RAMA UNIVERSITY

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FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

Concept of Agroforestry

Agroforestry is an age old practice, indeed very old. The scientific principles of agroforestry are Farmers of the warmer parts especially have long tradition of growing food crops, trees and animals together for producing multiple range of products. Trees and forests in fact an integral part of the Indian culture. The best of Indian culture was born in the forests. Our rishis who evolved the Hindu philosophy, lived in forests in complete harmony with the nature. In fact, so much has been said about trees in our ancient literature that planting tree was being done by individuals on their own along with agriculture crops. “Krishishukti” written by Maharishi Kashyap, classifies land into several categories and identifies areas which are suitable for planting trees: all wet and dry lands and areas around houses, wells, tanks are specifically identified for tree planting. But foresters and agriculturists, who have traditionally operated within rather rigid disciplinary boundaries concentrating on monoculture production of their preferred commodities of crops, animals and trees used to ignore such combined integrated production systems.

More recently, however, the forest area has receded and resources have shrunk considerably. The people are no longer able to meet their requirements of firewood, fodder, timber, bamboo, etc. from the forest. Due to shortage of wood the prices of these commodities have, therefore, increased manifold. Many forest based industries have been facing

problems in supply of raw material. Many farmers quite recently started planting trees on their farm lands to meet these shortages along with agriculture crop; thus from the concept of agroforestry it emerged out:

- agroforestry is a collective name for land use systems involving trees combined with crops and/or animals on the same unit of land. Further it,
- combines production of multiple outputs with protection of production base
- places emphasis on the use of multiple indigenous trees and shrubs
- is particularly suitable for low-input conditions and fragile environments
- involves the interplay of sociocultural values more than in most other land-use systems
- is structurally and functionally more complex than monoculture

AGROFORESTRY DEFINITIONS:

- Agroforestry is relatively new name of for set of old land use practices. Many definitions have been proposed world-wide. However it has now become an accepted land use system. Some of the definitions given by different workers are as follows:
- Bene et al. (1977) defined agroforestry as a sustainable management system for land that increases overall production, combines agriculture crops, forest plants and tree crop and/or animals simultaneously or sequentially and applies management practices that are compatible with the cultural patterns of a local population.

- King and Chandler (1978): “Agroforestry is a sustainable land management system which increases the overall yield of the land, combines the production of crops (including tree crops) and forest plants and/or animals simultaneously or sequentially, on the same unit of land and applies management practices that are compatible with the cultural practices of the local population.
- Nair (1979) defines agroforestry as a land use system that integrates trees, crops and animals in a way that is scientifically sound, ecologically desirable, practically feasible and socially acceptable to the farmers.
- According to Lundgren and Raintree (1982), agroforestry is a collective name for land use systems and technologies, where woody perennials (trees, shrubs, palm bamboos, etc.) are deliberately used in the same piece of land management units as agriculture crops and/or animals in some form of spatial arrangement or temporal sequence. In agroforestry systems, there are both ecological and economical interactions between the different components.

Some of the basic ideas emerging from the definition of Agroforestry:

- AF normally involves two or more species of plants (or plants and animals), at least one of which is woody
- An *AFS always has two or more outputs
- Cycle of the AFS is always more than one year
- Positive and negative interactions are exhibited among components (tree, crop)

- Even the simplest AFS is more complex ecologically (structurally and functionally) and economically, than a monocropping system

Agroforestry components OR Basic components of agroforestry

Objectives of Agroforestry:

In all agroforestry land management there are two essential and related aims such as

- The AFS should conserve and improve the site
- Optimize the combined production of tress, agricultural crops and animal

Attributes of Agroforestry:

There are three attributes which, theoretically, all agroforestry system possess, these are:

- Productivity: Most, if not all, agroforestry systems aim to maintain or increase production (of preferred commodities as well as productivity (of the land). Agroforestry can improve productivity in many different ways. These include: increased output of tree products, improved yields of associated crops, reduction of cropping system inputs, and increased labour efficiency.
- Sustainability: By conserving the production potential of the resource base, mainly through the beneficial effects of woody perennials on soils, agroforestry can achieve and indefinitely maintain conservation and fertility goals
- 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.

Potential of Agroforestry

The different aspects in which agroforestry hold viable potentials to meet the demands of ever- growing human and livestock population. are as follows:

i) Meeting the demand of food, fuelwood & fodder

- Enhanced food production from crops associated with trees through nitrogen fixation, better access to soil nutrients brought to surface through deep tree roots, improved availability of nutrients due to high cation-exchange capacity of the soil and its organic matter and mycorrhizal associations
- Food for man from trees as fruits, nuts and cereal substitutes
- Fodder for meeting rural needs

ii) Water conservation

- Improvement of soil-moisture retention in rainfed croplands and pastures.
- Regulation of stream flow, reducing flood hazards and a more even supply of water through reduction of run-off and improvement of interception and storage in infiltration galleries.

- Improvement in drainage from waterlogged or saline soils by trees with high water requirements- biological requirements.

iii) Fuelwood and energy

- Fuel-wood for direct combustion
- Pyrolytic conversion products such as charcoal. oil and gas
- Ethanol produced from fermentation of high-carbohydrate fruits
- Oils, latex and other combustible saps and resins

iv) Shelter from trees

- Building materials for shelter construction
- Shade trees for people, livestock and shade-loving crops
- Wind-breaks and shelter-belts for protection of settlements, crop lands, pastures and roadways
- **Fencing:** live fences and fence posts

v) Raw material for industries

- Raw material for pulp and paper industry
- Tannins. essential oils and medicinal ingredients
- Wood for agricultural implements and various crafts
- Fibre for weaving

vi) Cash benefits

- Direct cash benefits from sale of tree products
- Indirect cash benefits from increased productivity
- More income per unit of land than monoculture

vii) Increased yield and maximized production:

Combining agriculture crops with trees helps in increasing the productivity of the land by:

- Utilizing available solar radiations throughout the year and thus enhancing total productivity
- Many leguminous tree species fix nitrogen from the atmosphere and return much more in leaf fall than they take from soil.
- Leaves of tree species could be used as green manure and help the farmer to increase soil productivity at optimum levels over a long period of time.

viii) Diversified products:

- Several trees, shrubs, herbs and climbers yield a substantial quantity of food materials which are used by rural poor and particularly by tribal.
- About 213 species of large and small trees, 17 species of palm, 128 species of shrubs, 116 species of herbs, 4 species of fern and 15 species of fungi are known to yield edible/food material.
- Thus, by adopting agroforestry one can get diversified products viz. fuel, fodder, fruits, fibre, timber, etc.
- Tree and agriculture crop production system is more productive and is capable of meeting almost all the demands of timber, fodder, fruits, fiber and firewood.

ix) Utilization of wasteland and degraded land:

- In India approx 100 million ha area is under different kinds of waste land.
- These lands can be gainfully utilized for the cultivation of trees.

- Once the area is vegetated, ecological restoration process starts by means of leaf litter decomposition etc., which leads to improvement in soil condition.
- Once the soil is improved, this land can be utilized for agricultural production.

x) Employment opportunities:

- Unemployment is the country's main problem.
- Agroforestry systems increase the employment opportunities.
- Plantation, including seed collection and nursery raising generate employment of about 200-500 man days/yr.
- Wood based industries such as saw milling, furniture, sports goods, pulp and paper, Match splints, bamboo and cane furniture, etc. are the important sectors where rural youth get employment.

xi) Carbon sequestration services and its influence on climate change:

- One of the most important contributions of agroforestry in general is to respond to climate change through sequestration of carbon in above ground plant biomass and below ground biomass in the soils.

xii) Potential reduction in the rate of deforestation:

- Agroforestry reduced the annual rate of deforestation to a great extent.
- The ready availability of fuel wood in own farm reduces the burden on the natural forests.

- The time that household/family members especially women would have spent walking long distances in search of fuelwood in forests can be saved.

xiii) Improved soil health

- Trees improve physico-chemical properties of soil.
- The trees biomass also provide favourable environment for soil microbes and fauna which in turn break down the biomass and release plant nutrients.

xiv) Agroforestry as a habitat for wild species

- Agroforestry can enhance connectivity and landscape heterogeneity in multi-functional conservation landscape.

Social Forestry

- Social forestry is the practice of forestry on lands outside the conventional forest area for the benefit of the rural and urban communities.
- The term was coined by J.C. Westoby. It was first recognized as an important component of forestry for meeting rural needs in the interim report of the National Commission on Agriculture (NCA, 1976).
- The objectives of social forestry adopted by the NCA were to fulfill the basic and economic needs of the community.
- The scope of social forestry defined by the NCA included farm forestry, community woodlots and reforestation in degraded lands. By mid-1980, the concept of social forestry was firmly established as forestry of the people, by the people and for the people.

Social forestry includes within its scope the following:

a) Farm Forestry: Farm forestry is the practice of forestry on farms in the form of raising rows of tree on bunds or boundaries of field and individual trees in private agriculture land as well as creation of wind breaks, which are protective vegetal screens created round a farm or an orchard by raising one or two lines of trees fairly close with shrubs in between.
b) Extension Forestry: Extension forestry is the practice of forestry in areas devoid of tree growth and other vegetation and situated in places away from the conventional forest areas with the object of increasing the area under tree growth. It includes within its scope the following:
i. Mixed forestry: Mixed forestry is practice of forestry for raising fodder grass with scattered fodder trees, fruit trees and fuel-wood trees on suitable waste lands, panchayat land and village commons land.
ii. Shelterbelts: Shelterbelts is defined as 'a belt of trees and/or shrubs maintained for the purpose of shelter from wind, sun, snow-drift, etc. they are generally more extensive than the wind-breaks covering areas larger than a single farm and sometimes whole regions on a planned pattern.' Or Shelterbelt is wide belt of tree, shrubs and grasses which goes right across the land at right angle to the direction of prevailing wind in order to

- Reduce wind velocity
- Deflect wind current
- Protect public properly in leeward side

iii. Wind breaks: It is a protective planting around a garden, a farm or a field to protect it against strong winds. It usually consists of 2-3 rows of trees or shrubs, spaced at 0.5 m to 2.5 m apart, depending on the species.
iv. Linear Strip Plantation: These are plantations of fast-growing species on linear strips of land on the sides of public roads, canals and railway lines.
c) Community Woodlots: The community woodlots, consists of plantations of fuelwood species on community village lands, with intended objective of increasing a villager's access to fuel wood, fruits and fodder.
d) Rehabilitation of Degraded Forests
As a third component, the interim report of the NCA, 1976 suggested reforestation of degraded forests to achieve the following objectives:

- To grow short rotation fuel and timber species for meeting the requirements.
- To organize fuelwood supplies at reasonable rates, this will prevent pilferage from neighbouring commercial forests.
- To tie up degraded forest areas with the nearby rural and semi-urban centers for their requirements of fuelwood.
- To provide employment.
- To rehabilitate the degraded forests in the process.

e) Recreation Forestry: Recreation forestry is the practice of forestry with the object of raising avenue/flowering trees and shrubs mainly to serve as recreation forests for the urban and rural population. This type of forestry is also known as Aesthetic forestry which is defined as the practice of forestry with the object of developing or maintaining a forest of high scenic value.

Distinction between Social Forestry and Agroforestry

Social Forestry	Agroforestry
1. Social forestry is a plantation made on lands outside conventional forest areas for the benefit of rural and urban communities, with objectives to supply fuel wood to divert cow dung from village hearths to village fields, small timber for housing and agricultural implements and fodder for cattle of the rural population, protection of agriculture by creation of diverse ecosystem and arresting wind and water erosion, provide raw material for village cottage industries and improve scenic value in rural and urban areas.	1. Agroforestry is a sustainable land management system that increases the overall production, combines agricultural crops, tree crops and forest plants and/or animals simultaneously or sequentially, and applies management practices that are compatible with the cultural patterns of the local population.
2. It is thus the forestry of the people, by the people and for the people.	2. It is a system which is rather localized in its concept for managing the unit of land for maximizes production of agricultural crop and forest trees complimentary with each other.
3. Planting of trees on massive scale is done on vacant land community land, roadside railway track and even degraded reserve forest. Helps to	3. Agroforestry is practiced mostly in farmers' field/own land.

eradicate poverty especially among land less and marginal rural people by providing them job potential.	
4. Mainly trees and shrubs are to be used to harvest multiple products.	4. It involves integration of two or more than two components ion the same unit of land.
5. Social forestry is primarily a government based programme that aims to increase the forest area by rehabilitating wastelands while producing biomass both for industrial and local uses.	5. Agroforestry involves the rural awakening towards self sufficiency by producing maximum biomass per unit area, fulfilling then needs of food, fodder and fuelwood etc..