BLOCK 3
NATURAL RESOURCES MANAGEMENT AND ENVIRONMENT

BLOCK 3 INTRODUCTION

The course Rural Development Programmes consists of four blocks. **Block 3** of the programme will make you familiar with the natural resource management and environmental protection programmes. This Block has four Units.

Unit 9 of the block discusses the ways and means for the development of special areas. **Unit 10** of the block discusses the strategies and programme for the watershed management. **Unit 11** deals with the efforts and role of different institutional mechanisms in the direction of social forestry and Joint Forest management. **Unit 12** points out the role of science and technology in the development of rural areas.

The four Units of the block will help you in developing an understanding of the demographic and regional plurality and development of the different diverse regions in their specificity. Besides, this Unit will also familiarize you with the ways and means for the conservation, management, and furtherance of the natural resources and environment through a participatory method. Also, it helps you in understanding the implacability of the recent advances in the technological field in the development of rural areas.

UNIT 9 SPECIAL AREA DEVELOPMENT PROGRAMMES

Structure

9.0 AIMS AND OBJECTIVES

After reading this Unit, you will be able to understand:

- difference between the concepts of regional development, planning, special areas, and special areas plans;
- types of special area plans;
- need of special area development plans; and
- policy and implementation of various specialarea development programmes.

9.1 INTRODUCTION

A special area development programme is part of the planning policy of India for balanced regional development which focused on the development of those specific regions which failed to keep pace with other parts of the country. It is a significant development programme that has been initiated during the Fifth Five Year Plan in order to reduce imbalances and speed up the economic development of that region. Achieve balance regional development in India, is a challenging task due to its size and diversity.

Inequality between various regions of the country has grown over time, it has introduced variation in terms of uneven distribution of resources. Economic and social development in India is studied at various levels; the most common unit is the state level. However, there are many pockets/areas in a prosperous state, which are backward and under-developed. This is particularly due to diverse geographic, economic, and social characteristics. Some areas are backward due to the landscapes, for example, hilly and inaccessible areas, distinct cultural groups i.e. tribal areas, problematic and hostile environments i.e. unproductive soil, desert areas, and drought-prone areas, and ecologically sensitive areas i.e. western *ghats,* etc. These regions need special attention according to their geographical and socio-economic environment, not only for development but also to flourish like other regions.

According to Prof. R.P. Mishra, regional development is carried through regional planning which is a technique to evaluate the potential of the sub-national areas and to develop them to the best advantages of the nation as a whole.

As we know regional development aims to remove regional disparities through socio-economic development and eradicate the backwardness of the region at par with other regions of the country. In this regard, various committees have been constituted by the Government of India from time to time to prepare reports and assess the level of backwardness in these areas. Finally, for the first time in Fourth Plan (1969-74) special area development plans were implemented in these specific areas, considering the local issues and challenges including physical, economic, and social structures. Various programmes under Special Area Development Programmes were implemented like Hill Area Development Programme, Drought Prone Area Development Programme, Desert Development Programme, Western *Ghats* Development Programme, and Tribal Sub-Plans, etc.

9.2 CONCEPT AND DEFINITIONS RELATED TO SPECIAL AREA DEVELOPMENT PROGRAMMES

Special Area Development Programmes were designed to address the development challenges of the area with distinct physical and socio-economic characteristics. The concept of regional planning is central to special area development programmes. It means to develop the backward or less developed region which is an integral part of this planning policy. In the starting phases, the planning in India followed a top-down approach, which lacked the special needs of the local areas from the plan formulation perspective. As a concept, regional planning was introduced in the later plans, particularly after the Fourth Plan. It is, therefore, necessary to understand the basic concepts of regional planning and development for acquiring a whole understanding of the special area development programme.

9. 2.1 Region

It is a geographical and a real unit that is homogenous in nature in terms of definite criteria. These are the part of the Earth's surface, which are distinguished in some defined ways from surrounding areas, which may be due to the complex of land, water, air, animals, and men and women regarded in the spatial relationships as together constituent a definite position of the Earth surface. A planning region is a segment of territory where economic decisions apply. The concept occupies an important position in the planning as it is an important tool of national development.

9. 2.2 Planning

It is a process of taking decisions to implement certain developmental decisions to attain overall socio-economic goals. It involves taking decisions further to the welfare of people who can live a sustainable, equitable, efficient, and healthy life together. There are two dimensions of planning i.e. formulation and implementation.

9. 2.3 Regional Planning

Regional planning is a technique to assess the potential of sub-national areas and to develop them to the best advantage for the whole nation. It deals with efficient land use activities and settlement structure growth. It is a specific type of planning based on the regional system by including the public action aimed at social well-being. It also implies that regional planning is concerned fundamentally with society in the context of space. The basic origin of regional planning and development stems from regional inequality and intense socio-economic developmental imperatives of particular geographic areas in particular and society as whole.

Regional planning tries to fulfill regional aspirations, demands, make optimum use of regional resources, solve regional problems, involves local people in plan formation and implementation.

9.2.4 Programmes

This is a set of related activities with certain long-term goals. In the planning process, the programmes are linked to a set of activities with a defined objective and achieve targets to attain the long-term developmental needs of the country or the state. Programmes are specific in terms of their intent, objective and long-term target. The time factor is also an important factor in the formulation and implementation of programme planning. Each programme differs in terms of structure and approach. In regional programmes generally, local people through village *panchayats*, local groups, and schools involved in environmental conservation like afforestation and maintenance cultural heritage in particular.

9.2.5 Special Area

These are areas with distinct characteristics in terms of the physical setting, geographical location, social structure, cultural setting, and economic groupings. Special areas have their own special needs and developmental requirements due to unique characteristics. Normal plans and programs can't address the development imperatives of special areas; hence, for such areas, special plans are formulated and implemented from time to time to address the challenges and issues of regional development inequalities. In special areas, the ecological condition of the region is the main criteria for formulating programmes for achieving a dynamic balance of socio-economic development through resources exploitation and utilization for the purpose of human development.

9.3 SPECIAL AREA DEVELOPMENT PROGRAMMES: POLICY AND IMPLEMENTATION

Special Area Development Programme is an important programme of planning progress of Government of India, which was started in Fourth Five Year Plan. It is a strategic plan of the special requirement to deal with problems of the variousregions due to their distinct geo-physical structure and location like mountain, desert and socially economical backward region like tribal.

Brief discussions on some of the special area development programmes are as follows:

9.3.1 Hill Area Development Programme (HADP)

The Hill Area Development Programme was introduced during Fifth Five Year Plan for designated hill areas. In India, total of 17 percent area and 11 percent of the population comes under the hilly region. From a planning point of view, the hill area is divided into two groups on the basis of the total hill area. The first category belongs to those states which are entirely hill like Jammu and Kashmir, Arunachala Pradesh, Nagaland, Sikkim, Himachal Pradesh, and Uttarakhand. This region is termed as 'Special Category States' in which emphasis is given on infrastructure development, social and community services.

Apart from this, those hilly areas, which form part of larger states where limited parts are hilly and underdevelopment termed as 'Designated Hill Areas'. Mainly:

i) Two districts of Assam – North Cachar Hills and Karbi Anglong.

ii) Eight districts of Uttarakhand – Dehradun, Pauri Garhwal, Tehri Garhwal, Chamoli, Uttarkashi, Nainital, Almora and Pithoragarh.

iii) Darjeeling district of West Bengal.

iv) Nilgiris district of Tamil Nadu.

v) 163 Talukas of Western Ghats area Covering parts of Goa, Karnataka (40 talukas), Kerala (29 talukas), Maharashtra (162 talukas) and Tamil Nadu (29 talukas).

The HADP was introduced mainly for these designated hill areas in 1974-75 to remove interstate imbalances in the level of development. It was recommended by a committee of the National Development Council (NDC). There are many characteristics of the hilly region which are responsible for the formulation of this specific development plan, like terrain of hills, socio-economic and cultural diversity, population pressure, deforestation for commercial as well as household purposes, low productive of land due to soil erosion and road expansion, shifting cultivation, overgrazing, and mono culture forestry, etc.

Primarily, the planning approach of HADP has been economic development with sustainable use of natural resources of the area covered under this programme. The HADP programme started with basic objectives of Socio-economic development of the hills and their inhabitant with ecological development and to promoting the basic life support system through infrastructural development.

Under the HADP programmes, special Central Assistance is given to designated hill areas in order to develop these ecologically fragile areas. The strategy of the programme is based on a separate sub-plan approach for all hills areas in the concerned state. The HADP cell was established to formulate the Plan and implementation of the programmes.

The approach and strategy of HADP evolving for more than four decades from beneficiary-oriented in the Fifth Five Year Plan to eco-development. Ecology was the main central point in the seventh Plan with a focus on eco-restoration, eco-preservation, and eco-development. The eighth Plan focused on the productive sector of the hill economy especially in modernizing agriculture practice and small-scale industries of household, cottage, and village levels. Again, eco-preservation and eco-restoration were conceptualized with a focus on sustainable use of bio-diversity. The main objective of the Tenth Plan was based on the need and aspirations of the local community and their active participation in the design and implementation of strategies for the conservation of bio-diversity and sustainable livelihoods. The Watershed Development approach continued in further plans and it was implemented through HADP and WGDP to preserve fragile eco-systems in a sustainable manner and based on environmentally friendly technologies.

Soil conservation, Horticulture, and Forestry are the core sector under the hills programme. The participatory approach involved NGOs, Schemes for income generation and gap-filling infrastructure schemes such as the cultivation of bamboo, medicinal plants, and agro-forestry to enable people to

earn for livelihood. The action plan of the planning strategy of HADP are as follows:

i) Development of land use plan for the forest area as well as cultivated areas.

ii) Conserve soil and water to increase the productivity of the land by using vegetative methods and changing cropping patterns.

iii) Promote non-land-based economic activities to uplift the poor people for their income generation and to ensure environmental protection.

iv) Forestry, Plantation, horticulture, poultry, apiculture, animal husbandry, village and cottage industries to encourage and explore indigenous resources for eco-development.

v) Development of biosphere reservoirs, national parks, wildlife sanctuaries' for eco-restoration and preservation.

vi) Emphasis on a small scale high-value industry such as electronics, fibre optics, furniture, carpet weaving, and drugs and pharmaceutical.

vii) Promote tourism industries.

viii) Economic upliftment of tribes in isolated locations and settlements.

ix) To evolve a comprehensive human settlement policy and discourage migration.

x) "Area-based Approach" adopted and integrated plans to be prepared for all watersheds and high priority watersheds shall be chosen for treatment.

xi) Use of scientific interventions will be encouraged i.e. application of remote sensing, etc.

xii) Promotion of Non-Conventions Energy Sources i.e. Solar, Hydro, Bio-Gas etc.

xiii) Prevent *Jhum* cultivation and rehabilitating the *Jhumias* in such plantation agriculture, making them progressively owners of the plantation estate,

xiv) To ensure people's participation in all development, involving NGOs, local people in managing societal resources at the local level.

In Ninth Five Year Plan the Special Central Assistance (SCA) available for HADP is now divided between designated hill areas under HADP and the designated talukas of Western Ghats development programme in the ratio of 60:40. The SCA is divided on the basis of area and population both giving equal weightage. In Eleventh Five Year Plan, total Rs. 211.48 crores were allocated for implementation under the HADP in the Nilgiri district. The major part of funds for core sector such as soil conservation (22.51%), welfare of SC (26.3%)/ST (11.02%, forestry (18.44%), horticulture

(11.39 %,) development of local bodies (rural 18.64% & urban bodies 24.94%) and roads sector (13.63%) were allocated. An outlay fund for Twelfth Plan was 316.80 crores for spending at the rate of 63.36 crores per year.

The strategy of implementation of HADP has changed over time. Emphasis has shifted from individual-oriented schemes towards an area-based approach. The Nilgiris has adopted the "watershed-based Plans" since "Area Based Programme" such as soil and water conservation measures can be taken up more effectively. Under this scheme, the resources information of watersheds was gathered and analysed through Remote Sensing Techniques based on which, ISRO, Bengaluru have delineated watershed boundaries of Nilgiris District and boundaries verified with the coordination of Agriculture Engineering, Horticulture and Forest Departments. The Nilgiris District is drained by major rivers like Bhavani, Moyar and Kabbini, which are the tributaries of Cauvery and Pandian. The entire district has been delineated into 75 major watersheds based on the drainage pattern. Soil conservation, Horticulture, and Forestry are the core sectors under this Programme. Besides, importance is also accorded to the welfare of the SC/ST, Human Resource Development, Development of Local Bodies, Roads, Tourism, INDCO Tea Factories, Khadi & Village Industries, and Sericulture, etc. by providing substantial funds.

The entire watershed in order of annual crop coverage and aspects are prioritized with the ten-watershed identified as High Priority Watershed. For better coordination and implementation of the schemes under various sectoral heads, the delineated watershed has been further sub-divided into Micro-Watershed, each covering an area of 300-500 Ha. The activities of the core sectors have been integrated with those of the other line Department to stabilize the ecology besides involving the local people along with NGO by adopting integrating watershed approach from the year 1995-96. 60% 0f the total funds have been allocated to identify priority watersheds on an integrated watershed basis and 40% for other than watershed works which include 15% for maintenance of assets created under HADP and 10% towards establishment costs.

In order to involve the farmers and local people in planning for their own needs, the NGO takes up Participatory Rural Appraisal meetings in which the watershed communities take part to express their views and suggest corrective measures.

9.3.2 Tribal Area Development Programme (TADP)

The number of tribal populations and their situation presents a varied picture in the country. Some areas have high Tribal concentrations like Mizoram, Lakshadweep, and Meghalaya while in other areas; the tribal form only a small portion of the total population. Tribal areas are mainly geographically hilly, forested, and dry in nature, due to this socio-economic not happened.

There are some tribal groups, which are still at the food-gathering stage, practice shifting cultivation or pursuing primitive forms of agriculture. To prevent the exploitation of tribes by other groups of society and to bring them into the mainstream, our constitution also makes provision for their socio-economic development.

Till 1976, tribal regions were far from country development and were facing various problems. After a detailed and comprehensive review, specific efforts were taken in the Fifth Five Year Plan because their needs and problem vary depending on their geographic demographic concentration. the tribal area development programme took note as an integrated programme for areas with 50 percent or more tribal concentration. The importance is given to sub-plan preparation for such areas with the aim for improving quality of life of tribes and decrease gap between the level of development from other parts of country.

Tribal area sub-plan approach: To tackle the problem of tribal communities, in the form of a tribal sub-plan, was applied for the tribal development.This sub-plan approach to tribal development has been operative in 19 States and 2 Union Territories. It covers extensive areas of Madhya Pradesh, Chhattisgarh, Orrisa, Maharashtra, Gujarat, Andhra Pradesh, Jharkhand, and Rajasthan. The tribal areas have been divided into three categories as micro (block-level), meso (sub-division/tehsil), and macro (state level). In others, wards development block was taken as the smallest unit of development in the new strategic plan. It is known as the Integrated Tribal Development Project (ITDP). Important aspects of the tribal area development programme are as follows:

i) Take-up as family-oriented programme and to increase productivity level of beneficiary family in the field, horticulture, animal husbandry, and small-scale industry, etc.

ii) To liberate trials from the exploitation of land grabbing money-lending, debt-bandage, forest-labour, etc.

iii) To improve quality of life through education and training programme.

iv) To provide infrastructural facilities in tribal areas.

Under Tribal development programmes total of 180 ITDP units are operational. It is evident from the spatial distribution of tribal area programme that Central India is mostly covered under tribal sub-plan. The funds for the sub-plan come from a state plan, central outlay from central ministries, special central assistance, and institutional finance. Central assistance funds given for tribal programme can be divided into sector-wise i.e. education, economic upliftment, and health. Various services provided to the tribal population under this programme are free education, provision for educational equipment, school, scholarship, etc. Due to this plan, many tribal

communities of India have been improving their economic, educational, social, and cultural status.

The largest number of such projects has been in Central India. Madhya Pradesh has 49, followed by Orissa (21), Assam (19), Maharashtra (16), Bihar (14), and West Bengal (12). In all, more than two-third of the total projects are in these states. During the Seventh Plan total areal coverage under ITDP comprised 15.27 percent area of the country. Major parts of the States of Manipur (90.03 percent), Sikkim (63.49 percent), and Tripura (63.8 percent) were under such projects. The other states with large areas covered include Orrisa (44.2 percent), Himachal Pradesh (43.03 percent), Madhya Pradesh (36.9 percent), and Bihar (25.1 percent).

Despite many efforts of state and central government tribal are not much benefited, due of some grass route implementation problems. It is significant to note that non-tribal is now migrating to tribal majority areas in substantial numbers. On the other hand, tribal are migrating to other areas in search of educational and employment opportunities. The tribal population may not remain in the majority for long in any administrative unit. It is, therefore, necessary to have a proactive to meet this new challenge.

There is a need to give more attention to weaknesses of tribal area programme and by strengthening that their existence and participation can be possible in main stream of the country.

9.3.3 Western *Ghat* Development Programme (WGDP)

The mountain regions or hill areas of the Himalayan region in the north and Western *Ghat* region in the south hold the sources, the catchment, and watersheds of several major river systems flow; they prosper in forests, plants, animals, and mineral wealth. They have very fertile and very sensitive eco-systems. The Western *Ghats* are a range of mountains along the west coast about 1600 km long and 80 to 100 km wide running continuously from Maharashtra to Tamil Nadu with an interruption in continuity in the Palghat district of Kerala. The Western *Ghats* form 8.82 percent of the country's mountainous area. Hilly eco-systems of Western *Ghats* are one of the richest flora and fauna and unique bio-diversity with 30 percent of the area under forest. The Western *Ghats* range is an important determinant in shaping the climate, economy, and social milieu of peninsular India. The western ghat region is a part of Tamil Nadu which spreading in 33 taluks of eight districts: Coimbatore, Tirupur, Dindigul, Theni, Madurai, Virudhunagar, Tirunelveli, and Kanyakumari. It is 20 percent of Tamil Nadu. Western Ghat Development Programme (WGDP) began in 1975-76. This programme started with concerns with economic development programmes but the focus moved towards socio-economic, infrastructure, and ecological development.

The WGDP was initiated with 100 percent central assistance and is now shared between centre and state government in a ratio of 90:10. Under this

programme 70 percent of resources are reserved for those schemes which promoting sustainable livelihoods like soil and water conservation, forestry, and infrastructural development. Watershed is adopted as a basic treatment unit for augmentation and stabilization of production, minimizing ecological degradation, reduction in regional disparity, and opening up to greater livelihood opportunities for the rural poor. From the year 2010-11, emphasis was given to the watershed approach for WGDP implementation schemes. It is an integrated approach with local participation. During the Eleventh plan, soil and water conservation measures were taken up in 166 watersheds at a cost of Rs. 101.16 crore in which Rs. 36.63 crore was spent on the soil conservation sector and Rs. 19.10 crore on the forestry sector.

Scope of Development: Western *Ghats* region offers scope for the development of forest, horticulture, animal husbandry, and improving the water availability for recharging groundwater as well as for drinking purposes. The development of Western *Ghats* will also help ecological up-gradation and conserve natural resources. It has also scope for increasing the area under the plantation crops like tea, coffee, cardamom, cocoa, rubber, pepper, etc.

Development of the Western *Ghats* Region over the Plan (WGDP) periods: During the Fifth Five Year Plan, WGDP emphasizes the economic well-being of the local population in hill areas and exploitation of the resources of the hilly region. The main activities include in the area are horticulture, plantation, afforestation, minor irrigation, animal husbandry, and tourism.The Sixth Five Year Plan mainly focuses on pilot basis infrastructural development schemes. The Seventh and Eighth Five Year Plan were based on a life support system to preserve genetic diversity to restore the ecological damage caused by human activities. During the Ninth Five Year Plan period the objectives for development schemes under WGDP were 'Development in harmony with the environment and 'Development without upsetting the fragile systems'. In the Tenth Five Year Plan, the focus was given on sustainable use of bio-diversity, recognizing the needs and aspirations of local communities. Under the programme, the main activities undertaken are soil conservation, horticulture, forestry, minor irrigation, rural roads, animal husbandry, fisheries, remote sensing, and palm products development. The main objectives of WGDP are as follows:

i) Maintain ecological balance through forest preservation and conservation which is necessary for a life support system.

ii) To preserve genetic diversity to restore the ecological damage caused by human activities.

iii) Create awareness among the people and educate them about severe consequences of ecological degradation, therefore they play active participation in eco-development.

iv) Checking soil erosion and denudation of area around rivers, lakes, marshes, reservoirs, and springs for soil and water conservation.

v) Afforestation and forestry programmes for increasing tree cover.

vi) Meeting the basic livelihood requirement like fuel, fodder, timber, and forest products like medicinal materials for the rural tribal population.

vii) Creating a people's movement at a large scale with the involvement of women.

9.3.4 Drought Prone Area Development Programme (DPADP)

A major portion of land use in India is drought-prone and falls under the arid and semi-arid categories. Arid, semi-arid, or sub-humid are the various categories to demarcate the drought-prone areas in the country. A drought is a long-term period of dry weather caused by a shortfall in the normal rainfall for a given period of time. A drought is a condition of degradation of land, depleting water resources, decreasing productivity of crops, human resources, and livestock. It is also characterized by hunger, malnutrition, out-migration of both human and cattle populations during the crisis. In India, a major portion of land mass falls under these conditions due to very scanty rainfall and extreme climatic conditions. DPAP is a special area programme for this type of region specifically designed to cater to the needs of locations affected by drought-like conditions.

Draught-prone areas were important factors for creating a regional imbalance in the country. Drought Prone Areas Programme (DPAP) was first time initiated in 1970-71 as the Rural Works Programme (RWP) to tackle the problem of drought regions. During the Fourth Five Year Plan in 1973-74, it was changed into an Area Development Programme. The main objective of programme is to optimum utilization of land, water, and livestock resources, development of posture, soil and moisture conservation, afforestation with more emphasis on social and farm forestry, livestock development and dairy development, restructuring of cropping pattern, improve the economic condition by increasing income of poor and deprived sections of the society.

The intense pressure of human and livestock population in the drought-prone areas has reduced the natural resources emphasizing the issues of soil erosion, falling water table, and depleting the vegetative cover. After the recommendation of the planning committee Commission, DPAP followed an integrated area development approach for the same.

Initially, this programme was started with 50-50 sharing of centre and state. From the implementation point of view, the programme was not very successful in the starting due to rigid guidelines and an ill-designed framework. Lack of people's participation and infrastructure facilities were main disadvantage of this programme. Since 1995-96 watershed approach is

being introduced and the implementation unit of this programme was changed to a watershed project. Local people are actively involved in the planning and development of watershed projects. The fund sharing ratio was also modified to 75:25. By some estimation, DPAP is being operated in 16 states of Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Rajasthan, Uttarakhand, Uttar Pradesh and West Bengal, 195 districts and 972 blocks has coverage of 74.6 million hectare area. Total outlay plan during Eighth Five Year Plan was Rs. 1000 crore, in which Rs. 500 crore was central share.

Every state has its own organizational setup for the implementation of DPAP. Through this programme main emphasis is on irrigation projects, land development programmes, afforestation, grassland development, rural electrification, and other programmes of infrastructural development likeroads, markets, servicing, processing, and credit, etc.

Other weaker sections of the society and women were also encouraged to contribute substantially. The community participation and role of watershed approach were made the central themes in the programme implementation. Besides, a unified approach and convergence of all developmental programmes and effective monitoring and implementation revived the DPAP.

Land development, water resources development, and afforestation and pasture development were encouraged. Opportunities for alternate occupations and economic diversification are also locked and developed under this programme.

9.3.5 Desert Development Programme (DDP)

The Desert Development Programme (DDP) was started in 1977-78 on the recommendations of the National Commission on Agriculture (1974). Deserts are extremely arid regions where rainfall occurs less than 25 cm in a year. A desert area is characterized by no or very little vegetation, extremely low rainfall, low humidity, and extreme temperature covers both types of Deserts found in India i.e. cold desert and hot desert. Cold deserts can be found in the Union Territory of Ladakh, Lahaul, and Spiti districts of Himanchal Pradesh whereas hot deserts are found in the western part of the Rajasthan, Gujrat, and Haryana. DDP is a special area programme for such locations.

The major objectives of DDP are to controlling processes of desertification, promote of opportunities to raise the level of production through various activities like irrigation, afforestation, soil and water conservation, dry land agriculture, groundwater development, livestock development, and human resources development. Develop such degraded land on the watershed basis by considering the land, people, and livelihood of the locations. It also aims to promote socio-economic development and mitigate the adverse impact of

drought-affected areas, reduce the loss of livelihood, livestock management, and restoring the ecological balance by encouraging the local community participation.

Initially, it was implemented in an isolated manner but the later watershed approach was adopted. Since 1995 is a part of the watershed development programme. Now there are 1747 watershed projects under different stages of seven states. Initially, the fund was allocated on a 75:25 basis by the centre and state but presently it is 100 percent central assistance. At least 75% of the allocations have been earmarked for activities that would contribute towards combating the process of desertification. DDP was implemented on a sectoral basis and the proportionate weights assigned in which maximum given to afforestation and posture development (40%), water resources development (20%), etc. the fund allocation is at the rate of Rs. 24 lakh per 1000 sq. km. with a ceiling of Rs. 5000 lakh per district. Though, for the cold desert area a lump sum provision for Rs.100 lakh per district for Himachal Pradesh and Rs. 150 lakh for Jammu and Kashmir.

It was also suggested for the participation of weaker sections, voluntary organization, creation of assets, and using a unified approach for effective monitoring and evaluation. DDP is being implemented in 235 blocks, 40 districts, of 7 States by covering an area of 45.8 million hectares. It includes Andhra Pradesh, Gujarat, Haryana, Karnataka, Rajasthan (all hot-desert areas), and Himachal Pradesh and Jammu and Kashmir (cold-desert areas). The watershed approach is the key to DDP implementation. The resources inventory is the most important step before implementing it as it is crucial for understanding the area-specific problems. It is being followed since 1995-96 but still, there is a long way to go as only 5 % area is targeted under DDP is the entire country. At last, this programme was initiated to control the desertification process, mitigate the affected drought-prone areas, restoring the ecological balance in the affected areas, and raising the productivity of land water livestock, and human resources. Out of the total allocated funds, at least 75% have been contributed to combating the process of desertification.

9.3.6 Border Area Development Programme (BADP)

The Border Area Development Programme was started under the Seventh Five Year Plan with the objective of balanced development of the sensitive border in the western region of the country. The total outlay was Rs. 200 crore. In this programme emphasis was given on infrastructure facilities and the promotion of a sense of security among the local people. In starting this programme covered Punjab, Rajasthan, and Gujarat states but later on extended to Jammu and Kashmir. Schemes were started in 1986-87 under the Ministry of Home Affairs. The main thrust of the programme was changed to the development of human resources, particularly school education-technical and vocational in the community development blocks adjoining the border. Programme has comprised four elements i.e. issues of photo identity cards to

the population of target areas, education, irrigation, and research studies on socio-economic development of these areas.

In the year 1990-91 and 1991-92, annual outlays were about Rs. 85 crore in both years. During the Eighth Plan, coverage extended to the Eastern region, the scope was also reviewed by which problem of the international border can take care, not for general development schemes. In the Eighth plan, Rs. 640 crore were outlaid for this programme. Later, the scope of the programme was expanded to include other socio-economic aspects such as education, health, agriculture, and other allied sectors. During the eighth five-year plan, the coverage was extended to include the Eastern States that shared a border with Bangladesh. The implementation of the BADP scheme was on a participatory and decentralized basis through the Panchayati Raj Institutions, Autonomous Councils, and local bodies. The guidelines of BADP were revised in February, 2009 and as per the revised guidelines, the BADP covers 362 border blocks, which are located along the international border and come under 96 border districts of 17 States.

9.4 LET US SUM UP

Inclusive and balanced regional development has been the basic principle of the planning policy of India.The size and diversity of India are such that ideal planning for balanced regional development is still a distant dream. Over time, inequality between regions has grown rather than diminished. The topographical bottlenecks and natural hurdles need special attention for the development of the basic amenities in some regions of the country. Development in the country has been caused variation in terms of unequal distribution of resources and adverse geo-physiography structure. Special area development programmes are directed to remove these region-specific backwardness through a more open transfer of fundsin the form of SCA and set strategic plans. Many programmes like the Hill Area Development Programme, Tribal Area Development Programme, Drought Prone Area Programme, Western Ghats Development Programme, Border Area Development Programme are in tune with the holistic development of the specific region. The involvement of the different agencies for the monitoring and assessment makes these programmes successful.

9.5 KEYWORDS

Region: It is a geographical and areal unit which is homogenous in nature in terms of definite criteria. Region as a part of earth surface, distinguished in some defined ways from surrounding areas.

Special Area: It is area with special characteristics in terms of physical setting, geographical location, social structure, cultural setting and economic groupings. Special Areas which have some special needs and required

attention to address the challenges and problems of regional development inequalities.

Regional Planning: It is a specific type of planning based on the regional system by including the public action aimed social well-being. It also implies that regional planning is concerned fundamentally with the society in the context of space. The basic genesis of regional planning and development stems from regional inequality and intense socio-economic development imperatives of particular geographical areas in particular and society as a whole.

Desert: Desert is hyper arid areas with rainfall less than 25 cm a year. A desert is characterized by no or very less vegetation, extremely low rainfall, low humidity and extreme temperature. Desert is of two types based on temperature i.e. cold desert and hot desert.

Tribal Sub-plan Approach: A planning approach used for tribal area development programme with set of activities for achieving long term goals. It is important in planning process, to attain long term developmental needs of the country or state. Programmes are specific in terms of its intent, objective and long-term target. Time factor is also an important factor in formulation and implementation of programme planning. Each program differs in terms of structure and approach.

9.6 SUGGESTED READINGS AND REFERENCES

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UNIT 10 WATERSHED MANAGEMENT PROGRAMMES

Structure

10.0 AIMS AND OBJECTIVES

After reading this Unit, you will be able to:

- define watershed;
- identify the principles of watershed management;
- know about some case studies from India; and
- talk/write knowledgeably about watershed conservation programmes.

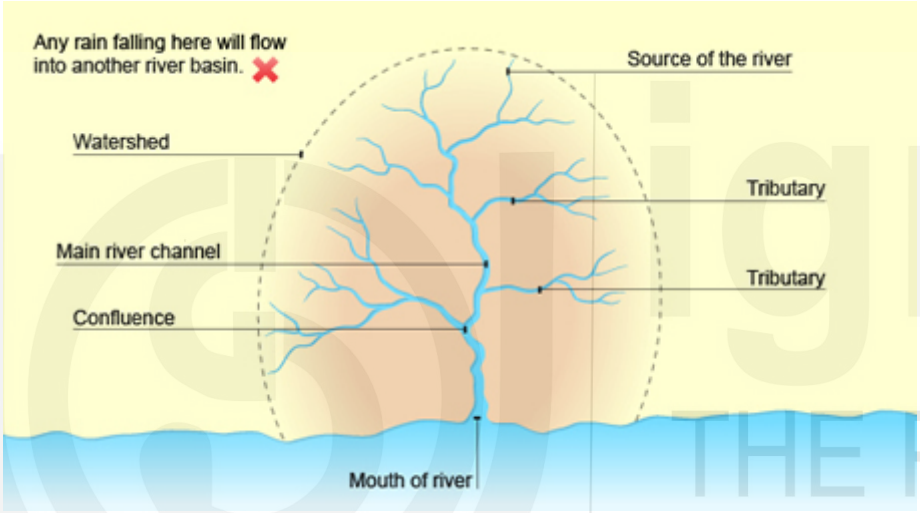
10.1 INTRODUCTION

Rapid urbanization and population growth have led to water shortages and rising water prices in many cities around the world. Scientists predict that due to the combined effects of climate change and population growth, water demand will exceed 40% of the water supply by 2030. In one of the Sustainable Development Goals (SDG), to achieve universally improved water supply and sanitation systems by 2030.

Watershed Management is an adaptive, comprehensive, integrated multi-resource management planning process that seeks to balance healthy, ecological, economic, and cultural/social conditions, within a watershed. It serves to integrate the planning of land and water.

10.2 THE CONCEPT OF WATERSHED

A Watershed is a geo-hydrological unit of an area draining to a common outlet point. It is recognized as an ideal unit for planning & developing of land water and vegetation resources. It is an area of land that feeds all the water running under it and draining off it into a body of water. Example: The place we live is a watershed which drains all the water to nearby lakes/rivers. And in turn, combining all such rivers and lakes which ultimately drain into the sea forms a watershed.



The development of catchment areas is a medium for the growth of agricultural production in rain-fed and semi-arid areas. Nearly 85 million hectares of land in the country are rain-fed. These areas were bypassed by the Green Revolution, and agricultural production has barely increased for decades. By documenting water management and improving soil and vegetation management, watershed development aims to create conditions conducive to increasing agricultural productivity while protecting natural resources.

10.3 WATERSHED MANAGEMENT

Watershed management is the process of controlling and organizing the use of land and other resources in a watershed to provide needed goods and services without adversely affecting soil and water resources. Each project under the plan achieves this goal from a micro perspective. The method is to solve under-production or under-production land and participate in related activities to benefit the landless. These plans adopt a joint multi-resource management strategy, involving all stakeholders in the basin. They work

together to determine the resource problems and concerns of the basin and formulate and implement a basin plan with environmentally friendly solutions. It is socially and economically sustainable.

Watershed management or development refers to the management and conservation of surface and groundwater resources which includes conservation, regeneration, and judicious use of all resources. Example: Even afforestation and reforestation is a measure to protect watersheds building check dams, percolation dams etc.

10.3.1 Characteristics

Activities Undertaken: The activities carried out in these plans include measures to protect soil and water, such as building dams, water structures, clearing village ponds, treating drainage pipes/canyons, leveling the land, binding farms, dealing with problematic soil, agricultural forestry, agricultural gardening, Silvi-pasture, organic farming, the use of organic fertilizers, the value-added and product sales of the farmer groups, the training and capacity building of interest groups.

Land Treatment: (a) Soil and moisture protection: land leveling, layered binding, contour binding, nutrient binding, contour planting, drainage pipe treatment, gully stabilization, gully blockage, infiltration ponds, and agricultural ponds. (b) Afforestation: Plant trees in degraded forests, Panchayat land, public land, private land, etc. (c) Pasture development: In community areas, there are suitable grass and fodder on pastures.

Production Activities

Cropping Pattern

- Introduction of suitable crops, improved crop varieties, inter-cropping, contour cultivation, and crop management practices;
- Sericulture;
- Horticulture;
- Livestock development fodder cultivation, milch cattle distribution, the establishment of milk co-operatives;
- Integration of other activities such as sheep rearing, fisheries, piggery, poultry, bee-keeping, etc.

Employment Generation Activities

- Creating more employment through land-based and productive activities;
- Raising backyard nurseries;
- Wage earning through community assets creation such as community buildings, village roads etc.
- Cottage industries based on bamboo, wood craft, cane craft etc.

10.3.2 Importance

- ✓ It recharges the groundwater table.
- ✓ Restores water for drinking and other human proposes
- ✓ Protects bio-diversity of a region, it managed properly can restore bio-diversity
- ✓ Restores soil Fertility and helps in soil conservation
- ✓ Helps fight climate change, and promotes sustainable agriculture.

10.4 OBJECTIVES OF WATERSHED DEVELOPMENT PROGRAMMES (WDPs)

The development of catchment areas aims to balance the protection, regeneration, and utilization of land and water resources in human basins. The common benefits of successful watershed development projects include increased agricultural production and improved drinking water supply. The general attributes of the watershed development method are roughly threefold. Promote rural economic development, create employment opportunities and restore ecological balance (Department of Land Resources, 2006). However, different goals include:

Environmental: For protecting vegetative cover throughout the year, to create ecological balance in the watershed area, protecting fertile topsoil, utilizing the land-based on its capabilities, in situ conservation of rainwater, increasing groundwater recharge, etc.

Economic: It draws attention for an increase in cropping intensity through inter and sequence cropping, maximizing farm income through agricultural-related activities such as dairy, poultry, sheep, and goat farming, improved and sustained livelihood status of the watershed community with special emphasis on the poor and women, etc.

Institutional: It includes the formation of watershed committees and self-help groups, establishing sustainable community organizations, etc.

Equity: To develops equitable distribution of the benefits of land and water resources development and the consequent biomass production, involvement of village communities in participatory planning, implementation, social and environmental arrangement, maintenance of assets and to operate in a more socially inclusive manner.

10.5 HISTORY OF WATERSHED DEVELOPMENT PROGRAMME IN INDIA

About 60% of India's arable land (142 million hectares) is fed by rainwater, which is characterized by low productivity, low income, low employment rate, high poverty rate, and many fragile and marginal lands. Regardless of

the total amount or distribution, the precipitation patterns in these areas are very different. This leads to water stress during the critical stages of crop production and makes agricultural production vulnerable to pre-and post-production risks. The Indian government has sponsored and implemented watershed development projects in the country since the early 1970s. Various water catchment development plans have been formulated, such as the Dry Area Plan (DPAP), Desert Development Plan (DDP), Watershed Project (RVP), National Rainwater Basin Development Project (NWDPRA), and Integrated Wasteland Development Plan (IWDP). Then the water launched in each aquatic ecological area is affected by water stress and similar drought conditions. The entire watershed development plan mainly focused on the structural methods of soil protection and rainwater harvesting in the 1980s and earlier. Despite doing all we can to protect the soil Maintenance habits (such as contour binding, excavation of foundation pits, etc.) are what farmers are accustomed to farming in the field. It has been suggested that the top-down approach to the Strait Jacket in the catchment area may not achieve the desired results, and therefore, the chaos of individual and community-based interventions is essential.

The integrated watershed development programme with a participatory approach was emphasized during the mid-1980s and in the early 1990s. This approach had focused on raising crop productivity and livelihood improvement in watersheds along with soil and water conservation measures. The Government of India appointed a committee in 1994 under the chairmanship of Prof. C.H. Hanumantha Rao. The committee thoroughly reviewed existing strategies of the watershed programme and strongly felt a need for moving away from the conventional approach of the government department to bureaucratic planning without involving local communities. The new guideline was recommended in the year 1995, which emphasized on collective action and community participation, including the participation of primary stakeholders through community-based organizations, non-governmental organizations, and Panchayati Raj Institutions (PRI). Watershed development guidelines were again revised in the year 2001 (called Hariyali guidelines) to make further simpli1cation and involvement of PRIs more meaningful in planning, implementation, and evaluation, and community empowerment and guidelines were issued in the year 2003. Subsequently, Neeranchal Committee (in the year 2005) evaluated the entire government-sponsored, NGO and donor implemented watershed development programs in India and suggested a shift in focus “away from a purely engineering and structural focus to a deeper concern with livelihood issues”. Major objectives of the watershed management programme are 1) conservation, up-gradation, and utilization of natural endowments such as land, water, plant, animal, and human resources in a harmonious and integrated manner with low-cost, simple, effective and replicable technology; 2) generation of massive employment; 3) reduction of inequalities between irrigated and rain-fed areas and poverty alleviation.

10.6 WATERSHED MANAGEMENT AND INDIA

The concept of watershed management is as old as the concept of crops under irrigated conditions, and this concept has led to the development of water tanks/reservoirs to increase production to meet the needs of a growing population. Different rulers in different regions realize and carry out their work according to the availability of funds, the needs of the people, the natural resources available in the region, etc. to meet the population and food needs. Tax beneficiaries and collect income from them. Sir Arthur Cotton submitted two reports to the British government in 1844 and 1845 after investigating the Papi Mountain to Sagaram area in the Godavari River Basin. In Dhawaleswaram in the Godavari region, a dam was built to use river water for agricultural development in the area. Early rulers have recognized the need to maintain better environment and natural resources, such as soil, water, and vegetation, and implemented them in different types of rural institutions (e.g. village officials, Gram Panchayat, rural rulers/administrators). Attempts to destroy natural resources are punished.

During the colonial period, due to the centralization of power and the absence of the democratic structure, the importance of Indian village-level administrative agencies gradually declined. This leads to greater destruction of vegetation in rural areas and environmental degradation due to soil degradation. Therefore, the Indian government and provincial governments have taken improvement measures, such as greening measures, soil protection measures, drainage water plans, etc. However, the expected results have not been consistently achieved. Therefore, in 1983-84, the Indian government launched the Watershed Development (WDP) programme to protect and use natural resources to increase productivity and improve socio-economic status. Although the plan has been in operation since 1983/84, its purpose is to assess the impact of the watershed plan in order to develop better strategies for protecting natural resources, improving and using natural resources to improve the growing population.

10.7 INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)

The Ministry of Land Resources and the Ministry of Rural Development of the Government of India run centrally sponsored Integrated Watershed Development Programme (IWDP), Drought Prone Area Programme (DPAP), and Desert Development Programme (DDP) programmes to develop waste/degraded land through watershed methods. These three plans are implemented on the basis of separate standards, funding methods, and technical components in accordance with their respective goals. DDP focuses on reforestation to prevent the growth of indifferent deserts, while DPAP focuses on non-agricultural land and drainage pipelines for in-situ soil and moisture protection, agriculture and forestry, pasture development, gardening, and alternative land use. On the other hand, IWDP has taken over

pasture development, soil and moisture protection as an outstanding activity in wastelands under state, community or private control. The common theme is the sustainable management of land and water resources. In order to achieve the integration of all regional development programmers, a new programme called the "Integrated Waterway Management Plan" (IWMP) has been launched for the integrated planning of communities, sustainable results, and rural livelihoods. The Integrated Watershed Management Plan (IWMP) covers all three regional development plans, which will be implemented by specialized agencies operating at the national, state, and regional levels.

The main features of the integrated management plan for the catchment area are 1. Decentralization of power to the states: Countries will now have the right to sanction and supervise the implementation of catchment area projects within their scope of responsibility and within the parameters specified in this Code. 2. Specialized agency: There will be a specialized executive agency, with multidisciplinary professional teams at the national, state, and regional levels to manage the watershed plan. 3. Financial assistance for special facilities: Additional financial support will be provided to strengthen district, state, and national facilities to ensure the professionalism of river basin project management 4. Duration of the program: With the expansion of the scope and expectations of this method, the duration of the project has been extended by 4 to 7 years according to the type of activity, divided into three different phases of the activity, namely the preparation phase, the work phase, and the merger phase.

Major Activities of the Watershed Project are:

- Soil & moisture conservation measures like terracing, trenching, vegetative barriers, etc.

- Planting & sowing of multi-purpose trees, shrubs, grasses, legumes, and land development
- Encouraging natural regeneration
- Promotion of agro-forestry and horticulture
- Wood substitution and fuel-wood conservation measures
- Measures needed to disseminate technology
- Training, extension, and creation of a greater degree of awareness among the participants
- Encouraging peoples' participation

10.8 ISSUES BEFORE WATERSHED MANAGEMENT

The watershed project failed to achieve sustainability because the implementing agency had no personnel involved. To make water catchment projects sustainable, a community management system is needed, which can only succeed with the contributions of farmers and their commitment to time and resources.

In many cases, it is found that stakeholders neither participate in the selection of project components nor encourage them to participate in various project activities. The entire development process of the basin involves the participation of government departments and local contractors, using a clear top-down approach, while the participation of the basin communities is very small. As a result, there is a mismatch between supply and demand, resulting in an insufficient description of local demand and watershed expectations, resulting in inefficient implementation and insufficient sustainability.

Since watershed is a land-based activity, the benefits of watershed management mainly affect farmers because the project intervention failed to provide livelihoods for landless families. The portfolio of alternate livelihood opportunities created for the beneficiaries due to intervention through watershed management could not cope with stress and shock and the primary stakeholders could not maintain those activities after the completion of the project period.

In the majority of the cases, sustainability had been causality mainly due to the absence of primary stakeholders in project planning and implementation stages.

The withdrawal mechanism has not been properly spelled out by the project implementing agencies for which local community level institutions did not come up to own the project. Due to lack of capacity and involvement of the community at the project completion stage, the assets created under the project could not be maintained with the involvement of local community which ultimately affected long run sustainability of the project.

10.9 IMPORTANT WATERSHED MANAGEMENT PROGRAMMES IN INDIA

In order to accelerate the development of wasteland/degraded land, the government established the National Wasteland Development Committee in 1985 under the leadership of the Ministry of Environment and Forestry. Later, in 1992, a separate wasteland development department was established in the Ministry of Rural Development and Poverty Reduction, and the National Wasteland Development Committee was entrusted to establish this department.

In April 1999, the Wasteland Development Department has renamed the Ministry of Land and Resources and served as the node agency for land resources management. As a result, all land development plans and land reform departments are included in this department. The Watershed Area Plan (DPAP), Desert Development Plan (DDP) and Integrated Wasteland Development Plan (IWDP) implemented by the department are watershed management plans implemented by the department.

Later, Prime Minister Krishi Sinchayee Yojana (WDC-PMKSY) merged DPAP, DDP, and IWDP into the best components of watershed development to ensure the best use of resources, sustainable results, and comprehensive planning.

Prime Minister Krishi Sinchayee Yojana (Watershed Development Component) (WDC-PMKSY)

The main objectives of the WDC-PMKSY are to restore the ecological balance by harnessing, conserving, and developing degraded natural resources such as soil, vegetative cover, and water. The outcomes are prevention of soil erosion, regeneration of natural vegetation, rainwater harvesting, and recharging of the groundwater table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area.

The salient features of WDC-PMKSY are as below:

- Setting up of Dedicated Institutions with multi-disciplinary experts at State level - State Level Nodal Agency (SLNA), District level - Watershed Cell cum Data Centre (WCDC), Project level - Project Implementing Agency (PIA), and Village level - Watershed Committee (WC).
- Cluster Approach in selection and preparation of projects: Average size of project - about 5,000 ha.
- Enhanced Cost Norms from Rs. 6000 per ha. to Rs.12,000/ha. in plains; Rs.15,000/ ha in difficult/hilly areas
- Uniform Funding pattern of 90:10 between Centre & States.

- Release of central assistance in three instalments (20%, 50% & 30%) instead of five instalments.
- Flexibility in the project period i.e. 4 to 7 years.
- Scientific planning of the projects by using IT, remote sensing techniques, GIS facilities for planning and monitoring & evaluation
- Earmarking of project funds for DPR preparation (1%), Entry point activities (4%), Capacity building (5%), Monitoring (1%), and Evaluation (1%).
- Introduction of new livelihood component with earmarking of project fund under Watershed Projects i.e. 9% of project fund for livelihoods for people having no asset and 10% for production system & micro-enterprises.
- Delegation of power of sanction of projects to States.

Neeranchal Watershed Programme

Neeranchal is a national watershed management project supported by the World Bank. Neeranchal aims to further strengthen the watershed part of PMKSY, especially all parts of PMKSY in general, and provide technical support to improve delivery capabilities. The programme is being implemented in nine participating countries-Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Telan-gana.

The main purpose of Neeranchal is to achieve the main goal of the watershed part of Pradhan Mantri Krishi Sinchayi Yojana (PMKSY), and to ensure that every farm (Har Khet Ko Pani) can get irrigation, and the effective use of water (Per Drop More Crop) solves the following problems:

- bring about institutional changes in watershed and rainfed agricultural management practices in India.
- build systems that ensure watershed programmes and rainfed irrigation management practices are better focussed, and more coordinated, and have quantifiable results.
- Device strategies for the sustainability of improved watershed. management practices in programme areas, even after the withdrawal of project support.
- Through the watershed plus approach, support improved equity, livelihoods, and incomes through forwarding linkages, on a platform of inclusiveness and local participation.

10.10 WATERSHED DEVELOPMENT APPROACH UNDER DIFFERENT SCHEMES

The watershed development works in India have been undertaken by a variety of schemes that ultimately achieve the common objectives of the watershed development programme. They are as follows.

Drought Prone Areas Programme (DPAP)

The Drought Prone Areas Programme (DPAP) was launched by the Government in 1973-74 to tackle the special problems faced by those fragile areas which are constantly affected. The programme is being implemented on Watershed basis since 1995. The responsibility of planning, executing and maintaining the Watershed Projects is entrusted to local people's organization specially instituted for the purpose. In view of the large problem area to be treated and the present level of financial allocation, the programme has to be taken up on a continuing basis for several years. The Watershed Projects taken up for these purposes have a project period of 5 years. The states covered are Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Rajasthan, Utter Pradesh and West Bengal. The expenditure on DPAP was being shared equally by the central and State Governments on 50:50 bases till 31.3.99. This funding pattern had been revised to 75:25 w.e.f. 1.4.99.

Objectives of DPAP

- To minimize the adverse effects of drought on the production of crops, livestock, the productivity of land, water, and human resources.
- To promote the overall economic development and improve the socio-economic conditions of the poor and disadvantage sections inhabiting the programme areas.
- To take up development works by watershed approach for land development, water resource development, and afforestation or pasture development.

Desert Development Programmes (DDPs)

Over the years, the increase in human and livestock population in drought-prone and desert areas has placed the natural resources of the regions under great stress. The major problems are continuous depletion of vegetative cover, increase in soil erosion, and fall in the groundwater table. All these factors account for diminishing productivity of land and loss of natural resources. The problems would have been worse but for the introduction of some highly focused specific area development programmes in such regions. As per the recommendations of the National Commission on Agriculture, mentioned in the Interim Report (1974) and the Final Report (1976) the Desert Development Programme (DDP) was started in the year 1977-78. The

programme was started both in the hot desert areas of Rajasthan, Gujarat, and Haryana, and the cold desert areas of Jammu & Kashmir and Himachal Pradesh. Since 1995-96 the coverage has been extended to few more districts in Andhra Pradesh and Karnataka. From inception till 1994-95, an area of over 5.5 lakh hectares of area was treated under the core sectors of land development, water resource development, and afforestation/pasture development. Till 31.3.99, in cold and sandy desert areas, Desert Development Programme was 100 percent centrally sponsored whereas in non-sandy areas, the expenditure was being shared by the Central and State Government in the ratio of 75:25. This funding pattern has been revised to 75:25 from 1.4.99 uniformly in all areas of the country.

National Watershed Development Project for Rainfed Areas (NWDPRA)

During the Sixth Five-year Plan the department of Agriculture and cooperation launched a pilot project for propagation of water conservation and harvesting in rain fed areas (in 19 watersheds) located in 15 states. The main objectives were water harvesting and water conservation. Besides, the Ministry of Rural Development selected 23 watersheds in drought-prone areas for soil and water conservation. In 1983-84 two World Bank aided projects were started in Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, and Garhwal region of Uttar Pradesh. These projects showed the potentials of vegetative conservation measures to support biomass production. Based on these experiences, the National Watershed Development Project for Rainfed Areas (NWDPRA) was launched during the Seventh Five-year Plan in 99 selected districts of the country. It was intended to develop a sustainable biomass production system and restore ecological balance in rain-fed areas. However, the main emphasis was on increasing crop production on arable lands. The project did not provide funds for non-arable land, as it was expected to be met from other sources. But non-availability of funds in time acted as a constraint. Therefore, during the Eighth Five-year Plan, the scheme was modified to provide single-window financing for both arable and nonarable lands. The modified scheme provides 100 Percent finance (75 Percent grant and 25 Per cent loan) to states for watershed development.

National Watershed Development Project for Rainfed Areas is being implemented in 2479 watersheds covering 350 districts spread over 25 states and 2 Union Territories. The community development blocks having less than 30 Percent of the available land under assured irrigation qualify for inclusion in the project. The area of a watershed is 500 to 1000 hectares. The project is being implemented with greater emphasis on people's participation at both planning and implementation stages. The main objectives of the modified National Watershed Development Project for Rain fed Areas are to conserve, upgrade and utilize land, water, plant, animal, and human resources in a harmonious and integrated manner, to generate massive employment during the project period and regular employment after completion of the

project, to improve production, environment, and restoration of ecological balance through scientific management of land and rainwater, using in-situ moisture conservation, a network of low cost, water harvesting structures, natural vegetative conservation measures for run-off management and for recharge of groundwater capability and to develop sustainable farming as well as livelihood systems based on the individual as well as common property resources. The Eighth Five-year plan fixed a target of only 28 lakh hectares of area to be covered under National Watershed Development Project for Rainfed Areas. But the actual area covered was as high as 42.97 lakh hectares. This is because per hectare requirement of funds under the approved projects is much less than the per hectare cost ceilings fixed. The Ninth plan further intensified the programme. Training of Implementing Agencies (TIA) at various levels is an important component of the National Watershed Development project for Rainfed Areas. But the progress has been slow in many states due to the non-availability of lands for the purpose.

10.11 WORTH MENTIONING GOVERNMENT INITIATIVES

Kuan Talab Jiao Abhiyan

The coordinated efforts of the local community and district administration have transformed the water-scarce village Jakhni of Banda district in Bundelkhand in Uttar Pradesh into a water-abundant village. Not only is water available round the year in the village, but the groundwater levels have also increased so much that hardly any deep excavation is required to get water. It is the resolve of the village residents to not let the water levels drop that makes the case study of Banda district a success story of sustainable water management. About three ago, village Jakhni was declared as a Jal Gram given abundant water availability, recharged wells and ponds, etc.

Participatory Well Recharge Programme

Mazhapolima is a community-based well recharge programme, initiated by the district administration in collaboration with the Panchayati Raj Institutions in the District. Networking NGOs/CBOs, households, departments and agencies, research institutions, private sector, and all other key stakeholders, either as water users or as water providers/planner is fundamental to the programme. It was initiated in 2009 by the Thrissur district administration in collaboration with Panchayati Raj institutions to ensure water security to households. In the first 3.5 years, around 8500 open wells were recharged across 53 Gram Panchayats, providing drinking water to approximately 40,000 people. The programme was run by a team of dedicated people headquartered at the Thrissur district office.

Pani Panchayats for Water Management

Backed by Pani Panchayats Act (2002), participatory irrigation management is flourishing in Odisha. In Sunei Medium Irrigation project of Mayurbhanj

district, the efficient coordination amongst Pani Panchayats under the supervision of the project committee coupled with adherence to rotational irrigation practice (beginning with the tail end of the command area) led to a whopping 36% increase even in a drought-like situation in 2015-16 Kharif season. The decision of the Project Committee and Pani Panchayats to restrict paddy cultivation during the Rabi season also proved to be effective in maximizing output. As of 31st May 2018, altogether 30,033 Pani Panchayats have been programmed out of which 28,105 have been formed by conducting elections. Not only does such participatory irrigation management bring equity in water distribution, improve crop productivity through collective effort and create a sense of ownership among the farmers for the irrigation infrastructure, it also integrates women into the mainstream through a provision in Pani Panchayat Act to reserve 33% women at block level. The formation of Water Users Associations in all categories of irrigation commands supplements this participatory approach.

Mission Kakatiya

Mission Kakatiya was launched by the Telangana Government in 2015 with an aim to restore all silt-filled tanks and ponds (minor irrigation sources) so that the rainwater could be harvested and used for agricultural and other purposes. The historical importance of tanks, which have been the lifeline of the region but became extinct due to pressures of urbanization and industrialization, was kept in mind while launching Mission Kakatiya. The topography and rainfall pattern in Telangana makes tank irrigation an ideal type of irrigation by storing and regulating water flow for agricultural use, particularly paddy cultivation. Before the launch of Mission Kakatiya, a census was conducted which found that there were 46531 water bodies with about 5000 chain link tanks in the State. The Mission envisaged to repair and rejuvenate 9,300 minor irrigation tanks every year through desilting, restoration of feeder channels, re-sectioning of irrigation channels, repairs to cross masonry and cross drainage structures, repairs of bunds, etc. By 2018, about 17859 water bodies were restored and around 12.47 lakh acres of command area stabilized. This resulted in increased agricultural production, showing record irrigation during the year 2016-17, irrigating an ayacut (the area served by an irrigation project) of around 16 lakhs acres through direct and indirect irrigation.

Meri Chhat Mera Pani Campaign in Chitrakoot

The district administration of Chitrakoot district resolved the water problems of the region by launching a unique campaign titled – ‘Meri Chhat Mera Pani’ – through which rainwater was harvested at the terraces of buildings. Chitrakoot district is one of the aspirational districts identified by Niti Aayog due to the acute scarcity of water resources in the region. Under the campaign, check dams were created to ensure that the rainwater met the river and groundwater were recharged using soak pits. As per an estimate, about 4,56,91,597 liters of water were saved in an area of 71393.12 square meters

by constructing rainwater harvesting structures in all administrative buildings and gram panchayats of the district.

10.12 EXTERNALLY AIDED WATERSHED DEVELOPMENT PROJECTS

Several international agencies like the World Bank, European Economic Community (EEC), German Bank for Reconstruction and Development (GBRD), Danish International Development Agency (DANIDA), Swiss Development Corporation (SDC), and Official Development Assistance (ODA) have been involved in implementing watershed development projects in India with the help of both government and non-government organizations.

10.13 LET US SUM UP

A balance between economic and environmental objectives and consideration of all interactions of the watershed system are important criteria in watershed management. This balance is necessary for countries at various stages of development. Conflicts are increasing over shared water resources between agriculture, industry, and urban domestic use as well as between State governments. Sustainable water management is thus crucial for economic development and livelihood of the people. In a country like India, where a lot of running water goes waste, it becomes very important to apply the technology of watershed management to solve its annual problems of droughts and floods.

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UNIT 11 SOCIAL FORESTRY AND JOINT FOREST MANAGEMENT

Structure

11.1 AIMS AND OBJECTIVES

After studying this Unit, you should be able to:

- critically analyse the role and extent of inter-dependence between the communities and forest resources in sustainability and conservation;
- explain the concepts of social forestry, Joint Forest Management and Village Eco-development;
- describe the programmes of the Government for the promotion of people's participation in forest management; and
- outline the performance of these programmes and the factors associated with them.

11.2 INTRODUCTION

The forests are a natural asset of great value, which, are renewable, can be productive and useful under proper management. Forests represent the largest, most complex, and self-generating of all eco-systems. Forests have a

direct and beneficial influence on various aspects like the environment, flora, fauna, and mankind. They act as buffer zones between natural and man-made eco-systems. Globally, around 25 percent of the world's population relies on forests for their livelihoods, many of whom are the poorest. Forests provide US$ 75–100 billion per year in goods and services such as clean water and healthy soils. Forests are home to 80 percent of the world's terrestrial biodiversity. Forests account for about 75 percent of the gross primary production of the Earth's biosphere and contain about 80 percent of the Earth's plant biomass. India faces a critical imbalance in its natural resources base with about 18 percent human and 15 percent livestock population of the world is supported only on 2.4 percent geographical area, 1.5 percent forestsand pasture lands, and 4.2 percent water resources. Increasing population, development programmes and accordingly the invasive use of forests has caused shrinking of forest areas and therefore increase in the pressure for forest products and services. Naturally the rural poor in the vicinity have been the worst affected lot. Managing forests increases the benefits, meets society's needs and maintains its sustainable services for the benefit of present and future generations.

The diversion of forests for various development needs also has contributed to the depletion of these resources. Conventional rural development programmes have seldom taken into consideration this situation and there have not been any specially designed rural development models for the rural areas with populations wholly dependent on the forest resources for subsistence. As a result, various programmes formulated with good intentions have often resulted in conflicting situations, especially in the context of the conservation status of natural resources like forests and wildlife. This has caused further impoverishment of the people. The maintenance of the forest resource base has always been a critical factor in the life of forest fringe communities, but it has seldom been seen as a means of rural development. Concepts of social forestry and participatory forest management have emerged as a response to these circumstances. This Unit aims at providing you an understanding of the concepts and programmes associated with *the forestry aspect* of natural resource management in a rural development environment. Also, the recent trends in the management of forest resources as applied in the social and legal framework of the empowerment scenario of rural life are introduced.

11.3 CONCEPT OF SOCIAL FORESTRY

The term social forestry coin by the West boy and which was used in the ninth commonwealth forest congress in 1968. Prasad (1985) describes social forestry as "Forestry outside the conventional forests which primarily aims at providing a continuous flow of goods and services for the benefit of people". It refers to the promotion and self-help management and use of trees and perennials to sustainably improve the livelihoods of local people, especially the poor, generally using participatory methodologies. Between the 1970s

and 1990s, almost all countries that were or remain in the developing world experienced the introduction of one kind of social forestry or another, either by their government or by non-government organizations at varying scales of implementation and incorporating a mix of practices. Social forestry is 'social' in the sense of being socially configured, that is, adaptable, dynamic, and responsive to the context and social environment.

The National Commission on Agriculture, considering the need to expand the tree resource base of the country, suggested the adoption of *social forestry* in rural are as in 1976. The Sixth Five Year Plan period (1980-85) gave a boost to the afforestation activities with the Centrally Sponsored "Social Forestry including Rural Fuel Wood Plantations" scheme. A series of social forestry projects followed with the support of international agencies including the World Bank, SIDA, DANIDA, US AID, and others.

11.4 OBJECTIVES OF SOCIAL FORESTRY

Social forestry projects aimed at taking the pressure away from the forests by afforestation of all the unused and fallow lands including village common lands, the Government wasteland and Panchayat lands. Planting of trees in and around agricultural fields, along railway lines, roadsides, river and canal banks were carried out to meet the growing demand for timber, fuel wood, fodder, etc., thereby reducing the pressure on the traditional forest area. It was also considered as a means of putting to the optimum use the fallow and degraded lands. Community Development schemes like NREP and RLEGP too had the components of social forestry, but the implementation through the Government establishment was aimed at planting trees as mentioned above. People's participation was envisaged through awareness creation through campaigns and extension services.

In 1976, the commission also highlighted certain aims about social forestry based on the needs of people lives and conditions, as under:

1) Arranging employment to increase family income will eradicate poverty in society.

2) To develop the forest-based industries like a collage.

3) To form the rural youth into the well verse for organise to achieve their destiny.

4) To indoctrinate the value of village-level self-sufficiency and self-management in the production as well as distribution of forest products with social justice.

5) To protect agriculture from natural calamity.

6) To solve the food problem of the rural area to a great extent. Certain edible fruits like cashew, mango, coconut, and palms have high nutritional value and grow under the social forestry programmes.

11.5 TYPES OF SOCIAL FORESTRY

Social forestry activities may be categorized into three groups: farm forestry, agro-forestry and community and extension forestry.

11.5.1 Farm Forestry

Farm forestry incorporates commercial tree growing into farming systems and includes plantations and native forests on farms. By careful planning and location in the landscape, farm forestry can:

- simultaneously address multiple NRM issues, making it a cost-effective public investment.
- provide landholders with an alternative source of income from wood and non-wood products.
- improve agricultural production by providing shelter for livestock and crops.

Individual farmers are encouraged to plant trees in their own farmlands to meet the market requirements of wood products. In five of the states viz. Gujarat, Andhra Pradesh, Rajasthan, Odisha, and Karnataka, tree growing co-operative has been developed on the line of An and cooperative pattern. The village wastelands are taken on a long lease and trees and fodder crops are planted by the members of cooperatives. Farm forestry co-operatives aim at establishing integrated farming systems including agro forestry and animal husbandry livestock, poultry, piggery, etc., the main objectives of these co-operatives are to develop farm forestry on a large scale on wastelands to bring ecological balance and to conserve soil and moisture.

Forest departments, as well as industries, promoted forestry as a diversification option to conventional agriculture in suitable farmlands. In the initial stages, planting material was made available by the state forest departments. Subsequently, industries established buy-back agreements with *tree growers,* and financial institutions also facilitated investments. These systems developed in the states like Punjab, Haryana, Gujarat, Karnataka, Uttar Pradesh, parts of Himachal Pradesh, etc. Now industries have their nursery development programmes and quality seedlings are provided to the farmers with whom they have buy-back arrangements.

The acceptance of farm forestry was not uniform throughout the country. The difference between these regions manifests itself in the number of farmers involved in tree plantation, total trees planted, survival rate, and the place and purpose of planting. For instance, in subsistence areas, trees were mainly grown for household use and to complement or supplement food crops. Consequently, a majority of the trees were planted on homesteads or farm bunds. In some subsistence areas, the government subsidies offered rather than the returns from the tree produce were the main motivation for planting them.

The programme experienced a setback in the wake of smaller holdings coming to the fore and difficulties of the industries to organize these arrangements with smaller farmers and also the relaxed import of pulp. A relatively longer gestation period, demand-driven market, and emphasis on exotics and monoculture also contributed to the slow progress of the programme. However, economic considerations ensured that the system survived in the private sector and is still prevalent in many parts of the country.

11.5.2 Agro-Forestry

Agro-forestry is the system of land use that combines the growing of forest trees along with agricultural crops. The farmlands are used for crops and trees are grown along the margins for various needs of the farmers. In fact, most farmers in India grow crops, rear animals, and plant certain trees on their land, often on the boundary areas. The growing of trees helps in conserving soil, enhancing soil fertility, and providing shelter belts for crops and fruit trees, apart from wood and other produce.

The commonly used definition of agroforestry is "Agro-forestry is a collective name for land-use system in which woody perennials (tree, shrubs etc.) are grown in association with herbaceous plants (crops, pastures) or livestock, in spatial arrangement, a rotation or both; there are usually both ecological and economic interactions between the trees and other components of the system". Recognizing agro-forestry as a viable venture, many business corporations, limited companies such as ITC, WIMCO, West Coast Paper Mills Ltd., Hindustan Paper Mills Ltd., and other institutions initiated agro-forestry research with emphasis on production of improved planting material of the fast-growing species with an objective to meet the demand of wood-based industries.

The agro-forestry programmes in India were started in the late 1970s as a component of social forestry programmes. The Government promoted agro-forestry systems that included fast-growing species like eucalyptus, poplar, sub label, siris, etc. These systems though still prevalent in some areas, have not become very popular because of the market situation, which led to the slump in farm-forestry systems. In the Tenth FiveYear Plan, it is proposed to popularize agro-forestry as a strategy to increase the green cover of the country in areas outside the government forests.

India launched the National Agro-forestry Policy in 2014 and became the first country in the world to have a National Agro-forestry Policy. The policy is not only seen as crucial to India's ambitious goal of achieving 33 percent tree cover but also to mitigate GHG emissions from the agriculture sector. After launching the NAP in 2014, considerable progress has been made in terms of putting it into practice. Department of Agriculture Cooperation and Farmers Welfare (DAC and FW) under the Ministry of Agriculture and Farmers Welfare (MOA and FW) is also playing a significant role in the

promotion of agro-forestry. It has taken a policy decision to include trees in all its programmes, and this will significantly increase tree-planting on farms, especially under schemes funded by the National Mission on Sustainable Agriculture (NMSA). This has so far approved the funding for 80,000 ha of new agro-forestry projects (pers. comm.). Efforts are on to issue guidelines on the production.

11.5.3 Community Forestry

Community forestry is a collective name of a variety of forestry management strategies, which gives attention to the participation of local communities in forest and tree resources management and their use in meeting their daily needs for food, fodder, timber, employment, income, and environment. It is a form of social forestry that helps to promote well-informed decisions as the decision-makers are familiar with the forest and land base in question as well as the concerns and goals of the local population (FAO, 1978). Community forestry entails the empowerment of the local people to take part in the management of natural biological diversity. Forests constitute a major natural resource in the tropics and subtropics on which a large number of people depend for their survival.

In India under the programme efforts have been made in raising trees on community land and not on private land as in farm forestry. All these programmes aim at creating tree resources for the entire community and not for any individual. The government takes the responsibility of providing seedlings, fertilizers, etc., but the community has to take the responsibility of protecting the trees. Some communities have managed the plantations sensibly and in a sustainable manner and the public continues to benefit.

Planting of trees on the sides of roads, canals, and railways, along with planting on wastelands came to be known as ‘extension forestry’, as it increases the domain of forests. Planting of trees in vacant lands in urban areas, mainly along roadsides for beautification and for reducing noise and dust levels, came to be known as ‘urban forestry’. Developing beautiful landscapes for recreation like picnics, jogging, relaxation, education, etc. have been named ‘recreation forestry’. Under this system, wood lots have been created in village common lands, government wastelands, panchayat lands, and urban areas.

11.6 SOCIAL FORESTRY PROGRAMME: AN EVALUATION

Forestry activities since independence fall into three distinct phases. They are as follows. The first phase was the initial *van mahotsava* movement which fails to gain momentum. The second phase was when farm-forestry was promoted in some of the States in the Seventies. The third phase has been the large scale Social Forestry activities started during the Eighties with massive aid programmes. In the developing countries, some of the International

Development Institutions like the World Bank and the Developed Nations, and the Bilateral Countries have been extending financial aid particularly for the development of natural vegetation.

It is pertinent to state that the development of vegetation through Social Forestry Programmes has been given due importance in all the Five-Year Plans of India. In this regard, the main emphasis of the Five-Year Plans is not only to accelerate the speed of the development of forestry but also to create fresh awareness among the rural poor for popularisation of these programmes as well as the expansion of forestry to protect the environment. After 2000 Social forestry activities are expected to be carried out in a comprehensive manner in conjunction with other related activities such as soil conservation, rain-water harvesting, minor irrigation work, suitable treatment wastelands, and afforestation. With the introduction of this scheme, the government is formally encouraging rural participation in the management of natural resources. In order to achieve these new objectives of social forestry, various schemes have been implemented that include: Plan plantation activities under - Integrated Watershed Development Projects, Western Ghat Development Programme, Drought Prone Area Programme, Employment Guarantee Scheme, etc. Non-plan activities such as Kisan Ropwatika Yojana (Plant Nursery by a farmer), Van Mahotsav (First Week of July is celebrated for protecting forests), and development of Central Nursery. After 2001 SFD was given the responsibility to implement watershed development projects under 'Hariyali' in some watersheds. In this project, there was the involvement of villagers in the planning, implementation, and monitoring of the project.

Most social forestry projects, however, came under increasing criticism because they failed to adequately involve the local communities and the rural poor, the main beneficiaries. Instead, these projects catered mainly to urban and commercial interests through the widespread promotion of fast-growing tree species for pulp and paper manufacture, rayon production, urban fuelwood supply, and other commercial uses. On the management front, the main drawbacks included greater emphasis on silviculture, lack of the required extension work, involvement of people and Panchayati Raj Institutions, commensurate modifications in the forest regulations to motivate people to grow trees, and that of orientation for the grassroots functionaries towards the needs of social forestry. Many socioeconomic issues of vital importance such as socio-cultural and economic structures of a village community, which were overlooked during the planning process, later became constraints or limiting factors to the successful implementation of community development projects.

11.7 JOINT FOREST MANAGEMENT

Indian forests cover about 633,400 sq km, or almost one-fifth of the national land area. However, about 42 percent of this is patchy or degraded. All forest land is state-owned, apart from small areas which are community- or

privately-owned. About 200 million of India's population of around one billion are partially or wholly dependent on forest resources for their livelihoods. There are strong co-relations between the locations of tribal people, high-poverty areas, and forests. Pressure from forest-dependent people causes much forest degradation. However, the overall process of degradation occurs through a series of human interventions, with multiple actors, including the forest industry, involved in disturbing the same area of forest at different points in time. With the forest policy of 1988, a radical shift occurred, with conservation becoming a priority, along with an emphasis on meeting the subsistence requirements of forest-dependent people. Joint Forest Management (JFM) subsequently emerged – requiring forests to be protected and managed through partnerships between forest departments and communities. Over the last twelve years, these groups have jostled for positions of influence, attempting variously to fulfill or subvert implementation of the pro-poor forest policy. India has some 200,000 forests infringe villages having a population of over 75 million people. India's forest supports some 270 million cattle, grazing of whom affects 78 percent of forest cover.

India has a long history of local community involvement in managing the forests. It was in this context Joint Forest Management was initiated as a major departure from the traditional approach to the management of the forest. It is a partnership arrangement between the forest department (the legal owner) and the local communities. Through an arrangement, the local communities assume the responsibility to protect and manage the forests and in return for this, they are given access to the products and share of the income from the area.

11.8 BASIS OF JOINT FOREST MANAGEMENT

JFM derives its grounding from the National Forest Policy 1988. Which besides the basic conservation, aims for massive afforestation and social forestry management, and meeting the requirements of the fuelwood, fodder, minor forest produce, and small timber of the rural and tribal population. The objectives of National Forest Policy, 1988 clearly point out the need or a community-based local forest management approach specially to meet the other objectives of the local subsistence needs, expanding forest cover, environment, and forest product. Also, this policy recognizes the intrinsic relationship of the tribal people with the forest and, entrusted tasks to all the agencies responsible for the forest management, including forest development corporations that they should be associate the tribals, people, closely in the protection, regeneration, and development of forest as well as to provide gainful employment to the people living in and around the forest. Subsequent guidelines for JFM were released by the Ministry of Environment, Forest and climate change in June 1990, February 2000, and December 2002. The main highlights of these guidelines are:

A) Legal backup to the JFM committee by registration, uniformity in names, expansion of membership, and MoU between the state government and JFM Committees.

B) To promote the participation of women by including them at different levels of the governing body.

C) Extending the reach of JFM to the good forest areas also alongwith degraded forest areas.

D) Guidance for micro-level planning and guidance for conflict resolution.

E) A better relationship with the Panchayati raj institutions, and

F) Capacity building for Non-Timber Forest Products especially in good forest areas.

11.9 JOINT FOREST MANAGEMENT COMMITTEE/ECO-DEVELOPMENT COMMITTEE

Joint Forest Management Committee (JFMC) is a democratic, decentralized, and transparent local institution of forest and forest fringe dwelling communities, that is part of the Gram Sabha fully or partially and set up as per the provisions of applicable JFM rules/guidelines of the state. Typically, there is one JFMC in one revenue village. However, in special situations, e.g., a historical collaboration between neighbouring villages, or where it doesn't make sense to divide the forest, a JFMC may cover two or more villages. On the other hand, especially in tribal areas, there may be situations where one village may have several dispersed hamlets, JFMCs may be set up at sub-revenue village or hamlet level Structures and nomenclatures of JFMC have varied from State to State.

An Eco-Development Committee (EDC) is similar to JFMCs but meant for villages in Protected Areas and their buffer zones. Their setup, working, role, responsibilities, powers, funds, etc. are as per the state-level orders. Their area of operation is restricted to protected areas, and forest and non-forest areas near protected areas. EDCs are set up with twin objectives – to protect wildlife and other biodiversity, and also undertake eco-development activities in the villages.

The base of the JFM structure, which comprises village-level institutions, is referred to as "forest protection committees". These bodies include a "General Body" and a "core", "Executive" or "Management Committee (MC)" elected by the General Body for discharging the assigned functions. The General Body comprises eligible members of the village. The eligibility criteria for membership vary from State to State. In most states, adults are eligible for joining the General Body. The General Body elects the local community representatives in the Executive Committee. The Executive

Committee has elected members ranging in numbers from 5 to 15. It also includes ex-officio, non-elected members drawn from the Forest Departments, local NGOs, village schools, village administrative and development officers, and in some cases representatives of the Gram or Mandal Panchayats. The States of Bihar, Himachal Pradesh, Karnataka, Jammu and Kashmir, Kerala, Madhya Pradesh, and Punjab give representation for underprivileged communities and castes and women in the executive committee. The term of the Executive Committee is generally for two years in most of the States. However, in Arunachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Tripura, and West Bengal, the tenure is one year. In Karnataka, Nagaland, and Tamil Nadu, the tenure of the Executive Committee is five years. The Executive Committee undertakes decision-making, planning, and implementation of management plans. By the year 2000, JFM had embraced an area of 102,500 sq. km., which accounted for 39.22 percent of the open forest area of 261,310 sq. km. in India. FPCs in the country numbered 36,130. By March 01, 2002, JFM had covered 140,953.6 sq. km. spread over 63,618 FPCs in 27States

11.10 FINANCIAL SUPPORT

Availability of finance is a critical issue for the success of the JFM system. In the early 1990s there was significant support from several international agencies. According to Ravindranath et. Al. (2000) JF has been particularly successful in states which have received external assistance from the forestry projects. The States of Karnataka, Maharashtra, Madhya Pradesh, Haryana, Himachal Pradesh, Andhra Pradesh, and West Bengal have received external assistance, which the authors attribute as the reason for the States bringing in a higher percentage of open forests under JFM. However, there are problems in assuming that JFM has worked well in all States that have benefited from externally aided projects. The States of Kerala and Maharashtra, which have benefited from externally aided projects, have not really performed well in terms of the multiple criteria for evaluating JFM success. 5 While Maharashtra has done well in terms of coverage, the structuring of FPCs in this State has not been in accordance with the objective of empowering communities. Similarly, the State of Kerala, despite having the benefit of World Bank assisted Social Forestry Project, has not extended the JFM concept beyond “pilot zones”

Besides financial resources have been channelized from the central and state governments especially under the scheme of the integrated watershed development programme, national rural employment guarantee programmes. Also, an increasingly substantial amount has been channelized for forestry development to FDAs and JFMCs to implement the programme like National Afforestation Programme, Green India Mission.

11.11 PANCHAYATI RAJ INSTITUTIONS AND JOINT FOREST MANAGEMENT COMMITTEE

The Panchayati Raj System in India envisages a 'democratic decentralization process in which people at the grass-root level can formulate their course of governance in tune with their general and specific interests. Among the 29 subjects, which have been transferred to the PRIs through the 73rd amendment lies the social forestry, minor form produces, fodder, and fuel. It shows that local stakeholders have a direct say in the policy formulation and management of the flora and fauna of the nearby areas. The new forest policy of 1988, marks a significant departure from the earlier stand of maintaining forest a state affair, to the involvement of communities in maintenance, management, and restoration at the grass-root level. Similarly, Panchayat (Extension to the Scheduled Areas) Act 1996 extended PRIs to the tribal-dominated districts of the different states and in tune with the NFM, it enables them to assume control over their own destiny to preserve and conserve their traditional rights over natural resources.

Gram Panchayats have knowledge about Panchayat's jurisdiction and laws. Therefore, they can help in establishing cordial relations between Panchayat & JFMC. Besides, they have the right to vote as they are a number of JFMC as well as elected representatives of the areas with the backing of the entire community. In case villagers elect the Gram Panchayat Sarpanch or Panch as JFMC president/ vice-president/ treasurer, any other member of the gram panchayat shall be selected as the ex-officio member.

Sometimes, confusion persists over the management of the forest produce especially the right over the Minor Forest Produce (MFP). The ownership of MFP with the PRIs has been accepted only to the extent of making only residual profits of state forest corporation/ federation cooperatives valuable to them. Therefore, the state forest is kept beyond the domain of PRIs, the option of appropriation of MFP by the communities in the JFMCs is available under the JFM regime for the state forest while MFP from the community forest such other forest areas will be at the disposal of PRIs. In the guidelines issued by the Government of India on JFM, it is suggested that the benefit accrued from the non-timber forest produce (NTFP) sales should be shared with all the members of the Gram Sabha including the JFM committee Panchayats & State Forest Corporation have been advised to assist the JFMs for developing skills for handling the NTFP collection, storage, and marketing. In some states, like Madhya Pradesh, the representative of Gram Sabha has been made a number of the executive committee of the JFMC as a measure of conflict resolution. The micro-planning and major decisions are taken in general meetings, there are few chances of conflicts. However, relations between JFMC and PRIs vary from state to state and it is essential to bring harmony between these institutions to avoid any conflicting situation.

11.12 PARTICIPATION OF WOMEN IN THE JFM PROGRAMME

The guidelines called for 50 % of the JFMC general body members to be women and also require 50 % of the women members to be present for a general body meeting. Further, the guidelines also laid down that the management committee or the executive committee should have 33 % of their membership from women general body members. The quorum for holding meetings of the committees should be one-third of women executive members or a minimum of one, whichever is more. Further one of the office bearers of the MC had to be a woman. Similarly, there have been major failures when it comes to efficiency in the distribution of produce. While the distribution of produce has been effective in cases from West Bengal.

The original JFM guidelines issued in June 1990 were "indicative"in nature and served to underline the desirability of a shift in the system of governance of forests in the country. It outlined the need for a participatory approach towards the management of degraded forests by providing suitable incentives to local communities. However, the guidelines did not specify the structure and nature of local bodies that were to be constituted for the purpose. The generality of the circular was exploited by State Governments, most of which accorded primacy to 'conservation', over the livelihood needs of local communities.

11.13 JOINT FOREST MANAGEMENT: AN ASSESSMENT

It is very difficult to judge the success of any scheme as it always carries the mix bag experiences, and Joint Forest management is no exception. The outcome of JFM has been extremely varied considering the enormous diversity in the social, political, economic, and institutional environment. Several studies suggest that JFM had a positive impact on the condition of forests. JFM has enhanced the income-earning opportunities –especially from the collection of non-wood forest products, sale of timber, and wages for various ongoing activities. witnessed an improvement in Afforestation and reforestation. In many states, JFM has broadened its intervention to improve the overall development of the villages, especially through investing in schools, healthcare centres, improving irrigation, agriculture development, etc.

The JFM process in India has suffered from key difficulties and constraints, which have hampered its efficiency in terms of planning, technology adoption, and execution. While case studies from West Bengal denote the successful effort of Forest Protection Committees in micro-planning and technology adoption and practice particularly in relation to natural regeneration, there have been instances where technologies relying on non-mechanical measures have not succeeded due to implementation problems. In

the Uttar Kannada District of Karnataka, studies have indicated that the economic efficiency of biomass produced from plantations under JFM has not been cost-effective as compared to regular Forest Department plantations, although it must be conceded that the methodology of carrying out the cost-benefit analysis was different. The effectiveness dimension of JFM programs has had mixed results, judging by the effects JFM had in improving the regeneration of forests and the standards of living of local communities. In Jammu and Kashmir, West Bengal, Bilaspur, and Hoshangabad areas of Madhya Pradesh regeneration of forests have been reported with positive effects. Sustainable harvesting of NTFPs by local communities is also reported for these areas. However, in South-West Bengal some FPCs experienced failure in conserving forests due to FDs not honouring their agreed commitment of sharing the benefits.

To conclude, the JFM process in India needs to be appreciated and analysed from a wider philosophical perspective that partakes of the issue of changing property rights over forest resources entailed by the process. Such a perspective can provide a better appreciation of the changing policy intent of the Central Government noticed since the National Forest Policy of 1988 and the circular of June 1990. In the case of JFM, the changes in guidelines noted in 2000 and 2002, serve to indicate the growing efforts on the part of the Central Government to fashion JFM as a property right restructuring measure. In India, with forests coming under the concurrent list of the Constitution in 1976, the *de facto* role of the Union Government in forest legislation has significantly increased. Though the Central Government has been exercising persuasive powers to convince State Governments to launch JFM in the true spirit of the National Forest Policy, 1988, there have also been efforts to wield the 'stick' by way of directly channelling financial resources to FPCs.

11.14 LET US SUM UP

With the growing demand, land-use change, and due to anthropogenic pressure globally, forest cover is shrinking rapidly, which brought to the necessity of decentralization and devolution of the governance process. Decentralization and participatory governance have increasingly been advocated especially in the context of natural resource management. Social forestry and Joint forest management are such broader contrive, with some local sub-manifestation, which aspire for restricting growing bio-diversity loss at the same time creating alternative livelihood options for the forest-dependent and communities. Both the mechanism focuses on the relationship among structures, processes, traditions, and institutions which determine how participation occurs, who makes key decisions, how authoritative power is transferred and exercised, and how the responsibilities and benefits are distributed among stakeholders. Social forestry and joint forest management need government support in various forms, including providing a legal basis and technical assistance to ensure community members' communal rights on

forest produce. This unit pointed to the vision and mission of both the programme, their institutional arrangement, which is gradually taking shape in the protection and management of the forest resources in India, and challenges faced in this regard.

11.15 Keywords

Agro-forestry: It involves growing trees in a way to provide the landowners with forest and agricultural products on a commercial basis. The purpose is to have positive interactions between the two systems of forestry and agriculture.

Van Mahotsav: it is an annual celebration of the plantation of trees in India. As it is celebrated in the first week of July, it coincides with the monsoon season.

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UNIT 12 SCIENCE AND TECHNOLOGY FOR RURAL DEVELOPMENT

Structure

12.0 AIMS AND OBJECTIVES

This Unit, will help you to understand:

- the importance of science & technology in the development of rural areas;
- description of the technology, awareness of technology & most importantly application of science & technology for rural development;
- identification of technological deficit area which requires the implementation of science & technology for rural development;
- description of programme launched for the involvement of science & technology in rural development; and
- to evaluate the utilization of major factors and role of spatial technologies in rural development.

12.1 INTRODUCTION

The application of science and technology for the development of rural areas is important in developing countries like India. Rural areas have experienced great improvements in various sectors such as livelihood, education, healthcare, small-scale industries, agriculture, housing, information technology, women empowerment, and especially in job opportunities. These developments are the eventual outcome of utilizing science and its innovative techniques. People of Rural areas are aware of the benefits of advanced

techniques. It is evident that the people of rural areas are involved in agriculture, a sector that is of late, being developed by employment advanced science and technology. The use of advanced technology has changed the overall picture of agriculture and the scenario of its productivity. Utilization, conservation, and enhancement of natural as well as human resources are essential for sustainable rural development. the continuous advancement in technology has created several modes of communication and information, which have definitely had a positive impact on society. The advancement of science and technology has an impact on the local values and norms. Rural areas have traditional beliefs and superstitions and it is not easy to replace them with new techniques and advanced methods. It is necessary to consider science and technology policies for rural development which are designed for the effective implementation of advanced techniques for the purpose of rural development.

This Unit will cover different aspects of the implementation of science and technologies for rural development, the significance, role & contribution of these advanced technologies, which are important for shaping rural societies in recent times.

There are several objectives of rural development which include improvement of living conditions of the people by providing them basic resources like food, shelter, employment, and education, elimination of poverty from rural areas, enhancing the overall productivity of the rural area, involving the local population in the decision-making process and hence in planning and development, ensuring justice and equal opportunities to the rural people, spreading awareness among rural people about the advanced techniques by means of agricultural advancement extension programs and training and to educate young fellows about the advanced techniques. All these objectives can be met only by understanding the vital importance of science & technology for rural development.

12.1.1 Science and Technology for Rural Development: An Indian Context

In India, after independence, the first three decades passed through extremely less economic growth which is about only 3%. But at the same time, there was an increase in the infrastructural positions for science and technologies. These scenarios got changed over time and particularly during the early 21stcentury, developments, improvements, and the introduction of innovative techniques took place. Science and Technology experienced improvements in its implications but not in the same proportion as business and industries. Science and Technology started making their appearance in most of the sectors and also started strengthening people with its system by reducing the problems. Most of the people, who utilized the services of science and technology raised their income, especially through the IT sector.

In the Indian context, science and technology are the major factors through which most of the development has taken place. These factors are also very significant for the overall development of rural India. The significance of science and technology should be realized and implemented for the better growth of various sectors in rural India such as agriculture, small-scale industries, houses & dwellings, buildings, medical facilities, education system, etc. Improvements and developments which are still under development for a long time may be brought forward by utilizing the services of science and technology. Techniques associated with science and technology are not only transforming Indian society but also enabling locals to think differently. These advanced techniques provide enormous scope for the development of rural areas. The government over time also made some policies that helped in the development of society mainly through science and technologies by focusing on the department of science and technology, bio-technology, non-conventional energy sources, ocean development, scientific and industrial research, and space. Water bodies and lakes are always present nearby in rural areas. These resources need proper care and protection. Proper utilization and implementation of these resources are vital for rural India. Science and technology are providing a different approach to manage these resources in a systematic and efficient manner. Now it is totally on the people of rural area to use and bring in their habit the use of these advanced techniques.

People of rural areas are required to explore the implications of advanced technologies basically for socio-economic things. They have to analyse the impact of these techniques on rural society & identify the evolving opportunities. The rapid and effective growth of advanced technologies which includes, the internet is also creating awareness among people about the potential of these techniques for rural societies and their overall development. In India, a vast difference lies between an urban and rural society which needs to be bridged for the better development of rural areas. Most of the rural areas started bridging this gap by introducing the implementation of advanced technologies like IT, GIS, GPS & remote sensing for the various aspect of rural development and its planning. These advanced technologies can also be used to overcome environmental issues such as pollution, groundwater depletion & surface water crisis. These advanced techniques always provide powerful tools for the evaluation of environmental issues and their precise solution.

12.1.2 Significance of Science and Technology

Science and technology, in most cases, have brought a significant positive change in rural areas. Its significance in influencing society is always high just because this has a record of bringing development in the lifestyle, health conditions, income generation & enhancement of productivity in the lives of the people. Science and Technology have been treated as the most important factor for the solution of most of the severe problems existing in the rural

areas even in the past. These techniques are always providing various stretched tools to deal with present-day problems. The present scenario witnessed a great use of these advanced techniques to enhance the quality of agriculture. Not only agriculture but other aspects of rural areas are also utilizing the benefits of these techniques to enhance productivity.

Poverty has been always a major problem for most of rural areas. In order to eliminate this huge problem from rural areas continuous effort is needed for the welfare of rural people by implementing schemes using science and technology. Proper utilization of technological methods will certainly prove to be a wise decision to reduce the level of poverty in rural areas. The gradually rural population will have a better standard of living, health facility, education facility, source of energy & clean and pure water.

Environmental issues like water pollution, air pollution, climate change, ozone depletion, land degradation, and desertification will have an adverse effect on the income of poor people who are dependent upon the environment for their livelihood. Science and technology enable us to identify these issues and providing us the scope to achieve the sustainable goal. There are synergistic opportunities to develop more effective response options to these environmental issues that enhance benefits, reduce cost, and more sustainably meet human needs. Environmental policies are required to integrate with development policies to achieve better success.

Science and technological factors are important for the economic growth of any country. In the case of developed countries, growth has taken place after the industrial revolution. These countries were rich from the past and they have quite good access to advanced techniques which made them efficient also. These countries have understood the importance of these new techniques and they have implemented this in the earlier phase of development. This is the main reason behind the rural development of developed countries which makes them different from developing countries. The human development index of developed countries is always higher than developing countries like India. Research and development in both developed and developing countries are always enhanced to reach a certain level of development. Whereas when it comes to the source of income then one must say that the employment opportunities for rural people from any means are very important for their income. These new techniques have helped rural people to have some kind of employment which will increase their income and enable them to feed themselves and their family also. Science and technology have contributed to the generation of employment opportunities which is not limited to agriculture but also in other areas such as industries, offices & education institutes.

12.2 SCIENCE & TECHNOLOGY: POLICIES AND PROGRAMMES

The development of rural areas is determined by the efficient & scientific assessment, conservation and optimum utilization of rural resources, use of science and technology for planning and decision making. The agriculture sector has experienced a boom in productivity by integrating with all the advancements in agriculture technology. These include high yielding and disease resistant seeds, fertilizers, pesticides, better and efficient irrigation and drainage equipment, crop rotation, storage & marketing. Various policies and programmes have been launched in recent times for proper integration of science & technology and rural development.

Out of various programmes some of the important ones are listed below:

a) It basically includes Science and Technology Applications for Rural Development (STARD).

b) Science and Technology Applications for the Weaker Sections (STAWS).

c) Science and Technology for Women (STW).

d) Science and technology for practical and strategic needs of SC Population.

e) Empowering tribal groups through science and technologies.

f) Scheme for young scientists.

a) **STARD:** STARD aims to facilitate the development of science and technologies based field groups and other innovative technologies related to rural development. This programme is unique to support some of the selected voluntary agencies with different innovative works for the development and application of technologies in rural areas.

Objectives of STARD

i) To strengthen the existing institutions, field groups involved in various research and development, design, adaption, and application of innovative science and technology for rural development by providing support for the core team.

ii) To capitalize research, development, and adaption of technology by giving time-bound support to development efforts mainly for rural areas.

iii) To motivate the science and technology fraternity for finding a solution to the main problems existing in the rural areas.

iv) To take up all the above activities which are conducive to the attainment of its objectives.

b) STAWS: STAWS aims to the development of an economically weaker section of rural and urban areas. It focuses on science and technological input which is necessary for the improvement of poor people, landless labours. Emphasis is on the multi-sectoral approach which uses original ideas by incorporating locally available resources which will give eventual benefits to rural people.

Objectives of STAWS

i) To promote research and development and adaption of science and technology for improving quality of life of economic weaker section.

ii) To motivate scientists and other people to eliminate the economic problems from rural areas by applying their technological knowledge.

c) Science and Technology for women: The science and technology for women scheme was launched to empowering women through inputs of science and technology to strengthen their position in our society. Women in rural areas are technologically weaker from the initial days of independence. But this picture of rural India is also changing very rapidly due to the evolvement of science and technology for women as well.

Objectives of this Scheme

i) To support research and development and knowledge generation with respect to various stages of the life cycle of women.

ii) To promote research and development for the generation of employment for the women, to reduce their drudgery, improve working conditions in local areas through the inputs of science and technology.

iii) To improve the quality of life, health, and nutrition of Women through the application of science and technology.

There are other programs that are available for the development of animal husbandry and fisheries which are an integral part of agriculture in rural India. Such programmes are

- Dairy Development Programme (DDP);
- Fodder Development Programme (FDP);
- Intensive Cattle Development Programme (ICDP); and
- Special Livestock Production Programme (SLPP).

Awareness in terms of science and technology inputs is always valuable for the proper development of rural areas. There have been different programmes initiated for rural areas of hilly region, tribal region, drought-prone region, and desert areas. Programmes are also initiated by adopting area-specific approaches such as:

- Hill Area Development Programme (HADP);
- Tribal Development Programme (TDP);
- Intensive Agricultural District Programme (IADP);
- Drought Prone Area Programme (DPAP);
- Desert Development Programme (DDP);
- Command Area Development Programme (CADP), and
- Whole Village Development Programme (WVDP).

Some of the programmes are also designed for rural housing which uses indigenous building materials and cost-effective construction techniques for rural development. India AwaasYojna (IAY) has been launched as a sub-scheme of Jawahar Rozgar Yojana (JRY). This scheme was implemented in January 1996 as an independent scheme that helped rural people to have their houses. Two other schemes are also available in these fields which are as follows:

- Pradhan Mantri Gramodaya Yojana
- Samagra Awaas Yojana

The national mission for rural housing and habitat was also set up to facilitate the science and technology inputs for the development of rural housing sector. Health and sanitation remained the fundamental component of rural development. Science and technology inputs are very effective for the enhancement of these features in rural area. Prevention and rehabilitation services are extended all over India through different health care programmes. Science and technological inputs are also used to improve low cost sanitation techniques and also for disposal or recycling of human and animal waste. Many other schemes and programs are also initiated in recent times for the development of different aspect of rural India. These programs and schemes always raised the bar of development in rural areas by focusing on the major problems.

12.3 IMPLEMENTATION OF INNOVATIONS

The techniques of science and technology have to integrate into processes in a systematic manner. The techniques & methods of science and technologies comprise of observation, measurement, recording, classification, and comparison with the previous result, generation of hypothesis, and testing of these hypotheses through an innovative approach. The culture of technology includes a focus on material specifications, product, and process, performance index, and planning for future consideration and especially planning for effective use of resources, energy, and finance. Developments that took place in recent times from the different sectors like bio-technology, space research, micro-electronics, and computers will generate immense benefits for rural area development.

Plans, operation, and maintenance are the characteristics of science and technology which require frequent maintenance to enhance the skills at the local level and to make use of tools and materials for sustainable technological factors. Techniques which can be easily managed and repaired are very useful for rural development. Techniques which are economically sustainable, beneficial, and more importantly contributing towards a better lifestyle of the rural population are necessary to consider for rural development. These kinds of technology can be implemented for fulfilling sustainable and effective goals of rural development.

Effective and Appropriate Technologies: Some of the effective and appropriate technologies are mentioned below which can be used for better rural development:

a) **Information and Communication Technology** (ICT): Computers are developed with very low cost in developing countries like India. These low-cost computers are very useful for the implementation of science and technological inputs mainly for rural development in India. These systems are compatible to work with advanced techniques of science and technology. ICT is not only providing the base for the research but also bridging gaps between traditional methods of research and new techniques. ICT from the past is enabling rural societies to overcome technological backwardness. The power of ICT is directly emphasizing the growth of rural areas and its positive development. Awareness about these updated techniques is also necessary to bring positive change in rural areas.

b) **Construction of Houses:** Technology is also useful for the construction of the house or any building.These techniques are rammed earth, dutch brick, and cob. These materials are not very expensive and can be afforded by the rural population. The houses and buildings made by these materials are strong and suitable for all conditions. These materials are highly used by rural people which allows them to build their houses appropriately.

c) **Source of Energy**: Source of energy is always important for rural areas. Most of the villages in rural India is dependent upon the conventional source of energy i.e. energy generated in thermal power plant. But the scenario regarding the source of energy is getting changed in the rural areas of India. People are opting for renewable sources of energy for their needs. Electricity can be obtained through solar energy, wind energy, hydro energy & biogas. Rural people experienced transformation in the source of energy and they are capitalizing on the same for their growth.

d) **Change in Cooking Technique**: Advancement in technology also changed fuel type used by the rural population. Woods and smoke got replaced by gas stoves and solar cooker's which lead them to get greater

efficiency. These new methods of cooking helped them to save time and human effort. These new techniques also reduced the level of deforestation and also possess health benefits.

e) **Health Facilities**: Health and medical facilities also started using science and technology for better results. Advancements and innovations which took place in medical science in recent days are enabling medical people to better handling of patients and severe diseases. This advancement reaches rural areas also and they are playing an important role in rural development.

f) **Agricultural Technologies:** The cultivation of different crops by using new techniques in agriculture increased the productivity of these crops as well as maintained soil fertility of agricultural land. Wheat, rice, mustard & maize are the main crops of India and these crops have used advanced seed and pesticides to increase crop acreage. New technologies have generated an enormous amount of employment in the agricultural sector also and these employment are quite helpful for the rural population those who are not having a parcel of land to do certain agriculture. These techniques have unconditionally reduced poverty, pollution, and land degradation ratio.

g) **Computer Systems**: Computer system in present time is not limited to urban areas only. This has started spreading its branches in rural India. Most of the people of rural India now understand the importance of computer systems. The computer user ratio has increased drastically in rural portions of India. Through the use of computer systems they are not only enhancing their knowledge bank but they are using this for income generation. Nowadays, students from rural areas are also using computer systems for completing their assignments in digital format. Almost every village in India is having at least a Common Service Centre (CSC) and that too is operated by local people. This is happening due to the advancement of techniques in recent days. Now villagers are not traveling long distances for their fundamental office-related works. Many times they are accessing all these services in their village itself.

h) **Mobile Phone**: Mobile is very common for everyone now. People of both urban and rural areas are now using mobile phones for communication. It is not only limited to communication but it has become the source of knowledge bank for most of the young as well as old age people. Mobile phones are enabling people to understand advanced technique through a common interface.

12.4 APPLICATION OF SCIENCE AND TECHNOLOGY AND SPATIAL TECHNOLOGIES IN RURAL DEVELOPMENT

Science and technology have diversified applications which have made most of the lives better in the last two decades especially in the rural areas. This diversified application of science and technology empowering the knowledge of rural people. These advanced techniques are not only enhancing the knowledge of people but also enabling them to utilize the benefits of the technologies. Advanced techniques are also developing the potential amongst the individual to fulfill their goals through different aspects. Some of the important applications of science and technologies for rural development are as follows:

- Potential uses of renewable sources of energy
- Maintenance and management of water body
- Rejuvenation of water body
- Housing
- Development of bio-fertilizers
- Utilization of ICT for rural development
- Technology transfer
- Women empowerment
- Employment generation

12.4.1 Application of Spatial Technologies in Rural Development

Spatial technologies are providing a helpful hand for rural development. These techniques help planners and decision-makers to process their work in a smarter way. Some powerful tools are provided by these technologies make the implementation of spatial techniques quite easier for the users. These technologies include Geographic Information System (GIS), Remote Sensing (RS), Global Positioning System (GPS) & Differential Global Positioning System (DGPS).

i) **Geographic Information System (GIS):** In very simple words GIS is basically a computer-based system that is designed to capture, store, manipulate, analyse and display geographically referenced data. All the data in GIS is having a set of latitudes and longitudes which makes this technology different from others. Scientific investigations become easier when data is available with locational aspects. Planning and decision-making with the help of this technology are more precise than other techniques. This technology deals with both simple and complex data sets. Using this technique many problems existing in the real world can

be resolved. GIS in general process deals with a spatial and non-spatial database. Spatial data refers to feature, object, and phenomena which is present on the earth surface whereas non-spatial data are the characteristics of spatial data. These two types of data are very important for the whole process just because these sorts of data act as a base data for any analysis.

This technique enables us to relate any geographical information to the real world with the help of a reference system or coordinate system. One can use multiple layers in a single time to carry out a certain result based on our requirements. Integration and interoperability are also one of the best benefits of this technique. Data from other fields can also be integrated and imported into this system to get the desired result. Time series analysis is also possible through this system. Almost every aspect of rural areas can be enhanced through this technique. So this inference makes it possible to solve the complex problem as well as better planning for rural areas. GIS, therefore, enhances the interaction of humans with different aspects of society for the better and timely solution of issues related to rural areas.

One of the main components of GIS is to produce the whole work in the form of graphics to present the result. On the basis of these graphics only, administrators and people can finalize their eventual tasks. There are different platforms to represent these graphics such as wall maps, web maps, web portals, application-based maps & Interactive maps. These maps are allowing us to visualize aspects of world features in a single sheet either through the paper map or on the internet platform.

Maps are the most effective means of communication. GIS in its modern time enables the user to link their attribute data with the graphic file (point, line & polygon). These linkages are used to produce quality maps by using all the elements of a map composition. Maps are produced by having a scale factor in mind. Small areas are produced with a large-scale map which shows minute information about the area whereas large areas are produced with very generalized maps on a small scale where only broad features can be shown. For example, the country as a whole can be mapped with a small scale map where generalization is very high; on the other hand, a village can be mapped with a large scale map where generalization is very less. Hence GIS is a very powerful technique for the development of the rural area.

ii) **Remote Sensing:** Remote Sensing in simple words can be described as the art and science of obtaining accurate and reliable information about an object's features and phenomena without touching the object itself. This technique deals with the detection of earth surface features with the help of electromagnetic radiation. Satellite images are the output of remote sensing which consists of information about earth surface features. This technique provides us a unique platform to visualize and

interpret earth surface features. Remote sensing provides information in different bands which one can use based on his requirement. Fusion of band is also useful for the identification and analysis of earth surface features.

Several satellites have been designed for natural resource management and kept under earth observation satellite. Remote sensing is providing data that are beyond the visible range of the human eye i.e. ultra-violet, infrared, microwave & radio waves. All these information which has been captured in different wavelength are very much significant for the identification and in differentiating earth surface features. Hence, remote sensing is very useful for identifying and managing various rural development activities.

iii) **Global Navigation Satellite System:** It is basically a satellite-based navigation system that is developed by different countries with a different name to facilitate the population of the country for precise navigation. These are like GAGAN (GPS-aided GEO augmented navigation) for India, DORIS for France, BeiDou Navigation Satellite System (BDS) for China, GLONASS for Russia, Galileo for European countries and many more satellite system has been designed for navigational purpose.

Four GPS satellite signals are necessary at any point in time for position computation in three dimensions. These satellite systems also have three segments that are used to monitor the health of the satellite. They are space segment (consist of satellites and their predefined orbit), control segment (consist of master control station and control station located all over the world), and user segment (consist of the user who is receiving signals through GPS receiver).

This technology enables us to do a precise survey of any particular area. The navigation satellite system is equipped with several numbers of satellites which is orbiting in space and provide coverage to all over the earth. These satellites are geostationary in nature and used for navigation and communication purposes. All these satellites are orbiting the earth's surface through its orbital path which is predefined and closely monitored by the control station. This technique is very useful in any sort of survey and for navigational analysis with minimum distortion. Most of the authorities in India are conducting training for GPS-enabled surveys. Demarcation of village boundaries, path tracing of wild animals, app-based surveys are the main examples of these techniques.

iv) **Differential Global Position System (DGPS):** This technique is the enhanced form of GPS which provides us data with very high accuracy. The technique can be used for surveying and boundary demarcation which always provides better output than GPS. Rural areas for few decades have experienced growth in different aspects among which most

of the development taken place with the help of DGPS and its component. This technique has given a most valuable approach for administrative and revenue authorities to rely on and making decisions based on this technique.

Hence, after going through various points regarding the role of science and technology for rural development, it is very significant that the implementation of these technologies in rural India will surely enhance the condition and livelihood of rural people. Any sort of progress taken place in science and technology is necessary to implement in routine procedure which will be useful for achieving sustainable goals basically in rural areas. Some of the challenges which are not solved by using science and technology are easily solved by implementing these techniques. Even today there are many challenges like the existence of poor governance in some villages, the absence of quality education, lack of roads & empowerment of women in most rural areas, etc. These above-mentioned challenges are acting as a barrier for rural development which is necessary to resolve in due course of time etc. In the overall development of villages, all the barriers need to be removed to make the lives of common people easy and peaceful.

12.5 MAJOR ACTIVITIES FOR RURAL DEVELOPMENT THROUGH SCIENCE AND TECHNOLOGY

Several activities can be used to enhance the development process of rural areas. These activities are necessary to channelize for the timely development of different aspects of rural areas. These activities are as follows:

i) **Setting up Goals and Objectives for Rural Development:** Formulation of goals and objectives is the most important activity in the initial level of development. This sort of activity is always a set-up path for any development but it is important to follow the same for the desired result. Goals and objectives will act as an action plan to resolve the existing problems in rural areas. Identification of problems and their probable solution is also considered as objectives for rural development.

ii) **Inter-relation with Other Fields to Bring out New Innovative Ideas & Knowledge:** Inter-relation of science and technology with other allied subjects to make proper use of the benefits of other fields. In the present scenario, one field is not sufficient to be capable enough to overcome all sorts of problems properly so it is very necessary to integrate other fields for timely development.

iii) **Enhancement in the Processes which Support Development:** The need of the hour is to support all the other processes which directly or indirectly enhance the level of development in any particular area. These

supporting processes are very necessary to measure progress taking place at different levels such as international, national, and regional.

iv) **Formulation of Policies to Prevent Negative use of Science and Technologies:** Positive and Negative aspects are always associated with any field. So it is always necessary to form some policies which will prevent and monitor the negative use of the technologies in the course of development.

v) **Organize Training Programs Related to Science and Technology for Rural People:** Time to time training programmes are important for capacity building mainly for the rural people. This sort of training is providing a platform for local people to enrich their technical knowledge and utilize advanced techniques in their works.

12.6 LET US SUM UP

Development is not the process that can be achieved in a single day it's a long-drawn process that generally requires a great effort. In this case, where science and technology are considered as the main pillar of development, it is very important to have a view of the application of science and technology in rural development. Development in the rural areas is the outcome of proper utilization of different advanced techniques which are associated with science and technology. There are different aspects of rural development that can be enhanced by using advanced techniques.

Several policies and programs are also framed to strengthen the use of science and technology for rural development by the government. These policies will prevent the negative uses of these techniques. Proper coordination is required to execute all the plans and policies. The involvement of local people and their capacity building is most important for the overall development of rural areas with their participation. Integration of other allied fields along with science and technology will also boost the development of rural areas.

Hence, it is very extremely essential to incorporate potential techniques which will help immensely to develop rural areas in due course of time.

12.7 KEYWORDS

Rural Development: It is the condition that took place in any particular rural area with positive growth.

Industrial Revolution: It is basically the transition in the manufacturing process from hand production method to machine-based production.

Hydro Energy: Energy which is generated mainly through water bodies.

Crop Acreage: A crop-specific measure equal to an average number of acres planted.

Geo-Stationary Satellite: An earth-orbiting satellite placed at an altitude of 36000 km directly over the equator.

Earth Observation Satellite: A satellite used to acquire earth imagery for the non-military purpose such as natural resource management etc.

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