ABSTRACT

Land degradation is a global problem, which is more serious in developing countries like India. In the Nilgiris district of south India also, soil loss has led to the degradation of thousands of hectares of land. Further as a result of soil erosion, Kundah and Bhavani reservoirs have been silted up heavily in the last decade, while the Katteri dam has been abandoned. The main causes for the degradation in the district are deforestation, improper and unwise landuse practice, landslides and biotic pressure. This thesis demonstrates the role of remote sensing and GIS in studying and quantifying degradation in the Nilgiris district and in suggesting action plans to combat such degradation.

The degradation status map has been prepared for the years 1973 and 1993, using GIS analysis and weighted overlay index method. Slope, landuse, drainage density, geomorphology and lineament density in the study area are used as input parameters. While landuse/land cover, geomorphology, lineaments are derived from remotely sensed data, the other thematic maps (drainage density, slope etc.) are derived from topographic maps and published data. Based on GIS analysis the whole district is divided into four zones as highly degraded, moderately degraded, less degraded and not degraded. During 1973, 13% of the land is highly degraded whereas in 1993 about 33% of the land falls under this category. The areas not affected by the degradation are reduced to 17% in 1993 from 32% in 1973. The figures

indicate the severity of the problem in the Nilgiris. The area of dense forest has been reduced to 26% from 38% of the total area. The area under tea has increased substantially. The 1993 degradation status map shows higher degradation in and around all the urban centres of Nilgiris district.

The Sillahalla, Kundahpalam and Neeralipallam watersheds in the highly degraded zones are taken up for action plan generation and to suggest conservation measures. It is seen that in Sillahalla watershed, annual crops are raised in about 50% of the area and out of this 75% of crops is grown in unsuitable slope. Accordingly, suitable crops based on the slope are suggested. In the Kundahpalam watershed tea is grown in 45% of the area and 78% of the tea is raised in unsuitable slope. In the Neeralipallam watershed, tea is grown in about 79% of the area and here also 64% of the plantations is raised in conflict with slope class. It is not possible to uproot the tea plantations in areas with more than 33% slope. However, a multi-layered approach by planting horticultural plants like plum, peach, and silver oak etc., in the existing plantation is suggested.

To further understand the status of soil erosion, drainage morphometric parameters of the three watersheds are studied with the aid of GIS software. Morphometric parameters such as circularity ratio, form factor, elongation ratio, bifurcation ratio, drainage density, stream frequency and texture ratio are computed and used to prioritize the sub watersheds for conservation.

Soil Stability Index, which indicates the soil erosion status of an area is computed for the study area using satellite image data and compared with the results of degradation study. Landsat MSS and TM radiance parameters are used to distinguish soil erosion, stability and deposition. Soil Stability Index was computed for 1973 and 1992. The result shows that the erosion prone area is more in 1992 compared to 1973, which corroborates with the result of the GIS based degradation study. Therefore, it is seen that Soil Stability Index is a quick way of understanding the soil erosion status of an area.

To sum up, there is severe degradation occurring in the Nilgiris district. The main problem is that annual crops are grown in all slope categories, which results in soil loss. Another important factor is the presence of extensive tea plantation in all slopes of majority of watersheds, which is not recommended for sustainable development, as they are not in conformity with slope.

Thus this thesis has demonstrated that remote sensing and GIS have vital role in assessing the degradation in the Nilgiris district and for suggesting suitable conservation measures.