Road, 200m north of Tung railway station, is also subjected to intensive quarrying. On a site 100m down of the Hill Cart Road from Sonada bazaar, a precipitous uphill slope alone the road is being quarried dangerously. Quarrying is done in Rangbang nadi near Mangarjung T.G. Along the road sides, quarrying is more noticeable because of easy transportation facilities. Near Cedar basti, a few sites of unauthorized quarrying are seen. The list is the least exhaustive. Because of paucity of time and resources, detailed survey could not be undertaken. However, it is believed that unauthorized quarrying has taken a very serious dimension in the study area. In innumerable spots, men and women could be seen breaking the boulders into chips for selling. After the loose boulders are collected, rock outcrops jutting either in the bed or on the bank are attacked with hammer and chisel, which is even more dangerous. These rock outcrops are the anchors and help transfer the weight of the landmass lying upslope to the deeper strata of earth. When they give way, mass failures occur.

6.1.2d. *Unscientific Water Disposal:* Nature has designed each *jhora*, however small or large, to carry a certain quantity of water from its catchments. If this quantity is altered, the *jhora* redesigns itself. If flow is augmented, velocity of flowing water, hydraulic radius of flow and gradient of surface of flow, increases. This shall be a high energy situation and hence unstable. To reduce the energy situation, the *jhora* will either widen the flow channel or meander. The former reduces the hydraulic radius and the latter the surface gradient of flow. The combination of these two causes soil erosion, lumping of the banks and ultimately landslide.

In the study area, when a drainage system traverses a road, it is better if its flow characteristics and natural catchments are not altered. But that is not done, on cost consideration. Each *jhora* is not provided with a safe passage across the road. The present practice may be economical for the time being but the overall loss in the long run is colossal. The unmetalled roads in the study area provide another

instance of unscientific water disposal. The roads are often not provided with side drains. So during rain storm, water flows over the surface of such dirt roads. Agricultural fields, even if terraced, do not have proper system of disposal of excess water by grassed water ways. In few cases, water from *jhora* is directed through irrigation channels for flood irrigation and excess water is not properly disposed off. This leads to soil degradation down slope. Such instances of unscientific water disposal are seen it Maharani T.G., Ringtong T.G., Chamu T.G., Mangarjung T.G. and Nagri Farm T.G. They are contributing a lot, to the sediment load of Pachhim and Rangbong *nadi*. In Rangmuk, Okas, Mondakotee and Gopaldhara T.G.'s, roads are not provided with proper side drains and water flows over the road causing soil erosion. In many tea gardens, foot paths have degenerated into rills and gullies.

6.1.2e. *Extension of Roads:* Construction and extension of roads is yet another activity causing lots of soil erosion. This involves removal of soil from the hill slopes for making road benches. The removed soil is never transported from the site or used otherwise and gets washed down with the onset of monsoon. It buries productive fields rendering them waste. Ultimately soil is washed down the stream and land becomes bare and infertile. Road benches change the hydrological characteristics of the streams which traverses them. This often forces the stream to flow on the surface of road dislodging freshly exposed soil particles. Because of obstructing road bench, water starts flowing chaotically, causing failure of road bench.

Construction and extension of roads is a continuous process for the development of an area. Though two national highways surround the entire study area yet lane and by lanes are getting constructed on demand of population expansion. New roads lead to new settlements. Without good transport facility an area cannot develop. A new road from Pubang Phatak (located near Lepchajagat) to Dudhia is under construction and an air strip on a site about 2km south west of Rangbul, has been constructed. The Pubong Phatak – Dudhia road is a very ambitions and challenging project taken up by Darjeeling Gorkha

Hill Council. This is under construction and initially caused severe soil erosion in upper Balason catchment. As the cutting of road bench proceeds further, it contributed increasingly high amounts of sediment load on top of a spur emanating from Rangbul. Here, too, flattening of ground involved huge amount of earth cutting. The dug up earth was washed down to, both Upper Balason and Rangmuk rivers. Many roads which are under construction in different tea gardens are also causing soil erosion.

6.1.2f. *Over Settlements:* Population is increasing at a faster rate in the study area. To support the ever increasing population, houses are being constructed in the study area in large numbers. Houses are mostly of concrete with multiple stories on the two sides of the major communicating roads, which exerts excessive pressure on the unstable hill slopes. Tea Garden houses are comparatively light weight since they are mostly made of bamboo, tin, mud and wood. The khasmahal areas namely, Jorebuglow, Sonada Khasmahal and Achalal Hatta posses a major threat with its heavy concrete houses. Since horizontal expansion is not possible, houses are expanding vertically, which is even more dangerous. Urban areas like Kurseong, is predicted to have major landslide in future due to increasing number of houses constructed every year on the hill slopes. Tea garden like Ambootia, Longview, Marma, New Fallodi, Pussimbing, Dooteria, Rangmuk Cader, Mangarjung and Sugmari also are facing the problem of congestion due to over settlement.

6.1.2g. *Overgrazing:* Overgrazing constantly threats the existence of soils, on the surface of the study area. This is a menace and generally does much more serious damage to vegetable cover than is actually believed. In 52 percent of India's forest, there is no regeneration owing to the combined effect of biotic pressures, the chief among which is over grazing. While the policies advocate a strict grazing practice, cattle entry into reserve forests continue to be free and unregulated (Sunder, 1992). Sheep and goat are arch enemies of vegetation. Sheep graze on grass only whereas goat is a voracious browser which devours leaves,

twigs, small branches and leading shoots of the plants, either killing them or mauling them very badly. Overgrazed slopes show erosion and characteristic heavy trails of cattle crisscrossing one another. Overgrazed grasslands degrade into bush land and dry thickets. The removal of protective vegetation combined with the trampling of the soil surface by animal hooves, leads to rapid loss of soil, a lowering of infiltration rate and flash flooding (Edward et al., 1990).

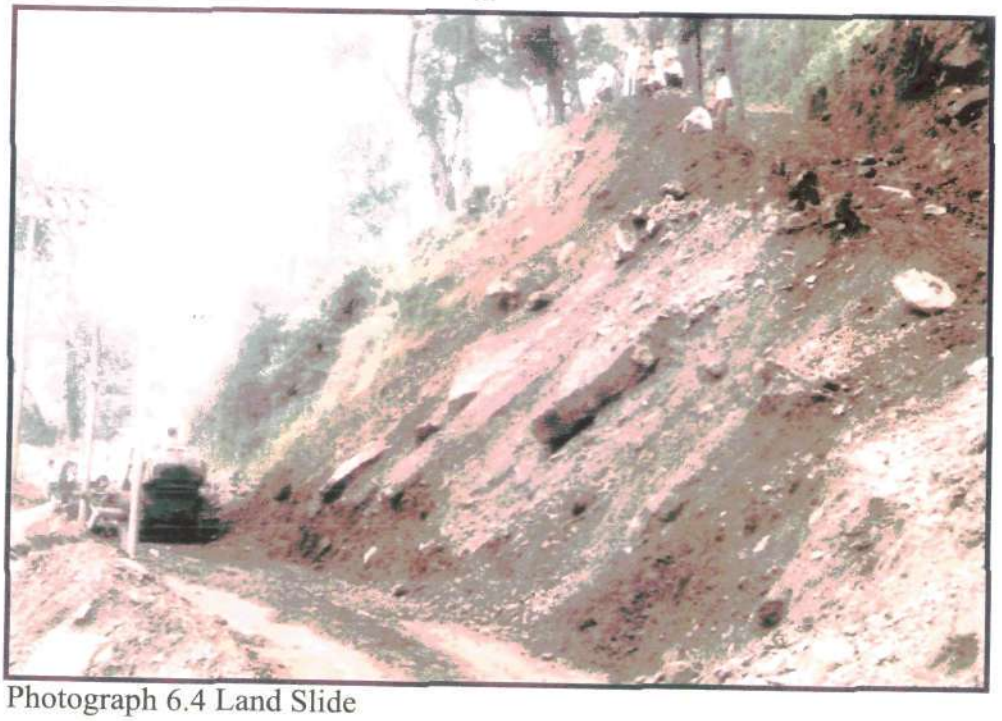
In Darjeeling Forest Division, which contributes north and north-western parts of the forests in the study area Ghoom Pahar Forest along with Phuguri and Manjha Forest in the east, open grazing was earlier allowed only in areas north of little Rangit river. Elsewhere, it was restricted and allowed only on the strength of permits. The deleterious effect of overgrazing on soil and regeneration are noticeable in these parts of upper hill forests where undergrowth has been reduced to such species which are non-palatable to cattle. Natural regeneration of tree species has become practically non-existent as a result of continued browsing and trampling. There are a number of departmental *bathans* where cattle are stall fed. The owners are allowed to collect fodder from the adjoining forests and there are fenced areas around the stalls where cattle can exercise. This system was introduced to discourage open grazing which often degenerates into overgrazing. But in practice, *bathan* stall feeding has been found to be of limited utility due to indifferent attitude of cattle owners (Govt. of West Bengal, 1970). Though Darjeeling Grazing Rules were made, way back in 1895, even then unauthorized grazing took place all along the boundaries of different forest areas situated in the study area. In younger plantations adjoining the localities, damage to seedlings is caused particularly by goats (Govt. of West Bengal, 1959).

6.1.2h. *Forest Fire:* In Darjeeling District, forest fire is a great source of danger in upper hill forests. In these forests fire breaks out easily due to strong winds and presence of dense bamboo under growth. The study area, where upper hill forests are less, does not suffer from any serious forest fire. In excessively dry weather, younger plantations do

suffer from ground fires. Protection of younger plantations from grazing produces profuse regeneration of grasses. These grasses dry during summer and act as fuel for occasional fire.

6.1.2i. *Construction of High-Tension Electric Lines:* In recent years, construction of high-tension electric posts in the tea gardens of Mirik and Sukhiapokhri police station areas, have exposed the underground soil and made the soil loose. Such construction causes washing away of the loose soil during monsoons. As a result soil was eroded in huge quantity.

6.1.2j. *Landslide:* Weak geological formations in the study area, is one of the major factors for failure of slope or landslide. Excessive wetting of soil in the north eastern part of the study area also bring about increased pore pressure leading to instability. Paddy cultivation by impounding water often leads to landslides. About 100mm to 200m precipitation in 24hrs, is usually sufficient to cause failure in Darjeeling Himalayas (Starkel, 1972). The most comprehensive report on the landslips of the Darjeeling District was published by the Geological Survey of India in 1966 where of slips have been termed 'soil slip', 'bedris slip' or 'rock slip', depending upon the material involved in the slip. Almost every year, due to incessant rain, landslips of different kinds occur along the Hill Card Road joining Kurseong and Darjeeling. For almost a decade, this has become a regular incident in the study area. Punkhbari Road is severely destroyed by landslides in 2003. Notorious Ambootia landslide lies at the southern tip of the study area, the size of which exceeds every year during the rainy season. Soil erosion degrades the top soil and reduces the soil fertility leading to progressive deterioration and finally disappearance of vegetation. This leads to extremes of climate indicated by rise in temperature. Humidity decreases and rainfall becomes erratic. Evaporation of soil moisture increases. In the study area, soil erosion has reduced the density of forest vegetation and vice versa. The effect is pronounced with overgrazing. Tea bushes become sick and yield decreases. Fertilizer input increases, increasing cost of production. Soil loss from



Photograph 6.4 Land Slide

Photograph 6.5 Land Slide

agricultural land and deposition of the same on the river bed is equally harmful. Rocky eroded debris, deposited on the agricultural land, turns it unfit for cultivation. Formation of rills and gullies also turn the agricultural tract into badland. Debris deposition, forces the river to change its course and at time blocked rivers cause flash flood, destroying the cultivated land along its banks. In the upper reaches of all most all the tributary river basins, large numbers of abandoned agricultural fields have been noticed. Shallow soil when gets removed by sheet erosion, land turns infertile and farmers abandon such lands. These lands are usually overgrazed, subsequently, causing reversal of natural restoration processes, if any (Patel, 1996). Most severe degradation is seen on the steeper slopes which are overgrazed.

With the disappearance of forests, fodder supply becomes limited. Overgrazed pastures affect the general health of the livestock. Supply of timber and fuel wood also decreases further aggravating their scarcity. In the study area, there is acute shortage of fodder. Commonly cattle are seen moving around inside reserved forests in huge numbers. People also collect fire wood from the forests illegally. Reduced forest cover, reduces infiltration capacity and the surface flow greatly increases. This results in frequent floods. Sedimentation of river beds reduces the water holding capacity, thus causing flood. Because of reduced infiltration, underground reservoirs are not replenished like before and consequent steams, which are fed by such sources, become dry after rainy season. Perennial springs have become non-perennial in the study area. In Longview T. G. and Jamadar Bhita Khasmahal streams are being replaced by tap water. Kurseong town and adjoining areas faces severe water crisis during the dry months. In absence of monitoring of rivers during dry season over a long period of time, it is not possible to draw any quantitative inference regarding the reduced supply in the study area. Accumulating sediments silt up the reservoirs and clog the irrigation channels. This causes mal-functioning of both the structures. Damage of communication routes, houses, agricultural land are the most visible effect of landslides. The instances of highway

and railway embankments being washed away by cutting of uncontrolled water, land slips, landslides and debris avalanche during rainy season is a common feature. It has been estimated that more than fifty percent of annual cost of maintenance of communication routes are due to landslide. According to past records, the Hill Cart Road and Punkhabari Road had been affected by landslides in 1950, 1968, 1980, 1991 and 1993.

The recent landslides, which occurred on 1998 severely, affected the Kurseong subdivision particularly the Hill Cart Road and few other roads. On 2003, there were also a large number of slides in and around Darjeeling and Kurseong town. Landslide severely affected settlements and twelve lives were lost. Heavy rainfall activated the debris slides. Unscientific cultivation and harvesting of ginger disturbed the cohesiveness of soil and aggravated soil erosion. On 2004, a series of devastating landslides crippled the tourist movement in the study area by disconnecting the Hill Cart Road at various places. Roads along the *jhoras* helped the flowing water to seep underground and cause subsidence. On 2005, landslides caused by heavy rain claimed two lives in the hills. Houses were also disrupted. On 2006, the Darjeeling hills as a whole have been affected by numerous small slides damaging more than 50 houses (Basu et al., 2006).

6.2 PROBLEMS FOR AGRICULTURAL DEVELOPMENT

Agriculture is controlled by a host of natural conditions like soil, rainfall, duration of sunshine, slope of land etc. Each part of the study area faces problem due to variation in physiography, climate, soil and water. These problems can be broadly divided into physical, institutional and cultural.

6.2.1 Physical Problems

6.2.1a. *Topography:* The steep, rugged topography limits the scope of agriculture in the study area. Rice, maize and potato can be done only in the terraced lands. The terraces in most cases are unscientific in shape and structure. Improper drainage in the terraces, disturb the

entire terracing system during times of heavy rainfall.

6.2.1b. *Uneven Distribution Of Rainfall And Sunshine:* The rainfall is concentrated between June and September and is most unevenly distributed over the study area. Thus the distribution of soil moisture is also even leading to uneven production of crops in different parts of the study area. Rain accompanied by hail damages the crops. Recently snowfall also is causing great damage to the crops in Sonada and Rangbul.

The variation in sunshine leads to the variation of cropping pattern and ripening season. The lower hills enjoy longer duration of sunshine and thus ripening of crops take shorter time.

6.2.1c. *Soil Fertility and Erosion:* Due to incessant rain, fast flowing surface run – off removes the top soil turning it infertile. This problem of soil erosion and loss of soil fertility can be observed in almost all parts of the study area.

6.2.2 Institutional Problems

i) The land distributed to the landless and marginal farmers were mostly inferior.

ii) Agricultural land was defined by use condition instead of soil quality.

iii) Such vested lands were kept barren or used for other purpose.

iv) Land holdings are very small and unprofitable to cultivate. Fragmentation of land is the major cause for such condition.

v) The steep slope and thin layer of soil restricts the use of machines like tractors, threshers to carry out farming operations more quickly and efficiently for maximizing out put.

vi) Lack of irrigation facilities affects the production of crops. The available irrigation systems are entirely dependent on monsoon rains and become dry in winter season.

vii) The poor economic condition of the farmers restricts them from arranging for irrigation, machines, HYV seeds etc. Thus they stick to traditional methods only.

viii) High cost of fertilizers and insecticides deters the farmers

from using such things.

ix) The banks do not show much interest in giving credit or loans to the farmers because of the small nature of loans and low return. Long tedious process of clearance of loan, discourages the farmers to go to the financial institutions. In fact they go to the local money lenders who charge high rate of interest which harms the interest of the farmers.

x) Lack of draught animals in the farms make the farmers work harder in the agricultural land.

xi) The land revenue department faces few problems regarding payment of revenue. Fifty percent of the farmers are reluctant to pay the revenue in time. They are mostly late in paying the land revenues. The tea garden owners has to pay land revenue to the Land Revenue Department, Government of West Bengal and Panchayat in time, unless which their production might be stopped by such authorities.

xii) Non-payment of wages: The wages of the tea plantation workers of West Bengal are the lowest in the organized sector. The workers barely manage to survive with the paltry daily wages of Rs. 49.25 in West Bengal, which is lower than Rs. 65.88 in Assam (The tea garden workers in Assam and West Bengal receive concessional foodstuff as part of their wages). This low wage prevail in spite of the fact that labour productivity in West Bengal is one of the highest in the country and so is the land yield and overall price of tea. However, at times, due to the closure of the tea gardens or change in management or internal problems, the workers are deprived of even the low wages, which they are receiving.

xiii) Land management problem: The tea gardens, in the study area are 'set garden' which are registered tea gardens and have taken land on lease from the forest department for 99 years. But there are new, relatively small, unregistered tea gardens which are cropping up in large numbers in different parts of North Bengal which do not care for plantation legislations and sell tea leaves produced by poorly paid labour in the wholesale market at a cheaper rate.

xiv) Problems in marketing: India, the world's largest producer of tea, with annual production exceeding 850 million kgs, has been hit badly because its traditional markets in the countries that made up the former Soviet Union have been steadily drying up. Tea produced by applying certain specified organic fertilizers are only in demand in the world market. On top of that, domestic consumption of tea, which accounted for 673 million tones in 2001, has increasingly been losing out to the manufacturers of bottled beverages. Transnational like Coca-Cola and Pepsi have been carving out large chunks of the market ever since they were allowed into the country under India's decade-old liberalization policies.

xv) Administrative problems: The theft of tea leaves and tea garden resources like irrigation pipes etc is a major problem.

xvi) Degraded tea plantations: The degraded tea gardens like Ambootia, Monteviot, Dooteria, Springside, Castleton etc. became so because of heavy soil erosion due to high velocity of rainfall along with neglected land management, i.e. lack of proper soil conservation and drainage measures. Large parts of Dooteria T.G. have been cleared for construction of helipad, thus causing land degradation. Due to lack of funds, old tea bushes cannot be changed which results in decline of crop yield.

6.2.3 Cultural Problems

The process of decision making and implementation of agricultural practices in rural areas is very much influenced by socio – cultural factors like religious importance of the crop, local demands and traditional value of the crops etc. The socio-cultural influence changes the cropping pattern, crop diversification and crop combination. In the study area, traditional agricultural practices still prevail in almost all the villages. This may be due to higher percentage of illiteracy among the farming community. The younger generation has a tendency to migrate to urban areas leaving the agricultural farming to older people, which is another problem.

6.3. SOCIO ECONOMIC PROBLEMS

6.3.1 Education

In spite of increase in population, many tea gardens still have only one primary school and no other educational institution. Since the women goes out to work in the tea gardens, it is their children who looks after the family, cooks food and fetch water from far off taps, tanks and springs. The children have no time to go to schools. Specially, the spread of education among girls is low due to poverty, social customs, negative parental attitude, poor accessibility to schools and non-availability of schools, which have women teachers. Low participation of girls in education has a direct impact on their social changes and future prospects. Due to absence of proper targeting and monitoring of achievements, Government subsidies tend to become ineffective in attracting children to the schools. This is more so because they are given regardless of the socio-economic background of the beneficiaries. In the khasmahals, the scenario is totally different. In response to the demand for 'better education', a large number of private schools have opened up in the last few years. Most of the private schools charge high fees compared to government schools and have English as the medium of instruction. Even then, the success of private schools is an indication of the fact that the quality and standard of education in the public sector are not commensurate with the expectations of parents. Especially in the tea gardens, high growth of population due to high birth rate is increasing unemployment. People are not adequately skilled and educated so the managerial staff are all coming from outside. Growing unemployment is making the local people aggressive and they are getting involved in all sorts of anti-social activities. Condition of the women and children workers: Women workers are under tremendous pressure. They are restricted by lack of skills from joining other income earning activities. An absence of alternate employment opportunities and unfavorable conditions for migrating long distances in search of alternate opportunities of work makes their life more miserable.

The analysis indicates that there is a need to rationalize the existing structure of the education system. There is also need for improving the preparation, motivation and deployment of teachers and for inspection and supervision of schools in remote areas. Further, poor maintenance and inadequate infrastructure of existing schools need to be taken care of. Improvement in education can only be possible if the following are the strategic thrust areas:

1. Education for all.
2. Provision for quality education.
3. Access to schools within walking distance of each village.
4. Improvement in school infrastructure.
5. Formalized system of teacher recruitment.
6. Encouragement of education to the weaker sections of society.
7. Widening scope of vocational education.
8. Establishment of technical colleges.

6.3.2 Health Services

The total medical facilities are in a deplorable condition in the study area. Facilities are concentrated in certain villages and large part of the basin is neglected from the primary medical services which is very important not only to control birth and death rates, but to make people aware of diseases like AIDS and TB. There is a slight improvement from 1991, when there were 25 villages without any medical facilities. Now the number went down to 10 villages, where medical services are day's dream. So, though health services have improved in the last three decades but still the facilities provided are inadequate and insufficient to the demand. Many of the tea gardens are still deprived of any medical facility. A few tea gardens have their own arrangements but that too is poorly maintained. People suffer a lot from ill health due to lack of health services. For health related problems, people has to rush to the nearest urban centers like Kurseong, Mirik, Darjeeling and even Siliguri for treatment. This is not only expensive but also impossible because of non-availability of ambulance services in the area. People are also very poor and are unable to bare the high

cost of transport and medical facilities provided. Inaccessibility of the tea gardens from the major medical centers is also an important factor that hindered people to avail such facilities.

6.3.3 Communications

Due to hilly terrain, remoteness and natural calamities, landline phones are mostly out of order. Mobile connections are provided at cheaper rates and are easily available so that people can afford. But tea garden workers are so poor that in spite of such offers, they are unable to avail such services. Since the study area is hilly and mountainous, to arrange for communication facilities is not only difficult but also expensive. If there is any fault in the telephone line, it takes many days for the Telecommunication Department workers to find it out because the line passes through steep mountain slopes or deep-forested areas. Natural calamities like thunderstorms, lightning and land slides totally damage and disrupt the communication system. Moreover the communication system is Government funded and there are limitations to connect the isolated villages scattered in different parts of the mountainous terrain. As a result, communication is not at all developed in the study area.

6.3.4 Transport

Government tries to run the rails at a loss, since it is declared as a world heritage. Local passengers are less and not really interested to avail the railway services due to its slow speed and low frequency. Though every tea garden have their own vehicles for transporting green leaves to the factory or finished tea to the markets but they do not have for domestic purposes. Tea workers have to wit many hours to get vehicles, which will take them to their destinations. Break journey is very common in the area, which wastes lot of time and money. People in the area can travel 5 - 10 kms by walking. Children go to schools by walking long distances. The laborers carry their goods on their head and shoulders from the village to local market and vice versa. People need a very hard life in the study area, which is still undeveloped in

transport network. Excessive rain turns the roads into drains and water channels in rainy season. No proper drains are constructed along the roadside. Potholes collect rainwater and become dangerous for plying vehicles. Most of the time during rainy season, the roads get blocked due to landslides. Part of road sinks and there is disruption of transport services for days. During this period, price of all essential commodities rise as supply is disrupted and mountains get detached from the plains. It is true that in this mountains terrain it is very difficult to construct and maintain the roads by the government due to lack of labour and funds, but the attention to increase road connection is low and untimely. Moreover the other roads like unmetalled roads and footpaths in the villages are in deplorable condition during the rainy season. Lack of transport facilities, cause damage to the crop production because it cannot be transported to the market in time. Especially perishable items like fruits, vegetables, milk etc are maximum affected. Farmers face severe loss. Moreover there are no proper storage facilities by which producers can be benefited. In the hilly areas, roads are winding and narrow, limiting the conditions for buses to ply. Moreover the low frequency of such services affects the transport system. Such vehicles have limited capacity to accommodate the increasing number of commuters and the transportation cost is very high, which is out of reach of common people.

6.3.5 Banking Facility

With respect to the number of people staying in the Balason basin and the total area covered, banking and credit facilities are extremely low and limited. Loan facilities are provided by the Gramin and other banks. But the processing and disbursement of loan is a very tedious process. At times the type of loan given is different from the local requirement. Few nationalized banks, cannot play a very significant role in developing the economic structure of the region as a whole and the people in particular because mostly they are located in the towns or larger settlements, situated far away from the villages. It is not only difficult but also expensive for the inhabitants of the small

remote rural settlements to avail such facilities by going to such big towns.

6.3.6 Electricity

Rural electrification is the most daunting task in the study area both because of the extreme and unfriendly topographical conditions and huge technological and financial resources involved. The configuration of villages in the hills is highly scattered sometimes making any community project not only cumbersome but also uneconomical. But all the houses of the villages do not enjoy electricity. Though electricity has reached in the villages, but remote part of the villages are still out of reach to avail this facility. Important facility like streetlights are not found anywhere in the study area. Due to shortage of supply from the source, a large number of villages remain in darkness or without electricity in both day and night in the study area for considerable hours. Moreover there are disruption in supply of electricity due to heavy rainfall and other natural calamities like landslide, theft, felling of posts. As a result villagers do not get regular supply of electricity, even though the study area is located very near to the hydel power station of Ramam, Fazi and Rinchingtong in Dargeeling district.

6.3.7 Drinking Water

Though water sources are there in summer even then water is only supplied for few hours of the day. In the hills, water gets collected all through out the night and in the morning stored water is supplied for few hours only. So naturally, there is severe crisis of water in rainless dry season. Scarcity of water forces poor people to break pipelines and stopcocks. People also steel the pipes. So people mostly use plastic pipes which leaks almost always causing great loss of precious water, in the study area. Pipelines mostly run along the roadsides drains and dirty water, at times, seeps inside the pipes. This causes some diseases like diarrhea, and gastric problem. People in the urban areas, boil drinking water but rural people due to dearth of fuel cannot afford to do so and mostly suffer from waterborne diseases.

Amount of supply of water depends on the availability of water in the *jhoras* and springs. During summer these *jhoras* become dry and the supply of water to the villagers is restricted due to inadequate storage.

6.3.8 Political Problems

Administration in the study area faced severe political crisis since November 2007 when people boycotted work in demand for a separate state – Gorkhaland. All tea gardens, Govt. offices, transport network, markets were closed for almost a week. People started agitating against the demand for 6th Schedule status in the Darjeeling Hills by fasting and strikes were called for more than a week. The situation could be controlled by the interference of the Chief Minister, West Bengal Government. This political agitation and strikes called by the Gorkha Jana Mukti Morcha caused severe loss in tea, tourism and transport mainly in the study area. Such political disturbances for the last 10 to 15 years are causing great economic loss in the study area.

CONCLUSION

Soil is the major component on which depends the agricultural economy and tea industry in the study area. The top soil is threatened by sheet erosion whereas more severe erosional features like rills and gullies are also found in plenty in the study area. Since heavy rainfall is concentrated over a short span of time, soil erosion has to be a major problem. Steep slopes accompanied by heavy rainfall causes soil erosion. Other factors like deforestation, faulty cultivation methods, unauthorized quarrying of boulders add to the already existing conditions of soil degradation. Landslides are quite frequent in the study area, which affects the life of the people in a disastrous way. Loss of life and property is a common incident related to landslide. It also destroys agricultural lands. Agriculture is the dominant occupation of the study area and due to high rate of soil erosion there are various problems which affect agriculture and production. Agricultural sector faces problems like steep slope, uneven distribution of rainfall, inadequate supply of inputs, lack of irrigation etc. In the context of

socio economic development, the study area has significant differences due to the various locational and remoteness of the villages. So education, health services, communication and transport etc. are far below the standard level. Children has very less scope of attaining knowledge by education mainly in the tea gardens due to non – availability of schools. They are 25 villages without any medial services. Communication and transport sectors are poorly developed but have positive scopes of improvement. Banking facilities are hardly available. Remote and scattered villages in the study area are yet to receive electricity. Though drinking water is available in all the villages, its supply during the dry months i.e. December – May is irregular and limited. Tourism has vast scope but there is no proper planning for its development. Tea industry is also facing few problems regarding its manpower and management. Since tea gardens are vastly spread over the study area hence all the above mentioned problems are directly or indirectly affecting the life of the people of the tea gardens.

So, different strategies have to be formulated and implemented to see that the area can develop at a faster rate. Such strategies are discussed in the following chapter.