

Environmental Protection through Agroforestry

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Abstract:

Agroforestry is a system of using the land in an environmentally friendly manner through which advances can be made in agriculture in order to solve environmental problems. An agroforestry practice consists of intentionally integrating woody vegetation (trees or shrubs) with crops and/or animal systems so that the resulting ecological and economic interactions can be reaped. Research suggests that the global agro-food sector may be able to achieve more sustainable methods of food and fiber production by adopting principles and practices that are based on agroforestry as a key means of achieving this. By adopting agroforestry principles and practices, farmers will benefit economically, as well as society in a positive way. There are numerous provisioning, regulating, cultural and supporting ecosystem services and environmental benefits that are provided by agroforestry, while also promoting eco-intensification based on a more efficient use of resources within an ecosystem. There is a lot of information that has been included in this article regarding the environmental benefits that agroforestry provides to the environment and how agroforestry helps protect the environment.

Introduction:

Many ecosystem services and environmental benefits can be obtained in the form of agroforestry, which has been recognized for its importance. There is now increasing awareness of its benefits and importance of managing it for global betterment, as evidenced by past and present research that shows this to be the case, and people are becoming more aware of those benefits. An important aspect of agroforestry is its potential for poverty alleviation, income generation, mitigation of climate change, soil health improvement, and the enhancement of other benefits to the environment. Consequently, farmers should adopt

this method on a large scale in order to be able to reap the benefits from it. The role that agroforestry plays in the agricultural sector is multi-functional. Agroforestry is a type of agriculture that bridges the gap between agriculture and forestry so that both environmental and socio-economic benefits can be achieved. Several studies have indicated that agroforestry has substantial potential to mitigate climate change, improve soil health, provide clean air and water, store carbon, and to generate income and well-being for mankind on the one hand and to mitigate climate change on the other hand. There are mainly four types of ecosystem services that can be classified as follows:

- Provision service
- Regulation service
- Cultural service
- Ancillary services



Fig 1: Agroforestry crops

Agroforestry offers a wide variety of ecosystem services that include carbon storage, clean air and water, soil health improvement, pollination, pest control, soil stability, erosion control, biodiversity, primary production, flood mitigation, cultural and aesthetic services, etc. As one of the most important ecosystem services offered by agroforestry, carbon storage is one of the most important. There is a direct connection between it and the mitigation of the effects of climate change.

Importance of Agroforestry:

There is no doubt that trees act as a collector of atmospheric CO₂. The other environmental benefits that are associated with agroforestry make it a better option for the mitigation of climate change than oceans or other terrestrial options. As far as storage capacity is concerned, the recommendations adopted depend on the type of agroforestry, the environment, the age of the trees, the species chosen, and so on. In Southeast Asia,

agroforestry systems are capable of storing 12–228 Mg of carbon per hectare in humid tropical lands and 68–81 Mg of carbon per hectare in dry lowlands.

The diversity of life on earth is under threat due to the excessive pressure of population growth and industrialization. It is important to note that biodiversity can be protected not only within the boundaries of forests and biosphere reserves, but also by establishing multifunctional agroforestry systems that can be adopted in many ways to conserve and enhance biodiversity. There is no doubt that agroforestry serves as a major environmental protector and enhancer of biodiversity in temperate and tropical regions of the world, both above and below ground levels. Through the adoption of agroforestry systems, it is possible to increase both the above-ground diversity as well as the below-ground microbial diversity to a significant extent.

The importance of agroforestry systems can be summarized as follows:

- Contributes to the conservation of germplasm and the biodiversity of species of plants and animals.
- As a habitat for a variety of species, it serves as a vital component of the ecosystem.
- Contributes to the establishment of sustainable forest management systems.
- Provides income generation opportunities for small scale farmers, as well as socio-economic benefits to them.
- Adding and cycling nutrients to the soil also improves the quality of the soil.
- Providing a sink for atmospheric carbon dioxide thereby mitigating the effects of climate change.
- This ensures that food and soil are secure in the long term.

Types of agroforestry:

1. **Agro-Silviculture:** multi-year-old trees are planted randomly or systematically in cropland with annual crops (for the purpose of providing food, fuel, fibre, timber, etc.) of the same type.
2. **Silvi-Pastureculture:** method involves the planting of trees either randomly or systematically on the grasslands in order to provide the grasslands with food, fuel, fibre, and wood in exchange for the trees planted on them. In addition to that, they are also used for the production of fodder, meal, and animal feed. This method can also be applied to barren lands as a means of utilizing them.

3. **Agro- Silvi-Pastureculture:** It is the cultivation of crops as well as animal and dairy products on the same piece of land.
4. **Home Garden:** Gardening in urban, peri-urban, or home conditions that combine trees and shrubs with the production of vegetables and fruits.
5. **Agro- Horticulture:** The cultivation of agricultural crops along with trees, flowers, fruit trees and vegetables on the same plot of land at the same time.
6. **Agro- Horti- Forestry:** This forest is used for growing fruit trees, vegetables/flowers/ornamental trees, and agricultural crops with value as fodder, timber, and fuel etc.

Conclusions:

By more efficiently cycling nutrients and reducing erosion, agroforestry is a very effective way to store large amounts of carbon and prevent soil fertility from eroding. Thus, it is also beneficial in terms of protecting crops and water sources, soil and settlements, as well as increasing agricultural yields. As a result of agroforestry systems, trees play an important role in nutrient cycling in addition to adding a great deal of nutrients and organic matter to the soil, mainly through leaf fall and root decomposition. A buffer effect is provided by organically planted trees. By filtering nutrients, they reduce the amount of nutrients lost as a result of sedimentation. By doing so, the environmental benefits will be maximized in an efficient manner. Trees need to be planted in sensitive areas, or wetland areas need to be created in sensitive areas. In order to remove silt deposits, nutrients, herbicides in surface and subsurface water before entering a water body, it is recommended to plant slow-growing trees, shrubs, and native grasses along water bodies. These buffers can be created by planting fast-growing trees along the water bodies. Therefore, there is an increasing need to promote agroforestry to achieve a higher level of agricultural productivity, as agroforestry - along with retaining carbon, improving nutrient and water cycling, preventing soil erosion and controlling runoff - can provide social and economic benefits and boost agricultural productivity. This is also something that you will be able to do.

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