

PREFACE

A large scale alteration in land use took place in eastern Himalayas in early part of this century with establishment of tea gardens. Most of the lands where tea gardens came up were natural forests and grasslands. In Darjeeling hills, too, land use pattern changed. Kurseong sub-division was the worst affected. In this sub-division, a large tract of natural forests and grass lands between 700 mt and 2000 mt contour line was cleared and tea garden established. The basin of the Balason river was very badly affected. Large number of labour was imported from outside to meet the requirement of tea industry. Traders, middlemen, and artisans closely followed the labour. The density of human and cattle population sought up dramatically in the Balason basin. Most of the human and the cattle population was concentrated on the sunnier eastern part of the Balason catchment. Mildly sloping piedmont slopes of these parts has the greatest concentration of the tea gardens, too. No study of Balason catchment for assessment of soil conservation status has been done so far. The traditional soil and water conservation techniques used till now has failed to check the pace of soil degradation in the area.

PURPOSE OF STUDY:

The eastern Balason catchment selected for the study has the following salient features that attract a closer survey:-

- i. This part has high concentration of human and cattle population. The demand of fuel by this population had put limited forest resources under severe strain. Forests owned by Govt. and tea gardens are degrading fast. Preventive measures are needed immediately.
- ii. Most of the Govt. forests, tea garden forests, waste scrub forests, and abandoned agricultural fields are being grazed far beyond their carrying capacity. Scrub and sterile cattle are aplenty. They are trampling the soils compact. The problem needs immediate attention and investigation.
- iii. Torrential jhoras are found in the upper reaches. High concentration of rainfall in monsoon months makes them disastrous. They often erode their banks. Landslides result, if they are not trained instantly.
- iv. Weak geological formation in the study area, necessitates a sound combination of engineering and biological

measures for soil and water conservation. Traditional soil and water conservation practices are inadequate.

- v. Rivers are sinuous and meandering in lower reaches. The direction of flow alternates between clockwise and anticlockwise in sinuous sections. Extensive bank failure are seen in such sections.
- vi. Agriculture is poorly developed. Field terraces often slope outward. They are badly maintained. Proper channels for safe disposal of excess water is rarely provided. Erosion permitting crops are extensively cultivated. Strip cropping is not practised.
- vii. Landslides are a menace in the study area. They devastate human habitations, productive fields and communication routes, etc. A few litres of water seeping into the soil per hour is often enough to trigger mass movement in these weak geological formations.
- viii. Terraces in many tea gardens are very poorly maintained. Several tea gardens maintain sickly tea bushes on slopes fit only for afforestation. Such lands are subjected to extensive sheet washing and rill erosion.
- ix. The catchments for supply of water to Darjeeling and Kurseong town are located in the study area. The yield of streams has gone down severely due to deforestation. Ground water recharging is inadequate because of absence of tree vegetation in the catchment. Overgrazing, forest fires and compaction of ground also impede the infiltration of water into the soil. Yield of streams is

going down year after year during summer. Kurseong and Darjeeling have chronic shortage of water during dry weather. Investigation is necessary in the matter.

OBJECTIVES OF STUDY:

The main objectives are :-

- i To study the physical aspects like geology, relief, drainage, climate, soil and vegetation of the study area and their interrelation for assessing major problems of soil conservation.
- ii. To study soils and their characteristics such as soil types, their formation, texture, structure, profile development, fertility, infiltration capacity, and water holding capacity.
- iii. To study parameters of drainage such as density, frequency, order, cross and long profile and relief.
- iv. To study various forms of surface and fluvial erosion including landslips.
- v. To study rivers in the basin area for total discharge and sediment load.
- vi. To study faulty agricultural practices, unauthorised quarrying, over settlement, development and extension of roads, deforestation, overgrazing and forest fires.
- vii. To study shortage of fuel and fodder, scarcity of water supply during dry season, floods, damage to irrigation

channel by siltation and damage to communication routes by sliding.

- viii. To study soil and water conservation techniques currently being used by Govt. Departments, private organizations and individuals.
- ix. To study different schemes of soil and water conservation executed in the area.
- x. and, finally to suggest a relevant strategy for soil and water conservation.

METHODOLOGY:

- i. Four rivers in the study area were monitored for two years to assess the soil loss. The cross section area - velocity method was used for the purpose. Rivers were monitored below the bridge over them. Water samples were collected and the quantity of sediment determined.
- ii. Satellite imageries were collected and interpreted.
- iii. The data and information were collected from Govt. and private organisations, clubs, municipalities and private individuals.
- iv. Information and literature have also been collected from different libraries, journals and personal experiences.
- v. Available data were analysed by computer for obtaining explanations and conclusions.

- vi. Maps and diagrams have been drawn using different cartographic techniques to illustrate the data and information.
- vii. On the basis of investigations reports have been prepared and various literatures cited to compare the study with those relating to similar problems in the country and abroad.

LIMITATIONS:

No investigation of soil erosion problems has been done in the area. Therefore, secondary data available was not much. Data was collected by field work. Hilly terrain and poor communication posed a great problem. Monitoring of rivers could be done only through cross section area - velocity method. More refined measuring devices were beyond the reach. Still more intensive soil sampling was not possible due do difficult communication. Infiltration was determined by an improvised single cylinder infiltrometer.

DESIGN OF THESIS:

The whole work commences with identification of the location of Eastern Balason Catchment in West Bengal State of Indian Union and giving the purpose, objective, and methodology adopted for the study.

Then the work commences with the first chapter which discusses the physical background of the area. The second chapter deals with the detailed investigation of soils. The third chapter deals with the analysis of various morphometric factors of relief and drainage and their relationships with soil erosion. The fourth chapter deals with the mechanism of various erosion forms met within the area. The fifth chapter deals with faulty land usages and effects of soil and water erosion. The sixth chapter details various methodologies used for investigation of problems. The seventh chapter deals with the review of earlier strategies and various Govt. schemes for soil and water conservation. And, finally, the eighth chapter comprises of suggestions regarding soil and water conservation.