



Role of Agroforestry in Conservation Agriculture for Enhancing Farm Income

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Conservation Agriculture

Conservation Agriculture (CA) is a farming system that can prevent losses of arable land while regenerating degraded lands. It promotes maintenance of a permanent soil cover, minimum soil disturbance, and diversification of plant species (FAO). Conservation agriculture (CA) is a system of agronomic practices that include reduced tillage (RT) or no-till (NT), permanent organic soil cover by retaining crop residues, and crop rotations, including cover crops. Together these practices aim to increase crop yields by enhancing several regulating and supporting ecosystem services. Though CA was originally introduced to regulate wind and water erosion (Baveye *et. al.*, 2011), it is now considered to deliver multiple ecosystem services.

Principles of Conservation Agriculture

		
1. Minimum mechanical soil disturbance	2. Permanent soil organic cover	3. Species Diversification

Why we practice conservation agriculture ?

- Sustainability
- Enhanced biodiversity
- Carbon sequestration
- Labour saving
- Healthier soil
- Increase yield
- Reduced costs

Benefits of conservation agriculture

1. Economic benefits that improve production efficiency :

- Time saving and thus reduction in labour requirement.
- Reduction of costs, e.g. fuel, machinery operating costs and maintenance, as well as a reduced labour cost.
- Higher efficiency in the sense of more output for a lower input.

2. Agronomic benefits that improve soil productivity :

- Organic matter increase.
- In-soil water conservation.
- Improvement of soil structure, and thus rooting zone

3. Environmental benefits that protect the soil and make agriculture more sustainable:

- Reduction in soil erosion, and thus of road, dam and hydroelectric power plant maintenance costs.
- Improvement of water quality.
- Improvement of air quality.
- Biodiversity increase.

Agroforestry

Definition:- Agroforestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. (www.fao.org.in)

International terminology for grazing lands and grazing animals defines agroforestry as the land-use system in which trees are used for forest products (e.g. timber, pulp, fruits, rubber, syrup, and browse) combined with agricultural crops, including forage crops and animal production (Allen, *et. al.*, 2011).

Classification of Agroforestry System

According to Nair (1987) agroforestry systems can be classified according to the following sets of criteria:

- Structural basis: Considering the composition of the components, including spatial admixture of the woody component, vertical stratification of the component mixes and temporal arrangement of the different components.
- Functional basis: This is based on the major function or role of the different components of the system, mainly of the woody components (these can be product, e.g., production of food, fodder, fuelwood and so on or protective, e.g., windbreak, shelter-belts, soil conservation and so on).
- Socioeconomic basis: Considers the level of inputs of management (low input, high input) or intensity or scale of management and commercial goals (subsistence, commercial, intermediate).
- Ecological basis: Takes into account the environmental conditions on the assumption that certain types of systems can be more appropriate for certain ecological conditions. There may be a set of AF systems for arid and semi-arid lands etc.

Major Agroforestry practices can be classified into the following categories

- ❖ Agrisilvicultural systems
- ❖ Silvopastoral systems
- ❖ Agrosilvopastoral systems and
- ❖ Other systems.

1. Agrisilvicultural System (crops and trees including shrubs/vines and trees): This system involves the conscious and deliberate use of land for the concurrent production of agricultural crops including tree crops and forest crops. Based on the nature of the components this system can be grouped into various forms.

- Improved fallow species in shifting cultivation
- The Taungya system
- Multispecies tree gardens

- Alley cropping (Hedgerow intercropping)
- Multipurpose trees and shrubs on farmlands
- Crop combinations with plantation crops ‘
- Agroforestry fuelwood production
- Shelter-belts
- Wind-breaks
- Soil conservation hedges etc.
- Riparian Buffer



2. Silvopastoral System (trees + pasture and/or animals): Silvopastoral systems are definitely the most prominent agroforestry practice. Silvopastoral systems are characterized by integrating trees with forage and livestock production. Traditionally, silvopastoral systems involved grazing livestock in wooded rangeland and incorporating trees in pastures for shade and timber. The majority of rangeland grazing in hills is typically comprise the grazing of natural herbaceous and shrubby vegetation for under trees such as pines, bhimal, Oak etc. This system is again classified into three categories:



- Protein bank
 - Living fence of fodder trees and hedges,
 - Trees and shrubs on pasture.
3. Agrosilvopastoral System (trees + crops+pasture/animals): This system has been grouped into two subgroups:
- Home Gardens: This is one of the oldest agroforestry practices, found extensively in high rainfall areas in tropical south and south-east Asia. Many species of trees, bushes, vegetables and other herbaceous plants are grown in dense and apparently random arrangements, although some rational control over choice plants and their spatial and temporal arrangement may be exercised. Most home gardens also support a variety of animals (cow, buffalo, bullock, goat, sheep) and birds (chicken, duck). In some places pigs are also raised. Fodder and legumes are widely grown to meet the daily fodder requirements of cattle. The waste materials from crops and homes are used as fodder/feed for animals/birds and barn wastes are used as manure for crops.
 - Woody Hedgerows: In this system various woody hedges especially fast-growing and coppicing fodder shrubs and trees, are planted for the purpose of browse, mulch, green manure, soil conservation etc. The main aim of this system is production of food/fodder/fuelwood and soil conservation.
4. Other Systems: The following systems can be included:
- Apiculture with Trees: In this system various honey (nectar) producing tree species frequently visited by honeybees are planted on the boundary, mixed with an agricultural crop. The main purpose of this system is the production of honey.
 - Aquaforestry: In this system various trees and shrubs preferred by fish are planted on the boundary and around fish-ponds. Tree leaves are used as forage for fish. The main or primary role of this system is fish production and bund stabilization around fish-ponds.

- Multipurpose Wood Lots: In this system special location-specific MPTS are grown mixed or separately planted for various purposes such as wood, fodder, soil protection, soil reclamation etc.

Why agroforestry?

- Agroforestry provides practical solutions to global problems
- Agroforestry provides a wide range of environmental services
- Agroforestry helps reduce poverty
- Agroforestry improves food and nutrition security
- Agroforestry contributes to create resilient livelihoods
- Agroforestry can help local communities and cultures thrive

References

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