Agroforestry

Theory and Practices

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AGROFORESTRY
THEORY AND PRACTICES

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FOREWORD

World's total forest area is 4.03 billion hectares, corresponding to 31 per cent of the total land area or an average of 0.6 ha of per capita, whereas India's forest and tree cover is 78.29 million hectares which is only 23.81 per cent of the geographical area. We are continuously putting efforts to achieve the national goal of 33 per cent geographic area of the country under the forest and tree cover as enshrined in the National Forest Policy, 1988. India has only 2.4 per cent of the world's geographical area and 0.5 per cent of the world's grazing area but supports over 16 per cent of the world's human population and over 18 per cent of world's cattle population. This ever increasing population places enormous demands and pressures on the land resources and forest resources. Agro-forestry is the potential option for increasing the tree cover outside the notified forest areas.

India is endowed with a variety of soils, climate, biodiversity and ecological regions. An area of 46.70 million ha has been estimated under wastelands which is 14.75 per cent of the total geographical area of the country. The land degradation issue threatens country's food security and the quality of the environment which assumes a major significance nowadays. Agroforestry practices are considered as most vital technology and potential farming system for minimizing the land degradation. Agroforestry practices increase farm productivity, diversify income sources for farmers and provide environmental services. Agroforestry improves soil, water and air quality, and biodiversity while supporting sustainable production of food, feed, fibre and energy. IPCC's prediction of temperature increase between 1.1ºC and 6.2ºC by the end of the century due to excessive carbon dioxide emission will most likely create extreme changes in temperature and precipitation. Agroforestry represents a significant opportunity for sequestering more carbon per unit area on agricultural lands and it can be better climate change mitigation option than ocean and other terrrestrial options because of vast production and protective benefits.

The new comprehensive editorial textbook "Agroforestry: Theory and Practices" by Dr.Antony Joseph Raj and Prof.S.B.Lal is a rich source of knowledge and practical information on agroforestry drawn from the scientific literature, databases and field experiences from all over world. This textbook provides thoroughly up-to-date principles and methods on agroforestry and excellently covers the latest and modern technologies in

the agroforestry field. This book, with its high standards, will enormously benefit the students for their preparation of competitive exams like UPSC-Civil Services, UPSC-Indian Forest Service, ICAR-ARS Scientist Exam, ICFRE Forestry Scientist Exam, NET Exam, State Public Service Commission Exams etc. I am confident that scientists, University and college teachers, and foresters from all over world should find this resource book useful in creating effective and innovative training programmes and manpower in agroforestry.

I welcome this latest Agroforestry textbook which will be most valuable to the students of agriculture, forestry, horticulture, soil science, water science, ecology, environment science and other plant sciences.

I would like to congratulate the authors, Dr. Antony Joseph Raj and Prof.S.B.Lal, for their tireless efforts in bringing this high quality textbook for the benefit of students, teachers, scientists and agricultural community.

[Rev.(Prof. Dr.) RAJENDRA B. LAL]

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PREFACE

Agroforestry provides a different land use option, compared with traditional agricultural and forestry systems. Agroforestry combines trees, shrubs, forages, grasses, livestock, and crops in innovative, flexible combinations tailored to the needs of farmers and landowners. This intensive integration in agroforestry ensures sustained availability of multiple products as direct benefits such as food, vegetables, fruits, fodder, fuel, manure, medicine, timber, etc. It makes use of the complementarity between trees and crops, so that the available resources can be more effectively exploited. It is a practice that respects the environment and has an obvious landscape benefit. The integration of trees, agricultural crops, and/or animals into an agroforestry system has the potential to enhance soil fertility, reduce erosion, improve water quality, enhance biodiversity, increase aesthetics and sequester carbon. Efficient, modern versions of agroforestry have been developed around the world which can be adapted to different agroclimatic conditions.

The agroforestry always remains productive for the farmer and generates continuous revenue. Agroforestry allows for the diversification of farm activity and makes better use of environmental resources. The goal of agroforestry is to optimize productivity and conservation benefits within a set of integrated land use practices. Agroforestry has interesting advantages from three different perspectives viz. agriculture, forestry and environment. The agroforestry practices enhance biodiversity, sequester more carbon dioxide from atmosphere, diversify farmers' income sources, generate greater profits than annual crops, and create a more integrated, interesting, and visually appealing land use system that may be more environmentally, economically, and socially sustainable than the original farmland. With the shrinking per capita land availability, agroforestry system with the integration of perennial woody trees with crops/pastures is most suitable technology for increasing total productivity of food, feed and fuel and thereby reducing the risk of farming.

This editorial textbook "Agroforestry: Theory and Practices" is one of the finest books on agroforestry that offers a global review of the basic approaches, tools and technologies, research innovations and real-world practices in agroforestry. The book offers a comprehensive guide to basic principles, techniques and applications, integrative strategies, economic and environmental concerns, and future trends in agroforestry in

different regions of the world. This textbook is an effort to create a coherent and wide-ranging guide to the practice of agroforestry. This book covers key areas in agroforestry, namely agroforestry practices and its distribution, agroforestry systems classification, agroforestry trees, agroforestry management, technologies and modern concepts in agroforestry, production benefits of agroforestry, environmental services of agroforestry, agroforestry education, research & extension, etc.

In many aspects, the topics and structure of this textbook is highly meritorious and unique than other agroforestry books. This textbook is intended for university & college students, professors, scientists, researchers, foresters, farmers, policy makers and professionals in the field of agriculture, forestry, horticulture, other agricultural sciences and biological sciences. The main intention of this textbook is to provide a state-of-the-art and up-to-date knowledge of recent developments in agroforestry as a potential future land use system. This textbook on agroforestry will enormously benefit the students for their preparation of competitive exams like UPSC-Civil Services, UPSC-Indian Forest Service, ICAR-ARS Scientist/NET Exam, ICFRE Forestry Scientist Exam, State Public Service Commission Exams and University Entrance Exam for admission to M.Sc. and Ph.D. programmes

This agroforestry textbook will contribute significantly to academic teaching and scientific research. Additional information or suggestions are invited from experienced researchers and experts for improving the quality of the book in future editions. We thank Dr.(Mrs.) Roselin Antony, Assistant Professor of Mekelle University (Ethiopia) for her editorial help and for enhancing the English language & technical writing of manuscript. We are confident that this agroforestry textbook will become a huge success just like our earlier book “Forestry: Principles and Applications”.

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