

Environmental Protection through Agro-forestry

Shripati Dwivedi¹, Pardeep Puria¹, S. Sangeeta Kumari^{1*} and Abhishek Kumar²

¹Research scholar, Department of Agricultural Economics, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar (848125), India

²Research scholar, Department of Genetics and Plant Breeding, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar (848125), India

ARTICLE ID: 25

Abstract:

Agro forestry 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 agro forestry 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 agro forestry as a key means of achieving this. By adopting agro forestry principles and practices, farmers will benefit economically, as well as society in a positive way. There is numerous provisioning, regulating, cultural and supporting ecosystem services and environmental benefits that are provided by agro forestry, 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 agro forestry provides to the environment and how agro forestry helps protect the environment.

Introduction:

Many ecosystem services and environmental benefits can be obtained in the form of agro forestry, 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 agro forestry plays in the agricultural sector is multi-functional. Agro forestry 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 agro forestry 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: Agro forestry crops

Agro forestry 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 agro forestry, 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 Agro forestry:

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 agro forestry, 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 agro forestry systems that can be adopted in many ways to conserve and enhance biodiversity. There is no doubt that agro forestry 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 agro forestry 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 agro forestry:

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-Pasture culture:** 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, agro forestry 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 agro forestry 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.

References:

Alavalapati, J. R., Shrestha, R. K., Stainback, G. A., & Matta, J. R. (2004). Agroforestry development: An environmental economic perspective. *New Vistas in Agroforestry: A*



- Compendium for 1st World Congress of Agroforestry*, (pp. 299-310). Springer Netherlands.
- Dhyani, S. K., & Handa, A. K. (2013). Area under agroforestry in India: An assessment for present status and future perspective. *Indian Journal of Agroforestry*, 15(1), 1-11.
- Nair, P. R. (2011). Agroforestry systems and environmental quality: introduction. *Journal of environmental quality*, 40(3), 784-790.
- Raj, A., Jhariya, M. K., Yadav, D. K., & Banerjee, A. (Eds.). (2020). Climate change and agroforestry systems: adaptation and mitigation strategies. CRC Press.
- Raj, A., Jhariya, M. K., Yadav, D. K., Banerjee, A., & Meena, R. S. (2019). Agroforestry: a holistic approach for agricultural sustainability. *Sustainable agriculture, forest and environmental management*, 101-131.
- Schoeneberger, M. M. (2009). Agroforestry: working trees for sequestering carbon on agricultural lands. *Agroforestry systems*, 75, 27-37.