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Crop diversification through Agroforestry

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Introduction

Crop diversification as the strategy of shifting from less profitable to more profitable crops, changing of variety and cropping system, increasing exports and competitiveness in both domestic and international market, protecting the environment and making conditions favourable for combining agriculture-fishery-forestry-livestock (Luat , 2001).

Determinants of Crop diversification

With the advent of modern agricultural technology, particularly during the Green Revolution of the late sixties and early seventies, there has been a steady rise in diversified agriculture in terms of crops, mainly on economic grounds. However, crop pattern shifts are the result of the interactive influence of several variables that can be narrowly grouped into the following five categories

- Resource related factors includes irrigation, rainfall and soil fertility
- Technology related factors not only covers seed, fertiliser and water but also includes processing to marketing
- Household related factors covering requirement for food and forage self-sufficiency as well as investment ability
- Price related factors such as output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly.
- Institutional and infrastructure related factors covering farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies (Hazra, 2001).

Agroforestry

Agroforestry 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" (Lundgren, 1982).

Agroforestry – Basic conditions

The multiple cropping systems has to satisfy three basic criteria to be an agroforestry system of cropping pattern which includes

- There should be a biological interaction between at least two plant species
- Out of the two plant species, one must be a woody perennial
- The other plant species should be used for fodder, annual or perennial crop production

Attributes of Agroforestry

There are three major attributes which all agroforestry system possess, these are

Productivity

The major aim of all agroforestry systems is to improve the production and productivity. It helps to improve the productivity in different ways which includes, increased yield of increased output of tree products, improved yields of associated crops, reduction of cropping system inputs, and increased labour efficiency.

Sustainability

Sustainability refers to utilization of natural resources and maintaining the ecological balance for the future generations. Symbiotic effect of woody perennials with the other cropping systems helps to attain and maintain soil fertility.

Adoptability

The word “adopt” here means “accept” and it may be distinguished from another commonly used word adapt, which implies “modify” or “change.” The fact that agroforestry is a relatively new word for an old set of practices means that, in some cases, agroforestry was already been accepted by the farming community. However, the implication here is that improved or new agroforestry technologies that are introduced into new areas should also conform to local farming practices.

Necessity of Agroforestry

- Continuous supply of fuel and fodder
- Ecological balance
- Fresh oxygen through photosynthesis
- Acts as windbreaks
- Creates employment opportunity

Employment generation potential of agroforestry in India

There is potential for further employment under-improved agroforestry systems, amounting to 943 million person-days annually from 25.4 million ha. Maximum employment opportunity is seen to be in tree-borne oil seeds, followed by silvipasture. It was estimated that the potential of agroforestry for rural development and employment generation amounts to 5.763 million person-days yr-1 in the Himalayas alone (NRCAF, 2007).

Different Agroforestry systems

Agri-silviculture :It is the combination of agricultural crops and trees

Agri-horticulture system: Growing of agricultural crops with horticultural fruit crops.

Silvi-pasture system: It is the combination of trees and pasture for livestock.

Horti-pasture system: Horti-pastoral system, where in the inter spaces between fruit trees species are utilized for cultivation of grasses and grass legume mixtures.

Agri-silvi-horticulture :Growing of agriculture crops, trees and fruit trees or ornamental trees or vegetables/flower together in same lands at the same time

Alley cropping: Alley cropping is the planting of trees or shrubs in two or more sets of single or multiple rows with agronomic, horticultural, or forage crops cultivated in the alleys between the rows of woody plants

Constraints in crop diversification

The major problems and constraints in crop diversification are primarily due to the following reasons with varied degrees of influence:

- More than two-third of the area under cultivation in India is Rainfed and dependent on rainfall
- Sub-optimal and over-use of resources like land and water resources, causing a negative impact on the environment and sustainability of agriculture
- Inadequate supply of improved and quality seeds and planting material of improved cultivars
- Fragmentation of land holdings and lack of mechanization of agriculture due investment constraints and land holding sizes
- Poor basic infrastructure like rural roads, power, transport, communications etc
- Inadequate post-harvest technologies and inadequate infrastructure for post-harvest handling of perishable horticultural produce
- Inadequate research - extension - farmer linkages
- Inadequately trained human resources and large scale illiteracy amongst farmers
- Emerging species of diseases and pests affecting most crop plants
- Poor database for horticultural crops and insufficient investments in the agricultural sector.

Conclusion

Integration of tree crops with agricultural crops leads to decline in the yields due to shading effect which can be minimized through proper tree management practices like pruning and lopping as well as they helps to maintain the soil health through addition of organic matter and growing multiple crops helps to increase profits. Agroforestry can play a vital role in such endeavors by meeting the diverse needs to them as inter-dependent benefits of the three components, viz. trees, crops and livestock in addition to the 6 Fs, i.e. food, fruit, fodder, fuel, fertilizer and fiber from limited land resources.However, over time, with shrinking land holdings, annual crops have replaced trees for various reasons. Thus agroforestry is emerging as one of the diversification options for farmers to grow tree crops with food crops, pastures and livestock to attain sustainable income

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