

Soil Degradation in Tropics

Soil

The most common matter underfoot which we scarcely even notice and sometimes called dirt is the mother of terrestrial life and the medium where its productivity is regenerated.

Ecological Problems

- Salinization
- Erosion
- Denuding of watersheds
- Silting of valleys and estuaries
- Degradation of arid lands
- Depletion and pollution of water resources/wetlands
- Pesticide and fertilizer residues
- Domestic and industrial wastes
- Poisoning of ground water
- Air pollution and acid rain

The result of these problems is:

1. Mass extinction of species
2. Threat of global climatic change

Soil degradation is also the result of environmental degradation. This is not inevitable and can be controlled provided we avoid major abuses

In 1990, the area of arable land available per capita basis was **0.3 ha** and this is reduced to a **quarter-hectare** by the end of this decade, and this will drop to **0.15 ha by the year 2050** if present rate of soil degradation continues.

The current studies reveal that **three-quarters of the world's soil degradation occur in the tropical areas.**

The reasons are obvious:

Tropical soils are ancient and highly weathered.

Experiencing frequent use of fertilizers and agrochemicals.

Suffer repeatedly from drought and flooding.

Deforestation

Overgrazing

Inappropriate use of agricultural practices on inherent poor soils.

Currently soil degradation is a Global Problem. The loss of potential productivity due to soil erosion world wide is estimated to be equivalent to some 20 million tonnes of grain per year or 1% of Global Production.

Water erosion annually carries about 20 billion tonnes of topsoil towards the oceans. Out of the 20 billion tonnes of top soil lost in the ocean, 45% comes from south and south-east Asia and 1.5 billion tonnes from Amazon Basins.

Soil erosion rates in **Sub-Saharan Africa** have increased **20-fold in the last 30 years**. Only a century ago 40% of Ethiopia was covered with forest, now only 3% of the forest cover remains. As a result, the annual Ethiopian highland top soil loss is estimated to 1-3 billion tonnes, a loss equivalent to about 1.5 million tonnes of grain a year.

In Asia about 487 million ha are currently affected by soil salinity. **23% of China's irrigated land and 21% of Pakistan's are affected by salinization**. Thus, money spent on irrigation is contributing directly to land degradation

Even developed countries like USA is facing this problem in the form of removal of top soil (6 billion tonnes per year, Napier, 1986)

Through the Global Assessment of Soil Degradation (GLASOD) study, carried out by UNEP and the International Soil Reference and Information Centre (ISRIC) Netherlands in beginning of the 1990's, it was shown that already 24% of the inhabited land area exhibits human-induced soil degradation. The world's total land area of 13.4 billion ha, about 2 billion ha is degraded to varying degrees. Soil degradation in Africa and Asia taken together itself accounts for a total of 1.24 billion ha or 62% of Global Soil Degradation

In India about 50% of the land area is undergoing degradation due to one or another cause (Abrol and Sehgal, 1992). According to an estimate approximately 5000 million tonnes of top soil is being eroded every year in our country and 30% of it's permanently getting lost to the sea (Dhruvanarayana and Ram Babu, 1983)

Meaning of Soil Degradation

Soil degradation refers to the decline in soil productivity and quality resulting from human activities.

Soil degradation is a process which lowers the current and/or future capacity of the soil to produce goods and services (Oldeman, 1988)

Soil degradation can be defined as “The rate of adverse changes in soil quality resulting in decline in productivity capacity of land due to processes induced mainly by human intervention” (UNEP, 1992)

Soil Degradation Types in Tropics

Over exploitation of soil resources

Erosion of soil (loss of top soil)

Chemical deterioration (loss of nutrients and/or organic matter, salinization/acidification and pollution due to agrochemicals/fertilizer residues/wastes)

Physical deterioration
(water logging/flooding/compaction/drought)

Causative Factors

Deforestation for logging and fuelwood uses

Deforestation for shifting cultivation

Intensive agriculture

Industrial activities

Overgrazing

Unscientific agricultural activities

Climatic factors

Topographic factors

Edaphic factors

Problem of soil degradation in hilly terrain is different from the plains

In plains the soil degradation is mainly due to over exploitation of soil resources, flooding, drought and excessive use of fertilizers

In hilly terrain the problem of soil degradation is mainly due to removal of topsoil through water erosion as a result of massive deforestation for logging and shifting cultivation (Jhuming)

In Arunachal Pradesh (North Eastern India) the problem of soil degradation is mainly due to large deforestation and neotectonics. Soil degradation problem is the subject of environmental concern and has drawn the attention of world's scientific community.

Assessment of soil degradation

Soil survey manual of USDA is followed for the assessment of soil degradation

This manual is based on the measurement of physical and chemical properties of soils

Biological and biochemical parameters are important as they are involved in transformation of C,N,P,K and S elements required for plant growth

These parameters are often used as an index for the measurement soil fertility

The measurement of these parameters is also rapid and reliable
Therefore, I feel the biological and biochemical parameters of soil should also be taken into consideration while assessing the degree of degradation of soil.