UNIT 5

FOREST RESOURCES

Structure

5.1 INTRODUCTION

In the previous unit, you have studied about land and water as resources. In the present unit we shall discuss about the forest as a resource. You must have read in your Social Sciences text book about the early humans who were basically wanderers in the forest. They used to derive food, clothing and shelter from the forest. Later on, human being started settled life by clearing forest. But, life was still highly dependent on forests in a symbiotic manner. After industrial revolution in 18th century, humans began to exploit forest in a ruthless manner without considering its negative impact on the earth and its environment.

In this unit, we will describe economic, ecological and socio-cultural significance of forest as a resource in section 5.2. In section 5.3, explanation for various causes and consequences of deforestation are presented followed by some selected case studies in section 5.4 and 5.5. In the final section i.e. Section 5.6, methods of conservation and management of forest resources are being described.

Expected Learning Outcomes

After studying this unit you will be able to:

- describe significance of forest as a resource;
- explain various causes and consequences of deforestation;
- analyse impact of mining, dam building and other developmental activities on environment, forest and biodiversity;
- highlight the impact of mining and dam building and other developmental activities on forested People and their rights through various case studies; and
- describe various methods of conservation and management of forest resources.

5.2 FOREST AS A RESOURCE

Forests are our treasures which provide us a wide variety of commodities such as timber, fuel wood, fodder, fibre, fruits, herbal drugs, cosmetics and many types of raw materials used by the industries. A great variety of mammals and birds which live in the forests, serve as useful living resources (Fig. 5.1). Forests play a great role in soil formation, water conservation and regenerating of oxygen. Trees fix CO_2 in their biomass and through transpiration (loss of moisture to atmosphere) they moderate the climate. Can you imagine what would happen if forest does not exist in the world. As mentioned above, it performs certain functions which can be directly observed. But there are certain functions which cannot be directly observed like purification of air, carbon sink etc.

Fig. 5.1: Forest Supports many Forms of Life. a) A Nilgai Antelope Calf; b) Elephant Feeding on Yellow-bark Acacia Tree.

Broadly, all the above mentioned functions performed by the forest can be categorised under three major headings: economic, ecological and social.

i) Economic Significance

Forest is one of the largest available renewable resources on the planet earth. It provides a wide variety of goods and services which include food, fodder and fuel. Wood is used for making houses, furniture, matches, ploughs, bridges and boats. Forest products such as tannins, gums, spices, waxes, honey, musk, and hides are all provided by the flora and fauna of forests.Fruits, leaves, roots and tubers of plants form the food of forest tribes.Wood and bamboo pulp are used for manufacturing paper and rayon. The flora and fauna of the forest also holds the key to numerous life sustaining products such as pharmaceuticals, insecticides and pesticides. These substances should be harvested sustainably so that it could enhance the long term resource value of the forest.

ii) Ecological Significance:

As mentioned above forest performs certain function like moderation of global climate, supporting natural ecological systems and processes. Let us discuss them in detail:

a) **Moderation of global climate:** Forests stabilise global climate in a significant manner by influencing natural cycles such as hydrological and carbon cycles. You might have read about these cycles when you were in school. As you know, spatial as well as temporal patterns of rainfall are greatly influenced by forest. How much of water is retained in the soil, and how much flows away, sometime causing floods, also depends on tree cover. Similarly forest can also influence the atmospheric carbon dioxide level. Tree biomass holds carbon dioxide in a fixed state. Therefore, forest acts as a major source of carbon sink i.e. ability to absorb carbon dioxide from the atmosphere.In other words, a carbon sink is a natural or artificial reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period. When wood is burnt CO_2 is released in the atmosphere. This has a direct impact on the extent of greenhouse effect and global warming. In other words, more forests lead to greater removal of atmospheric carbon dioxide during photosynthesis resulting reduction of the greenhouse gases in the atmosphere. Therefore, large-scale afforestation has been adopted as a measure to reduce greenhouse effect.

b) **Protection of biodiversity:**Forests are the greatest repository of biodiversity on the land as they provide ideal conditions for the survival and growth of living organisms. The number of species per unit area is much greater in a forest than in any other terrestrial ecosystem. For example, the tropical rainforest covers less than 7% of the earth's land surface but accounts for more than 50% of all known species. About 62% of all known plants are found in these rainforests. That is why there has been a growing campaign for saving the rain forest in Amazon and Nile basin. The growing awareness about the importance and necessity to conserve biodiversity is helping human being to realise the significance of forest. Do you think this awareness or campaign is sufficient to protect rain forest? Think about it? We will discuss some of the conservation measures in the last section of this unit.

c) **Supporting natural ecological systems and processes:** As mentioned earlier forests perform certain activities which are crucial for supporting ecological systems and processes directly. Some of these functions and processes are as follows:

- Forests check the soil erosion by preventing the action of winds and water thereby preserves the fertile top soil.
- It prevents landslides and reduces the intensity of cyclones and floods.
- By preventing soil erosion, forests reduce silting of water bodies including reservoirs.
- Forest improves air quality by absorbing toxic gases and particulate matter.
- It protect watersheds and ensure perennial supplies of fresh water.

iii) **Socio-cultural significance:** As mentioned in the introduction, forests have been part of our social and cultural ethos since the inception of civilization. We find signs of such cultural bonds even in today's modern and materialistic life. This is largely because forests have significant aesthetic, recreational and spiritual value.

I am sure, till now, you must have realised the importance of forest as a resource. You might be reading in the newspapers or might have watched in the television about clearing of forests for urbanisation, mining, establishing industries, construction of dams, railway lines, roads etc. Do you know rate of deforestation is so high the world over that it has started affecting our life. In the following section we will discuss about extent, causes and consequences of deforestation.

SAQ 1

Answer the below given question within 30 words.

i) How does the forest act as a carbon sink?

ii) State any three socio-cultural significance of forest.

5.3 DEFORESTATION: CAUSES AND CONSEQUENCES

Deforestation refers to the permanent removal or destruction of indigenous forests. Today, it has been roughly estimated that the indigenous forest cover constitutes 21% of the earth's land surface. According to the World Resources Institute, deforestation is regarded as one of the world's most pressing land-use problems. Another major concern is the rate at which deforestation is occurring. Currently, 12 million hectares of forests are cleared annually. Almost all of this deforestation occurs in the moist forests and open woodlands of the tropics. It has been predicted that if deforestation continues at this rate then all the moist tropical forest could be lost by the year 2050, except for isolated areas in the Amazon and the Zaire basin, as well as a few protected areas within reserves and parks.

In India, forests cover 24.39 percent of the total geographical area. However, it is assessed that the country needs 33% of its area under forests to meet the ecological and economic needs.

5.3.1 Causes of Deforestation

Let us discuss some of the major causes of deforestation all ouer the world in general and India In specitic.

i. **Population Explosion:**Increasing human population is one of the major causes of deforestation. It poses a major threat to the environment. Vast areas of forest land are cleared (Fig. 5.2) to reclaim land for expansion of farming land, mining activities, creation of new and expansion of existing

human settlements, and development of infrastructure like roads and railway tracks. Growth of population increases the demand for forest products like timber, firewood, paper and other valuable products of importance, all necessitating felling of trees.

ii. **Forest Fires:** This is also another major cause of deforestation. Forest fires occur either naturally or are human induced. Some of the major causes of forest fires are as follows:

Fig. 5.2: Logging operation in the forest .

- Dry humus and organic matter forming a thick cover over the forest floor provides ideal condition for ground or carelessly surface fires.Throwing burning cigarette stubbs on dried foliage can light a fire.
- Crown fire takes place in densely populated forests where tree tops may catch fire by heat produced by the constant rubbing against each other.

Fire destroys fully grown trees, results in killing and scorching of the seeds, humus, ground flora and animal life.

iii) **Grazing of Animals:** Trampling of the forest soil in the course of overgrazing by livestock has far reaching effects such as loss of porosity of soil, soil erosion and desertification reduced productivity of the previously fertile forest area.

iv) **Pest Attacks:** Pests destroy trees by eating up the leaves, boring into shoots and by spreading diseases.

5.3.2 Consequences of Deforestation

Forests are closely related with climate, biological diversity, wild animals, crops and medicinal plants. Large scale deforestation has far-reaching consequences:

i) Habitat destruction of wild animals. Tree-using animals are deprived of food and shelter.

ii) Increased soil erosion due to reduction of vegetation cover.

iii) Reduction in the oxygen liberated by plants through photosynthesis.

iv) Increase in pollution due to burning of wood and due to reduction in carbon dioxide fixation by plants.

v) Decrease in availability of forest products.

vi) Loss of plant, animal and microbial diversity.

vii) Scarcity of fuel wood and deterioration in economy and quality of life of people residing near forests.

viii) Lowering of the water table due to more run-off, and resultant increased use of the underground water.

ix) Rise in carbon dioxide level in the air due to burning of vegetation has caused global warming resulting in melting of ice caps and glaciers and consequent flooding of coastal areas.

SAQ 2

Fill in the blanks with appropriate words

i) In India, forests cover _____ percentages of the total geographical area but the country needs _____ percentages of its area under forests to meet the ecological and economic needs.

ii) _____ fire takes place in densely populated forests.

iii) Deforestation leads to reduction in the _____ liberated by plants through _____

5.4 IMPACT OF MINING AND DAM BUILDING ON ENVIRONMENT, FOREST AND BIODIVERSITY

Timber extraction, mining and construction of dams are invariably parts of the needs of a developing country like India. Unfortunately forests are located in areas where there are rich mineral resources. Mineral based industries like iron and steel, aluminia refinaries etc. are also located in these areas. Out of the top mineral producing districts in the country, almost half of the districts are predominantly tribal dominated. The average forest cover in these districts

is 28 per cent, much more than the national average of 20.9 per cent (Centre for Science and Environment, 2008). Forests also cover the steep embankments of river valleys, which are ideally suited to develop hydel and irrigation projects. Thus, there is a constant conflict of interest between conservation and development. What needs to be understood is that long-term ecological gains cannot be sacrificed for short-term economic gains that unfortunately lead to deforestation. These forests where development projects are planned can displace thousands of tribal people who lose their homes when these plans are executed.

Floods, droughts and landslides become more prevalent in such areas. Forests are the repositories of invaluable gifts of nature in the form of biodiversity and by destroying them, we are going to lose these species even before knowing their significance as well as benefits. These species could be having marvellous economic or medicinal value and deforestation results in loss of this storehouse of species which have evolved over millions of years in a single stroke.

5.5 EFFECT ON TRIBAL POPULATION AND THEIR RIGHTS

Poverty amidst plenty, nature is bountiful but tribals are poor. This statement explains the conditions of majority of tribal population in our country. Tribal dominated areas of the country have rich forest cover, mineral bearing areas, and significant number of watersheds of key rivers. Forest provides food, medicine and other products needed for tribal people and plays a vital role in the life and economy of tribes living in the forest. As mentioned in the previous section, due to developmental activities like construction of dams, mining, establishment of mineral based industries etc. alienated tribal people from their own land. This alienation deprived them from their livelihoods. Most of them are dependent upon natural resources based informal economy. Their natural resource based informal economy is mostly dependant on agriculture, both settled and jhum and on the other non-timber forest product (NTFP) such as medicinal herbs, edible flowers, leaves and fruits. They also get their small timber and firewood from the forest.

Hence development is bound to affect their agricultural and forest land which is the primary source of their livelihood. The development process pushes them from an informal to a formal economy that is new to them without any preparation. They had depended on agricultural land and forests, both of which they loose to the project. When they receive compensation it is monetary with which most communities living in the informal economy are nor familiar. As mentioned above in most cases the Common Property Resources are not compensated. Therefore, there was a need to address these problems. Government of India passed an act in the Parliament titled 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006' to address this anomaly (See Box 5.1).

Boc 5.1 : The Scheduled Tribes and Other Traditional Forest Dwellers Act, 2006

An Act to recognize and vest the forest rights and occupation in forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded; to provide for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land.

And whereas, the recognised rights of the forest dwelling Scheduled Tribes and other traditional forest dwellers include the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance and thereby strengthening the conservation regime of the forests while ensuring livelihood and food security of the forest dwellings Scheduled Tribes and other traditional forest dwellers;

And whereas, the forest rights on ancestral lands and their habitat were not adequately recognised in the consolidation of state forests during the colonial period as well as in independent India resulting in historical injustice to the forest dwelling Scheduled Tribes and other traditional forest dwellers who are integral to the very survival and sustainability of the forest ecosystem.

And wherea, it has become necessary to address the long standing insecurity of tenurial and access rights of forest dwelling Scheduled Tribes and other traditional forest dwellers including those who were forced to relocate their dwelling due to state development interventions.

Source : https://indiacode.nic.in/bitstrean/123456789/2070/1/A/2007-02.pdf

SAQ 3

Answer the below given question within 30 words.

i) Name any four non-timber based forest product (NTFP).

ii) How do Forest Right Act 2006 enable tribals and other forest dwellers in strengthening the con servation of the forests while ensuring the livelihood and food security?

5.6 CONSERVATION AND MANAGEMENT OF FOREST RESOURCES

As a result of increased exploitation of forests for timber, firewood and other forest products, without putting in adequate efforts to regenerate them, the forests are known to be fast disappearing. This has caused an environmental imbalance. For example, most of the rainwater is lost as runoff which flows over the mountain slopes unchecked often causing floods. The excessive washing away of top soil results in low fertility and reduces crop yields. It is because of these consequences

of deforestation, a strong forest policy has been adopted by our Indian Government to protect forests and to plant more trees. Some of the conservation measures practiced in India and other parts of the world are as follows:

i) **Increase in area of forest plantation:** The Tree plantation can be raised in vacant or unused lands and waste, degraded and marginal lands, especially on road side, along railway tracts, on contours and on land not suited for agricultural production. Planting trees outside forest areas will reduce pressure on forests for timber, fodder and fuel wood. Apart from this, the deforested areas need to be reforested.

ii) **Developing alternative sources and promoting the substitutes:** It has become necessary to find alternative fuels as well as raw materials to manufacture paper, sports goods, packing cases, furniture and beams used in buildings. Research is going on to develop alternate sources; in some cases, plastics and composite materials have been successful in replacing the use of timber.

iii) **Increase the area of forest permanently reserved for timber production:** The most serious impediment to sustainable forest management is the lack of dedicated forests specifically set aside for timber production. If the forest does not have a dedicated long-term tenure for timber production then there is no incentive to care for the long-term interests of the forest. FAO (2001) found that 89 per cent of forests in industrialized countries were under some form of management but only about six per cent were in developing countries. If 20 per cent could be set aside, not only could timber demand be sustainably met but buffer zones could be established to consolidate the protected areas.

iv) **Adoption and promotion of sustainable management of forest:** Achieving ecological sustainability means that the ecological values of the forest must not be degraded and if possible they should be improved. This means that **silviculture** and management should not reduce biodiversity, soil erosion should be controlled, soil fertility should not be lost, water quality on and off site should be maintained and that forest health and vitality should be safeguarded. However, management for environmental services alone is not economically and socially sustainable. It will not happen until or unless the developing nations have reached a stage of development and affluence so that they can accommodate the costs of doing so. There are vast areas of unused land some of which is degraded and of low fertility. Technological advances are being made to bring this land back into production. This should be a major priority since a significant proportion of cleared tropical forest will eventually end up as degraded land of low fertility.

v) **Developing a reliable mechanism of information base and regular monitoring**: Knowledge of how much forest, where it is and what it is comprised of seems to be straightforward. However, surprisingly, this most basic information is not always available. It is not possible to properly manage a forest ecosystem without first understanding it. Remote sensing technologies make it feasible and affordable to identify hotspots of deforestation. The international

community could undertake monitoring efforts that would have immediate payoffs. A priority is to fund and coordinate basic monitoring on the rate, location and causes of global deforestation and forest poverty along with the impacts of project and policy interventions.

vi) Establishing an effective system of fighting forest fires:

vii) Strictly enforcing laws to deal with unauthorized cutting of trees.

viii) **Promoting agro-forestry and social forestry**: Rural people partly meet their needs for fire wood and small timber by growing fast growing trees planted within the limits of their village, along the footpaths, roadsides, alongside railway tracks, side roads or canals and streams, boundaries of fields and empty spaces. The aim of social forestry is to meet the needs of fuel, fodder, fruits, timber and other requirements of local people.

ix) **Participatory forest management and rights:** All stakeholders with an interest in the fate of the forest should be involved in planning, management and benefit sharing. The balance of rights can be tilted strongly toward society in the form of publicly owned strictly protected areas. State ownership and management can be retained but with sustainable timber extraction allowed. As of now much of the world's tropical forest are state owned but community participation in forest ownership and management needs to be encouraged. Land reform is essential in order to address the problem of deforestation. However an enduring shift in favour of the peasants is also needed for such reforms to endure. Moreover the rights of indigenous forest dwellers and others who depend on intact forests must be upheld. Therefore, the recognition of traditional laws of the indigenous peoples as indigenous rights will address the conflicts between customary and statutory laws and regulations related to forest ownership and natural resource use while ensuring conservation of forest resources. Keeping this in view various state Govenment in India has been implementating Joint Forest Management Programme after successful implementation in West Bengal and Haryana in 1970's.

Box 5.2 : Joint Forest Management

The need to include local communities in Forest Management has become a growing concern. Local people will only support greening an area if they can see some economic benefit from conservation. An informal arrangement between local communities and the Forest Department began in 1972, in Midnapore District of West Bengal. JFM has now evolved into a formal agreement which identifies and respects the local community's rights and benefits that they need from forest resources. Under JFM schemes, Forest Protection Committees from local community members are formed. They participate in restoring green cover and protect the area from being over exploited.

Fig. 5.3: Planting pine trees on the steep slopes of mountains.

SAQ 4

Answer the below given question within 30 words.

i) How can we address the conflicts between customary and statutory laws and regulations related to forest ownership and natural resource use?

ii) What is the aim of social forestry?

5.7 SUMMARY

- Functions performed by the forest as a resource can be categorised under three major headings: economic, ecological and social. Ecological functions include stabilising global climate, protect biodiversity and support global ecological system and processes. Forest has also socio-cultural significance in terms of providing ethical, spiritual, recreational and tourist value.
- There are various causes responsible for deforestation. Some of the immediate or explicit causes are logging for wood, land use and land cover change, forest fire and pest attack. Indirect or implicit cause is increasing population.
- Large scale deforestation has far-reaching consequences namely habitat destruction of wild animals and deprivation of food and shelter for tree-using animals; Increased soil erosion; reduction in the oxygen liberated by plants through photosynthesis; increase in pollution due to burning of wood and due to reduction in carbon dioxide fixation by plants; decrease in availability of forest products; loss of plant, animal and microbial diversity; scarcity of fuel wood and deterioration in economy and quality of life of people residing near forests; lowering of the water table due to more run-off, and resultant increased use of the underground water and rise in carbon dioxide level in the air due to burning of vegetation has caused global warming resulting in melting of ice caps and glaciers and consequent flooding of coastal areas.

- There is a constant conflict of interest's between conservation and development. What needs to be understood is that long-term ecological gains can not be sacrificed for short-term economic gains that unfortunately lead to deforestation.
- Developing alternative sources and promoting the substitutes, application of scientific methods, monitoring and management of growth of forests, establishing a system for controlling and preventing forest fire and by strictly implementing forest laws we can conserve our forest resources.

5.8 TERMINAL QUESTIONS

1. Describe the three major functions of forest as a resource.
2. Name the four major causes of deforestation.
3. State any five consequences of deforestation.
4. Why is there a constant conflict of inlerest between conservation and development? Explain with suitable examples.
5. Explain any five conservation measures for forest resources in India.

5.9 ANSWERS

Self-Assessment Questions

1. i. A carbon sink is a natural or artificial reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period.
   ii. Aesthetic, recreational and spititual value
2. i. 24, 33 percentages
   ii. Crown
   iii. Oxygen, photosynthesis
3. i. Medicinal herbs, edible flowers, leaves and fruits
   ii. The recognised rights of the forest dewelling Scheduled Tribes and ofther traditional forest dwellers include the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance and thereby strengthening the conservation regime of the forests while ensuring livelihood and for security.
4. i. Recognition of traditional laws of the indigenous peoples as indigenous rights.
   ii. The aim of social forestry is to meet the needs of fuel, fodder, fruits, timber and other requirements.

Terminal Questions

1. The three major functions of forest as a resource are economic, ecological and socio-cultural. Explain the three functions in detail with suitable examples. Refer Section 5.2
2. Four major causes of deforestation are : population explosion, forest fires, grazing of animals and pest attacks. Describe the four major causes in detail with suitable examples. Refer Section 5.3
3. Consequences of deforestation are habitat destruction of wild animals, increased soil erosion, reduction in the oxygen liberated by plants, increase in pollution, decrease in availability of forest products, loss of plant, animal and microbial diversity, scarcity of fuel wood and deterioration in economy and quality of life of people residing near forests, lowering of the water table and rise in carbon-di-oxide level in the air (any five)
4. Timber extraction, mining and construction of dams are invariably parts of the needs of a developing country like India. Unfortunately, forests are located in areas where there are rich mineral resources. Mineral based industries like iron and steel, alumina refineries etc. are also located in these areas. Out of the top 50 mineral producing districts in the country, almost half of the districts are predominantly tribal dominated. Forests also cover the steep embankments of river valleys which are ideally suited to develop hydel and irrigation projects.
5. Conservation measures adopted for forest resources in India are developing alternative sources and promoting the substitutes; Increase in area of forest plantation; increase the area of forest permanently reserved for timber production; adoption and promotion of sustainable management of forest; developing a reliable mechanism of information base and regular monitoring; establishing an effective system of fighting forest fires; strictly enforcing laws to deal with unauthorized cutting of trees; promoting agro forestry and social forestry; and participatory forest management and rights.

5.10 FURTHER READING

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4. Rajagopalan, R. 3rd Ed. (2015) *Environmental Studies*, New Delhi: Oxford University Press.
5. Wright, R. T. (2008) *Environmental Science: Towards a Sustainable Future,* New Delhi: PHL Learning Private Ltd.

Acknowledgement

Fig. 5.1: Forest supports many forms of life a) A Nilgai antelop calf; b) Elephant feeding on yellow bark Acacia tree

Source :

a) https://thefarmatwalnutcreek.com/deer-elk-nilgai-html

b) https://www.countrylife.co.za/conservation/elephant-survivors-damaraland

Fig. 5.2: Logging operations in the forest

Source: https://en.wikipedia.org/wiki/File:Logging Operation on BLSF.jpg

Fig. 5.3: Planting pine trees on the steep slopes of mountains

Source: https://www.denbow.com/wp-content/uploads/2016/10/steep-slopes-1000.jpg