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Review Article

Agroforestry and Horticulture: An Employable and Eco-Friendly Option

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Abstract

Agroforestry and Horticulture are emerging thrust areas of agriculture sector in post green revolution period for food, wood, shelter, nutritional and environmental security. Agroforestry is science and art of judiciously managing agricultural crops with woody perennials in a unit piece of land to enhance the productivity and profitability for combined goods and services while horticulture deals with cultivation and management of fruits, vegetables, ornamental flowers etc and their post-harvest management. The rising population forced the upsurge in demand of food, wood and other goods which can be possible by the scientific and modern interventions in the agriculture sector by enhancing the productivity of farm with integration of Agroforestry and Horticulture. This sector has potential of good employability with an eco-friendly option to cater the need of agro-entrepreneurs, forest based industries like paper & pulp, timber, plywood, plantation companies, orchard managers, manager for protected cultivation of vegetables and flowers, landscape and golf court managers and processing and value addition units of horticultural produce besides CSR activities of corporate and NGOs are few to mention. The current trends of green jobs in every sector required these professionals to put their endevours in shaping the green activities not only in rural areas but also in urban areas of green building and landscapes, recreation & ecotourism, infra projects of road, industries, mining, sports, urban centers etc. The rising concerns of global warming and climate change further aggravated the scope of agroforestry and horticulture as peripheral areas of agriculture for improvement of microclimate of agro-ecosystem and transforming the lives and landscapes of the masses in general.

Keywords

Agriculture
Agroforestry
Eco-friendly
Employment
Forestry
Green jobs
Horticulture
Marketability

Introduction

Agriculture is one of the prime sectors for the growth of the country like India but its contribution in India's GDP has been slide from 51% in 1950 to 13.7 % in 2014. At the same time the diversification of agriculture sector in number of super specialized discipline out of which Agroforestry and Horticulture are promising fields for food, wood and sustainable natural resource management. The growing inhabitants forced the expansion in demand not only for food but other goods and services. In current scenario of global warming and

climate change interventions in the agriculture sector for enhancing the productivity of farm with integration of Agroforestry and Horticulture are viable green potions. The convergence of these two disciplines is complementary to each other which can provide larger share in employability with eco-friendly options. The different aspects of agroforestry and horticulture with their thematic areas and employability options are described in details for awakening the people about the scope of the subjects for betterment of society.

Agroforestry

Agroforestry is a land use system, integrates trees, crops and/or animals in a way that is scientifically sound, practically feasible, ecologically desirable and socially acceptable by the farmers (Nair, 1979). In other words, Agroforestry can be stated as science and art of judiciously managing agricultural crops with woody perennials (forest and horticultural trees) in a unit piece of land to enhance the productivity and profitability for combined goods and services. In the present market oriented world the dimensions of agroforestry has changed from subsistence to commercial and Eco-friendly with a rider of maintaining balance between ecology and economy.

Why agroforestry is the need of the time

Mounting human population requires enormous amount of food and wood, which eventually generating intense pressure on cultivable land and forests in India. The rising demand of food is being met by the scientific and modern interventions in the agriculture sector, however the same pace could not achieve in forestry sector. In India, the production potential of trees for wood is restricted to about 0.7 m^3/ha/year compared to the world average of about 2.1 m^3/ha/year resulted huge gap between the demand and supply. As per national forestry action programme timber requirements of India during 2006 were 82 million m^3, whereas, the domestic availability was just 27 million m^3, moreover, in last ten years the money spent on import of wood has increased from US$ 1.0 billion in 2001 to more than $ 5 billion in 2011. Due to the scarcity of domestic timber resources and rapidly growing demand, wood imports in India have doubled since 2006, in order to meet the country's growing hunger for wood products (RISI, 2013).

The rising demand of food and wood products are the basic livelihood needs, can be achieved by increasing the farm and forest area or by raising / enhancing the productivity of land. Land being a restricted resource, expansion of the farm area is not possible however, enhancing the productivity of farm with integration of fast growing trees as agroforestry is the reasonable and realistic alternative of today. The integration of different components in spatial and temporal arrangement with social acceptance can promote the agroforestry (Nair, 1993, 1994). Agroforestry is believed to be one of the sensible substitutes, has got the potential to capture land degradation, sequestering carbon and recover site productivity through interactions among trees, soil, agricultural crops, and livestock, and thus restore environment and enhance the productivity (Avery, 1990). Moreover, it is also recognized that the planting trees outside the forest in the form of agroforestry/farm-forestry is the only substitute to meet the goal as required by the national forest policy 1988 for increasing vegetation cover to 33% from the present level of 24.01% (Forest cover 21.23% and Tree Cover 2.78% as per FSI, 2013). National Forest Commission has also stressed the expansion of forestry activities outside the forest area to achieve requisite forest cover (NFC, 2006) which can only be possible through TOF as agroforestry, Farm Forestry and other extension forestry approaches.

Development of agroforestry in India

Agroforestry is a new name of existing set of aged old practices retaining multipurpose trees on the agricultural field primarily for fuel & fodder requirement, a type of conventional agroforestry. In India the organized and scientific agroforestry started by the Indian Council of Agriculture Research (ICAR), launching All India Coordinated Research Project on Agroforestry (AICRPAF) during 1983 with 20 centers now reached to 39 centers in ICAR institutes and State Agricultural Universities (SAUs). Further a National Research Centre for Agroforestry (NRCAF) was established by ICAR during 1988 at Jhansi in Central India. On 8th May, 2013, the NRCAF- ICAR, Jhansi has celebrated its silver jubilee and the 8th May is declared as “National Agroforestry Day” by ICAR, New Delhi. Recently in 2015 the NRCAF, Jhansi has been upgraded to an institute as “Central Agroforestry Research Institute (CAFRI)”. The final landmark sat in the world history of agroforestry on 10th February, 2014 by India when the Hon’ble president of India Mr. Pranab Mukherjee unveiled the first National Agroforestry Policy in the opening session of 3rd World Congress on Agroforestry held at New Delhi. Now India has become the first nation in the world to adopt an exclusive agroforestry

policy at National level. At present the research, education and extension in agroforestry in India are being pursued by Ministry of Agriculture, however the role of Ministry of Environment, Forest and Climate Change is equally important as agroforestry is a link subject between agricultural crops and trees. Today, the biggest challenge faced by pulp, paper and match industries in the India is the unavailability of wood based raw material which require establishment of industrial wood plantations.

Imperative and salable themes in agroforestry

Agroforestry covers all the economically viable, ecologically sustainable and productive areas related to agriculture and forestry and thus seems to be the need of the hour as green areas.

The extremely salable and important aspect covered under agroforestry as of today are: Agroforestry systems; Industrial agroforestry- Pulp and Paper industry, Plywood industry, Composite wood industry, Timber industry, Saw mills, Matchbox industry; Value Chain in Industrial Agroforestry; Industrial wood based raw material procurement; Economic and Fast growing trees; Economics of timber in Agroforestry and Farm Forestry Systems; Crop Production; PPP based Agro-Farm-Forestry; Farm and Tree certification; Institute-Industry-Farmer based tri and quad partite agroforestry models; Climate Smart Agroforestry; Diagnosis and Design in Agroforestry; Multipurpose Trees; Fruit Trees; Fodder and Pasture Development; Soil and Water Management; Measurement and Post harvest techniques of industrial Trees; Cultivation of Shade loving crops; Modern Plantation Technology; Carbon sequestration in farm trees; Agroforestry enterprise and trading; Agroforestry programs, Policy and legal framework; Value addition; Agro-Farm-Forestry Management; Wood Based Industry in India; Extent of Agroforestry in India; Commercial Agroforestry Models; Valuation of Agroforestry Models; Tree-Crop interaction and management; Food and wood productivity; Agroforestry for livelihood supporting projects and activities; Agroforestry and Phyto-remediation; Agroforestry and Food Security; Agro-biodiversity conservation; Agroforestry and Ecosystem Services; Economically Feasible Agroforestry practices in India; Energy and Biomass plantation; CDM projects through agroforestry, carbon credits and agroforestry, carbon finance through agroforestry options, linking Small farmers to carbon finance, agroforestry and agro-ecotourism.

Employment and green jobs in agroforestry

Employment opportunities as a Green manager exist with Non Governmental Organizations (NGOs) working in protection and conservation of forest resources and Corporate having their own plantations for wood and timber production. There are sequence of reputed Funding agencies and NGOs which are working in the agroforestry sectors and recruiting the Green Managers like BAIF, PRADAN, CAPART, Aagakhan, Srijan, CPF, etc. Furthermore, an agroforestry expert can work as a freelance consultant for the agroforestry based NGOs and agencies. The Green jobs to the agroforestry experts are available in the international agencies *viz.* ITTO, OXFAM, UNDP, CIFOR, UNDP, ICRAF, FAO, IUCN, INBAR, World Bank, Asian Development Bank and ICIMOD etc nevertheless; the jobs in these agencies are extremely remunerative.

The agroforestry professionals can join the national and international University/institution as faculty, Scientists, Extension Officer, Subject matter Specialist in Krishi Vigyan Kendra (KVK) and Research Officers. There is a good scope for agroforestry professionals in the tea, coffee, chincona, rubber and sericulture boards and related companies. The carbon estimation and carbon trading is the new and exciting domain for the agroforestry experts. The agroforestry professionals can launch their own enterprise in the field of Plant Nursery centre, Tissue culture centre for forest crops, Agricultural seed production centre, Apiculture, Lac culture, Silk culture, vermiculture, Agri-business, Agri-clinic etc. In private sector the agroforestry professionals can take up employment either in offices, laboratories and Plantation companies like ITC, wood based industries or outdoors depending on their field of specialization. The professionals can be recruited in tree Based Industries like Pulp and Paper Industries, Katha Making Industry, Resin and Turpentine Industry, Medicinal and Aromatic Plant Units, Other Wood Products Industries etc. The industries namely Green ply wood industry, Century paper mill, Star paper mills, ITC Bhadrachalam paper boards limited, JK corps limited, Ballarpur Industries limited (BILT), Orient paper mills, WIMCO (ITC) match Industry, Biofuel and Biomass based industry etc require professionally qualified managers having expertise in forestry and agroforestry to run their industries. In the banking sector the agroforestry professionals are appointed as Agriculture Officers, Rural Development Officers and Extension Officers. Many banking agencies like NABARD,

Syndicate bank, PNB, SBI, Dena Bank, Union Bank, Oriental Bank of Commerce etc are recruiting these professionals in rural development activities directly or by IBPS system. The private banks such as Axis bank, HDFC bank, IBDI bank, ICICI bank etc are also recruiting the agroforestry professionals. The various states of India in their PMUs are recruiting agroforestry professionals in the Livelihood Projects as Project Managers for the activities related to livelihood and agroforestry.

Horticulture

Horticulture deals with cultivation and management of fruits, vegetables, ornamental flowers etc and their post-harvest management or Horticulture is a science and art of growing, processing and marketing fruits, vegetables and ornamental plants/flowers, moreover, it also deals with green house management, turf-grass management, nursery management, arboriculture, landscape management, interior landscaping, bonsai management, post harvest and value addition of horticultural produce etc. Horticulture accounts about 30% of India's agricultural, GDP from 8.5% of the cropped area with largest producer and exporter of banana, cashew, papaya and pomegranate, however, productivity of India is amongst the highest in case of some fruits like grapes, banana, papaya etc. Presently our country is next to China in area and production of fruits and vegetable crops and has been contributing 12% of fruits and 14% of vegetable of the total world production. India is currently producing 257.2 million tonnes of horticulture produce from an area of 23 million ha.

Important themes in horticulture

Horticulture covers all the practices of fruit, vegetables, flowers, etc and their harvesting, processing, packaging and marketing, moreover the gardenia, orchard management and land scaping etc are integral part of horticulture and seem to be the need of the time. The extremely marketable and contemporary aspects covered under horticulture are theme-wise mentioned as below.

Introduction, Concepts and Management in Horticulture

Importance and scope of horticulture; National and International scenario of horticultural crops; Export and import potential of horticulture crops; Agencies involved in horticulture development and management; Organic horticulture a future guideline; PPP based Horticulture; Horticulture programs, Policy and legal framework; Export and Import policy of Horticulture products; Managerial tools in Horticulture; Farm and Field Management; Protected and captive Horticulture; Horticulture as livelihood support; Agri-Horti Models; Horticulture Mission; National horticulture board; Horticulture research and development in India; Institutes and AICRPs on horticulture and different fruits.

Fruit crop cultivation, production and management

Tropical, Sub-Tropical and Temperate Fruit Production; Fruit orchard planning, layout, development and management; Propagation techniques and Nursery management of fruit crops; Canopy management-training and pruning operations in fruit crops; Biodiversity and Conservation of fruit crops; Protected Fruit Culture; Biotic and A-biotic stress management in fruit crops.

Vegetables and off season crops

Present status, scope and importance of vegetable production; Production of cool season vegetables, warm season vegetables; Seed Production in vegetable crops; Underexploited vegetable crops; Off season, Poly house vegetable cultivation for commercial purpose; vegetable hybrid seed production, Vegetable Seed processing, storage and certification.

Floriculture and landscape architecture

Scope and importance of floriculture and landscaping; Present demand and trend of cut flowers and loose flowers consumption; Cultivation practices and technology involve in Cut Flowers and loose Flowers farming and production; Landscaping and Ornamental Gardening Management; Protected Floriculture cultivation; Value Addition in Flowers; National and global cut flower production and trade.

Post-harvest technology of fruit and vegetables

Importance and need of post-harvest technology; Indigenous and scientific post-harvest techniques; Methods of storage, processing and Packing of fruits and vegetable and income generation; Methods of preservation of Pickle, Jam, Jellies, Fruit and juice; PHT and food processing industries etc.

Entrepreneurship development in horticulture

Local and Global Entrepreneurship in horticulture produce; Structure of Horticulture Industry India; Value addition; Value chain in Horticulture Industry; Commercial horticulture models; Institute-Industry-Farmer based Horticulture; Agri-Horti export zones and Food parks; Management of Horti processing units and industries; Marketing and distribution of horti products and trade.

Climate change and horticulture

Climate change- impact on fruit and vegetable crops; Carbon Sequestration and productivity in horticultural trees; Climate Smart Horticulture; Natural Resource conservation and Management in Horticultural system.

Employment in horticulture

Horticulture is an applied and exceptionally diversified field with almost boundless green career opportunities in a variety of job settings as: Horticultural Manager, Horticulture Inspector, Fruit and Vegetable Inspector, Marketing Inspector, Horticulture Consultant, Landscape designer and consultant, Landscape Manager in golf course, Orchard manager, One can start the Agri-Horti clinic, Commercial fruit plants, flower and ornamental plants, Seed producer of vegetables and flower crops, Fruit/ Vegetable / Flower grower, Floral decorator, grower and manager in fruits and vegetable processing units, cold chain unit and Proprietor of cold storage etc (Singh et al. 2013).

A horticulturist is expected to perform variety of task related to fruits, vegetable, flowers, medicinal plants, spices, plantation crops and post harvest of all these produce. Therefore they have avenues in orchard management of different fruits, orchard design and management; post harvest and management of different fruits, fruit breeder and propagation expert which is essential part in horticulture. The scope is also available in vegetable sector as vegetable breeder, vegetable seed production, and vegetable post harvest and management, protected cultivation of off season vegetables, seed condiments production, harvesting and packaging. Management of plantations crops like cassava, cinnamon, clove, palm oil, coconut trees, coffee, cocoa, tea etc.

Medicinal and aromatic plant cultivation and harvesting, value addition and storage, packing is again a complete chain of managed work. Post harvest technology (PHT) of most of the horticulture produce is important business and provides them market access with high price. Therefore, PHT can provide ample opportunities to diversify the horticulture products from juices to jelly, powder to perfume, refreshing drinks from all fruits and vegetables, flavoring agents from spices and condiments and health drinks from the medicinal and aromatic plants. Even commercial scale production of all these provide a self employment as well Ministry of small scale industries provides finance for setting up such micro units. Apiculture, sericulture and lac culture are the interdisciplinary areas where horticulturist can join as an expert or as manager.

Floriculture is another important area where skilled manpower is needs even for management of flori farms and all the high value crops like carnation, gladiolus, anthurium, rose, and all these are managed under protected cultivation unit. The regulation of all the activities in protected cultivation is equally important, moreover protected cultivation unit manager another grey area for horticulturist.

Cut flower and their post management are equally important. Besides these traditional work of arboriculture, bonsai, avenue tree maintenance garden, lawn, golf course, turf grass management all require horticulturist. One can become consultant for various hotel, recreational parks, Horti based agro-ecotourism sites development, Corporate houses, institutes and green landscape designers in different infra projects etc.

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