Introduction

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Forests are widespread and easily exploited renewable resources. They are a source of fuel, construction materials, paper, wildlife habitat and erosion control. Forests are found in most humid and sub-humid regions of the world, from the tropics to the tundras. They are severely degraded in many parts of the world. However, in some cases, forests have recovered in recent decades because of human intervention.

Human beings have been using tropical forests and their resources since time immemorial. Forests have been traditionally used by people indigenous to this environment for food, fiber, fodder, medicine, and building materials. This type of use normally involves minimal alteration to the ecosystem as exploitation of forest resources is within sustainable capacity. Traditional shifting agriculture causes greater disturbance to tropical forests.This type of land-use is found in all tropical forest regions. It involves clearing and preparing of small patches of forest land (0.5 to 2.0 hectares) for agriculture through a combination of tree felling, slashing the understory vegetation, and fire. However, shifting agriculture on a patch can only be practiced for a few years because of depletion of soil fertility. When the soil nutrients become too limited for crop growth, the patch is abandoned and secondary forest naturally regenerate on the land over several decades.

Today most of the Earth's tropical forests are being cut for commercial timber production. Trees are logged either by selective or clear cutting. Once cut, the forests may regenerate naturally or with the intervention by way of a variety of forest management techniques. In some cases, regeneration of a secondary forest is halted or slowed down because of livestock grazing. Scientific evidence suggests that intensive logging of tropical trees can result in severe environmental damage and loss of biodiversity and change of ecosystem. Soils exposed after logging are easily eroded by flowing water. Eroded sediments pollute streams which in turn influence the survival of aquatic plants and fish. Studies and research have shown that clear cutting can modify the energy and hydrologic balance of areas resulting in local or regional climate change.

It is almost a century since the first 'modern' experiments in comparative forest hydrology were conducted in Switzerland. One might have thought that experience accumulated since then would allow prediction of catchment behaviour, under various management regimes, to be made with confidence but, this is not the case. Massive quantities of experimental data have been gathered on interactions between water and forest in recent decades. Most research still concentrates on direct observations on overall catchment outputs, using traditional research methods such as paired catchment responses, or split sample experiments. Certainly, it is necessary to observe and quantify these impacts by direct catchment experimentation, to answer 'what happens when' type of questions. However, little of this information is of use in predicting the hydrologic response of a forested landscape to change in forest management, especially at locations or at scales different from study areas. To answer 'what if' questions that face forest managers and planners that makes the forest respond in the way they do when disturbance occurs, evolution of this culture as a new paradigm in forest hydrology, is now widely accepted by research workers. Results of this way of thinking are reflected in the chapters of this book.

Many issues that motivate research in the area of forest hydrology are: impact of human-induced changes on land use/land cover, changes on water yield, water quality, soil erosion and sedimentation. Over the years, new areas of research have emerged in the forest hydrology, such as joint forestry management (effectively, the people's participation in the forest management), global climate change, carbon sequestration, ecological sustainable development., etc. The inexorable population growth, with exploitation and often irreversible destruction of forest, demands that planners must be supplied with the scientific basis for managing the forest resources in a sustainable manner. Also, there is a need to propagate the ill impact of forest degradation on the bio-diversity. Hence, there exists a strong link between the forest, water and people.

Forest hydrology is interdisciplinary in nature. Due to increased demand, native forest has been brought into other land uses in India. However, limited studies have been carried out to quantify the impact of land use and land cover changes on hydrology, social and economic status of the people living in these areas. In this direction, the Hard Rock Regional Centre, National Institute of Hydrology, organized a 2 days seminar on "Forest, Water and People" at Belgaum, Karnataka during 29–30 July, 2004 to bring the academicians, scientists, practitionaries, planners, managers and NGO's working in the area of hydrology, agriculture, forest and social science to share a platform and discuss the present state of understanding of forest hydrology. In all 42 papers were selected after a thorough reviewing by the referees and accordingly the papers were revised. The articles and research papers covering the different facets of forest hydrology have been grouped under 6 broad themes;

1. Land use–Land cover Mapping (Remote Sensing and GIS in mapping)
2. Hydrological aspects of forests
3. Impact of Forest on Groundwater Recharge
4. Soil and Land use Change
5. Plantation and Bio-Fencing in Forested Eco-system
6. Community Participation

This book contains the present trend of research being undertaken in different parts of India in respect of forest and water management. The results presented in each of the chapters will serve in setting the trend for future research activities in the field of forest hydrology. Also, it is an effort to produce a comprehensive document which can assist the policy makers and managers to take decisions at appropriate levels.