# Effects of Overexploitation of Biological Resources

Unit

3

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## Introduction

Human beings evolved in the natural systems as a result of interactive forces among the pre- existing biological forms. Though late to arrive on the evolutionary scene, man is the only life form to initiate drastic interventions in nature. He has always been using natural resources around his dwellings to meet his basic, social and cultural needs. The customs, traditions, practices, beliefs, and ,rules ensured a balance between human needs and environmental conservation in ancient times. However, with passage of time this symbiotic relationship was gradually replaced by destructive dependence. His activities became so heavily dependent on his surroundings that the process of development became synonymous with divestment of natural ecosystems. At some point during this phase he apparently forgot that the ecosystem has certain carrying capacity that reflects a limit to its exploitability.

In this Unit you will learn how cutting of forests has led to environmental degradation and that indiscriminate industrialisation has led to deforestation and related problems of desertification and loss of wildlife. You will be able to see that desertification is the physical effect of deforestation whereas loss of wildlife is a biological effect of deforestation both of which result from overexploitation of natural resources.

## Causes of Overexploitation

Overexploitation of biological resources is mainly because of increasing human greed. This has resulted in deforestation, desertification and loss of wildlife. We discuss below the causes of overexploitation of some of these biological resources.

### Deforestation

Deforestation is a broad term. It means reckless cutting of trees including repeated lopping, felling removal of forest litter, browsing, grazing and trampling of seedlings. It results mainly from

i) shifting cultivation
ii) development projects
iii) demand for firewood
iv) demand of wood for industry and for commercial purposes
v) other causes.

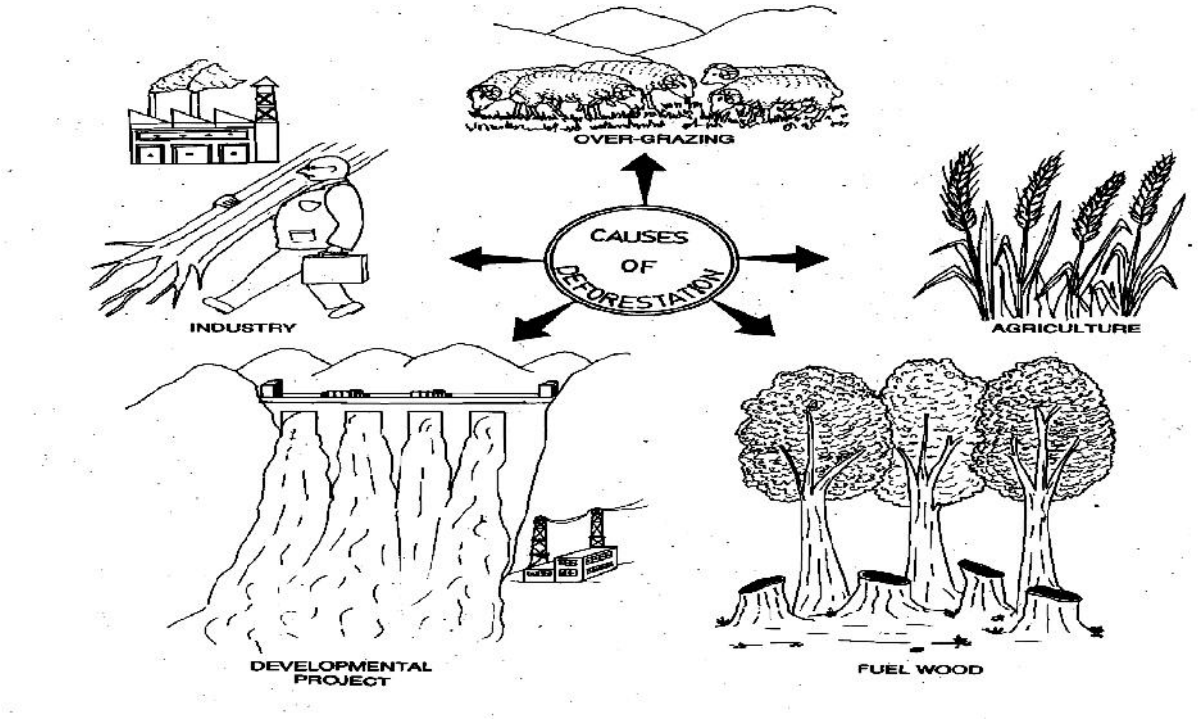


Fig: 3.1 causes of deforestation

Fig. 3.1 illustrates some of these causes in a diagrammatic manner. As a result of deforestation forest cover has been extremely reduced. Deforestation affects the existence of wildlife. Human activities such as hunting of animals for game or for skin also lead to loss of wildlife.

i) **Shifting cultivation**: Hunting and gathering (HAG) has been the main form of sustenance practised in the earlier parts of human history. The characteristic of HAG societies is the absence of any surplus and thus these communities have a subsistence living. However, this method of cultivation causes extreme deforestation, as after 2-3 years of tilling, the land is left to the mercy of nature to recover. This type of cultivation was always meant to fulfil local needs or onsite demands to meet the requirements of the cultivating groups or villagers closeby.

ii) **Development projects**: Now let us see how developmental activities cause deforestation. Forest dweller was geared to keeping a balance between human and environmental needs but today there has been a transition from a balanced use of forest resources to their overexploitation. As a result, the situation has changed. Apart from drawing raw materials from the forest, a development project starts destroying the forest even before it goes into production. The process begins with building of infrastructure in the form of roads, railway lines, buildings, dams, townships, electric supply etc. Hydro-electric projects and projects like irrigation dams, and canals use timber and other forest produce for raw materials also. Industrialisation is not a one-time event that destroys a few hectares of forest immediately

under them. The developmental projects instead continue to cause deforestation before and long after their establishment. As a result of the sudden disappearance of trees from an area of several hectares, people living in the vicinity are at once deprived of the source of fuel, fodder, fibre and timber, which is essential for many of their daily needs like making implements, fences for feedlots and for livestock pens. This destruction of their source of sustenance begins a chain of reactions including reduction in income, deterioration of nutritional status, indebtedness, land alienation, reduction in cultivated area, and consequent deforestation of a much larger area because dependence on sale of firewood increases.

iii) **Firewood**: Fifty four per cent of the total global wood produced fulfils fuel requirements of the world. A close look at the pattern of utilisation of wood produced will show that the developed countries utilise 16 per cent of their share for fuel requirements. On the other hand, in developing countries, 82 per cent of their forest produce is burnt as firewood which is a wasteful way of spending this resource.

| Region | Total Wood Consumption (in billion cubic metres) | Wood Use (in billion $m^3$) | | Wood Use (%) | |
|---|---|---|---|---|---|
| | | Industrial | Fire-wood | Industrial | Fire-wood |
| Global | 3.2 | 1.5 | 1.7 | 46 | 54 |
| Developing Countries | 1.8 (57 %) | 0.324 | 1.476 | 18 | 82 |
| Developed Countries | 1.4 (43 %) | 1.176 | 0.224 | 84 | 16 |

Table : 3.1

iv) **Demand of wood for industry and for commercial purposes** : Wood, the versatile forest produce. is used for several industrial purposes, such as making boxes, crates, packing cases, furniture, match boxes, paper and pulp, plywood, etc.

v) **Other causes** : Forests may sometimes suffer from natural enemies such as termites, diseases, floods and forest fires as well. In addition to the above causes, deforestation can also result from overgrazing and agriculture as well.

## Desertification

Desertification and deforestation are closely linked phenomena. Forests maintain humidity of an area. When the air is humid; not only does less solar heat penetrate to ground during the day but also less of it escapes to the outer atmosphere during the night. Forests thus tend to provide seasonal stability to the terrain. Desertification is a systemic phenomenon resulting from excessive felling of trees which manifests itself as loss of fertility, high wind velocity, low precipitation, extreme aridity and extremes of temperature in the affected

terrain. Desert supports scanty vegetation and animals which are especially adapted to extremely unfavourable conditions. Although desertification can develop from natural causes alone, in a majority of instances human intervention causes an accentuation of arid conditions in an already desert terrain. This can happen in any climatic zone or ecosystem, resulting from exploitative interaction of man with the natural ecosystem. Accentuation of desertification is caused mainly by deforestation. Most of the deserts of recent origin have resulted from the following human activities.

- Uneconomic land use for agriculture by cultivation on marginal lands affecting adjacent fertile lands and soil erosion.
- Uncontrolled grazing and indiscriminate cutting of trees or overexploitation of grazing lands and forest resources leading to drought, soil erosion, deterioration of soil fertility and stunted plant growth.
- Intensive and uneconomic exploitation of water resources leading to rise-in water table, seepage and problems of increased salinisation of soil.
- Excessive mining in arid and semi-arid regions for extraction of ore, coal or lime resulting in loss of trees, bushes and green cover, and leading to total destruction of conditions conducive to vegetation.

We shall now discuss each of the above causes of desertification in more detail.

i) **Uneconomic land use**: Uneconomic land use and exploitation of resources for the purpose of agriculture is one of the main causes of desertification making the deserts uninhabitable.

ii) **Uncontrolled grazing**: Increased pressure of livestock on the grazing lands, results in overexploitation of resources. This also causes soil erosion leading to desertification. Uncontrolled grazing associated with indiscriminate felling and lopping of trees makes the desertification more intense. The trees, shrubs and even their roots are often used by rural population for top feed and fodder.

iii) **Overexploitation of ground water**: Excessive and uneconomic drawing of ground and surface water resources for irrigation is known as intensive irrigation. This leads, on one hand, to depletion of ground water and on the other, to rise in water table, waterlogging and increased salinisation in arid zones.

iv) **Excessive mining**: The processes of mining include surface or open casting and underground mining. In the former case vegetation and soil have to be removed to get access to deposits. Thus, loss of productive soil and associated flora and fauna is unavoidable. Generally, the mining debris forms twice the mined ore or material. The overburden or piled up soils are subject to erosion besides occupying large land surface. In case of underground mining, tunnels and shafts are needed which also cause problem of debris. Besides, land subsidence or landslides in the areas where extraction has been done extensively, cause a further loss of land which might be under natural vegetation of cultivation. The area thus lost is quite large.

### Loss of Wildlife

Man, because of his vanity and greed has become one of the greatest enemies of wildlife. Man has tried to control all the adverse factors for his survival without any concern for the other animals living around him. Increasing human population with its increasing food requirements has resulted in reduction of area under forest cover, because large tracts of forest area have been put under intensive agriculture. This has resulted in a severe disruption of ecological equilibrium.

Projects like taming of the rivers for irrigation projects, draining of marshes for agriculture and urbanisation etc. have thoroughly altered and in some cases even destroyed the natural habitat of wild animals causing a great reduction in their population size which may also lead to their extinction. Resides natural enemies like parasites and predators, various climatic and accidental hazards like droughts, floods, earthquake and fire, man's greed has contributed greatly in limiting the population of these animals. Excessive hunting of animals for game or skin has endangered the very survival of a large number of wild fauna.

Animals provide for one of the most lucrative black markets in the world. Every year, the worldwide trade in animals takes a toll of an estimated 40,000 primates, a part of which are bred in captivity.

## Effects of Overexploitation

After becoming familiar with the causes you would like know the effects of overexploitation on physical and biological components of environment.

### Physical Environment

As you have studied earlier, forests play an important role in maintaining oxygen supply and freshness of the air we breathe. They bind soil, intercept heavy rainfall and help in recharging the underground waters. They act as environmental buffers regulating climate and atmospheric humidity. They stop erosion of soil by reducing the speed of run off waters and velocity of strong surface winds. Thus, they help prevent degradation in the physical environment. If forests are cut down, land is degraded, soil is eroded and transported with surface run off thus polluting the water. The destruction of natural vegetation cover causes loss of top soil. It is virtually irreplaceable as nature takes about a hundred odd years to build an inch of top soil. As a consequence of heavy desertification, Aravali hills, for example, have become woefully naked. Vast portions of the land are turning into waste lands.

Some of the effects of this are as follows:

i) Increased incidence of dust, sand storms and sand collection due to loosening of soil particles,

ii) Movement of sand and piling of sand dunes,

iii) Formation of soil crusts and depletion of organic matter in soil,

iv) Considerable increase in the degree of salinisation ( Salinisation is the process that leads to an excessive increase of water-soluble salts in the soil. The accumulated salts include sodium, potassium, magnesium and calcium, chloride, sulphate, carbonate and bicarbonate mainly sodium chloride and sodium sulphate) and alkalinisation of the soil, Deterioration in the depth and quality-of water, and

v) Transformation of weather and climate.

### Biological Environment

So far, we have learnt that every ecosystem maintains dynamic equilibrium between its living and non-living components. Like other biotic components, the wild animals also require an environment that provides living and foraging space, right type of nourishment for growth and better chances of escape from enemies. Besides their natural enemies, man's greed has led to a great loss of wildlife and elimination of habitat of the species which play an important role in ecosystem functioning. The increasing demand for wildlife products has led to indiscriminate slaughter of many species.

Japan is the world's largest trader in endangered species. Japan and to some extent France are responsible for decimating the rare musk deer from Nepal. Over the first nine months of 1987, the Japanese market imported 8 18 kg of musk to be used as aphrodisiac. With about 80 deer required to produce one kg of musk, some 80,000 deer were slaughtered in this period alone - a substantial part of their existing population.

## Environmental Protection

Fig: 3.2

The conservationists and the economists should now set up mutually compatible goals and aspirations so that whatever biological resources exist today are properly managed. For example, instead of extending arable land at the cost of forested area, production per unit area should be increased by adopting improved scientific methods and proper environmental strategies. The endeavour should be towards sustainable development in which neither a resource is indiscriminately depleted nor has mankind to go without making appropriate use of it. Thus, well managed biological resources will be recognised by their extensive species diversity, stable ecosystem and usefulness to mankind while allowing certain level of exploitation without losing the ecological balance.

## Biodiversity Conservation

This incorporates the preservation, maintenance, sustainable use (conservation), recovery and enhancement of the components of biological diversity, where:

- Conservation - is the sustainable use of resources and encompasses protection as well as exploitation and;
- Preservation - is an aspect of conservation meaning to keep something without altering or changing it.

### Sustainable development

This refers to development that meets the needs of the current generation without compromising the ability of future generations to meet their needs; it simply refers to intra and intergenerational equity. A balance between the environment, development and society results to sustainable development which ensures biodiversity conservation.

### Conservation Measures of Biodiversity

Ex-situ conservation:

- Refers to conservation of components of biodiversity outside their natural habitats, e.g. zoos, museums, gene banks, botanic gardens/arboretums;
- Used for threatened and endangered species to avoid their extinction; also known as captive conservation.
- In-situ conservation:
- Refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats.

### Convention on biological diversity (CBD)

Conservation of biological diversity and sustainable use of its components came into the limelight in 1972 (United Nations Conference on Human Environment; Stockholm). In 1973, UNEP identified conservation of biodiversity as a priority area, hence there was need to get the legal mandate for conservation of world resources. There were negotiations for a legally binding instrument to address biological diversity and its loss to enhance fairness and equity in sharing of the benefits of biodiversity; this led to the opening of the Convention on Biological Diversity in 1992; Rio de Janeiro under the United Nations Conference on Environment and Development (UNCED)/ Earth Summit.
The convention was inspired by the growing concern all over the world for sustainable development.

The convention objectives were:

- Conservation of the biological diversity;
- Sustainable use of its components;
- A fair and equitable sharing of its benefits.

This was the first global comprehensive agreement that addressed all the aspects of biological diversity; genetic resources, species diversity and ecosystem diversity.

### Other international biodiversity conventions and conservation organizations

- African Convention on Conservation of nature and natural resources.
- The Ramsar Convention on Wetlands of international importance.
- International Union for the Conservation of nature (World Conservation Union).
- Convention on International trade for endangered species (CITES).
- International Convention for the Protection on birds.

- International Board for Plant genetic resources.
- World Resources Institute.
- World Wide Fund for Nature.
- Convention on Conservation of migratory species of wild animals.
- International Convention for the Regulation of whaling.
- UNESCO programme on Man and biosphere.