Different Types Of Agroforestry Systems In District Saharanpur

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Abstract

Using agroforestry as an example, the study explored the status of the practice in the district of Saharanpur and analyzed it. This study was done in 10 villages of the district Saharanpur and 10 farmers were selected randomly from each village. There were mainly three agroforestry practices being practiced by the farmers: Agri silviculture, Horticulture, and Silvopastoral. In the study area poplar, eucalyptus and other tree species were growing along with crops and fodder. There is an 89% adoption rate of agroforestry in the region. Poplar is the most common crop grown by farmers (90%) in the region.

Keywords: *Agroforestry, practices, farmers, Species.*

1. Introduction

Agroforestry trees offer food, fodder, industrial raw materials, lumber, fuel, and mulch, as well as varying diets and generating money (ICRAF, 1993). The practice of agroforestry dates back thousands of years(Himshikha, n.d.). The agricultural forestry system involves planting trees or shrubs near or in between crops or pastures(Saravanan & Berry, 2021). Agroforestry is one of the first-rate recognized conventional practices and has a vital position in lowering vulnerability growing resilience of farming systems and buffering households towards weather-associated dangers, but there are several demanding situations that reap the advantages of agroforestry in India(Shukla et al., 2020). There are many benefits of agroforestry practices to the environment like increased biodiversity, erosion reduction, and increased soil fertility, etc. The capacity of agroforestry structures to deliver monetary, environmental, and social blessings(Mosquera-Losada et al., 2012). Different type of agroforestry practices is being practiced in diff[1]erent parts, of India. Revegetating marginal land with trees and grasses in conjunction with crops could make 50 percent of the country's agricultural land more productive(Dwivedi et al., n.d.). As far back as history can be traced, agroforestry has been practiced in Saharanpur, UP. In agricultural landscapes, agroforestry integrates trees to enhance production for social, economic, and environmental benefits by incorporating trees into an ecologically-based natural resources management system. By growing crops and/or livestock along with trees and shrubs, agroforestry practices can take advantage of the benefits of interplay. Traditional practices like this are well known for providing livelihoods, managing land appropriately, and promoting sustainable development. In different places, agroforestry is referred to by multiple terms that denote different forms or subdivisions. Some publications list "Agri-horticulture," "horticulture," "Agri-silvers," and "silvi-pastures," etc. Agroforestry is being practiced in India and other countries for so long. As well as modern agroforestry systems, there have also been systems established for environmental protection such as riparian buffers, shelterbelts, and soil protection systems for food, fuel, and timber, including soarable (trees and crops) and silvopastoral (trees and pasture/livestock)(Rajput & Upadhyay, 2019).

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The rate of adoption of agroforestry in Uttar Pradesh is very high because comparatively traditional agroforestry or forestry yields more returns. In districts of Uttar Pradesh, different agroforestry practices are being practiced. In western Uttar Pradesh farmers are commonly growing Poplar (Populus deltoides) or Eucalyptus with crops or fodder.

2. Agroforestry practices in district Saharanpur

Saharanpur is mostly known for the types of agroforestry practices that are practiced by local farmers. Agroforestry offers a great deal of potential to create jobs for rural and urban residents through production, industrial use, and value-added initiatives(Sudhir Sharma, n.d.). Agroforestry has benefited millions of people in linked economic sectors including transportation, wholesale, retailing, and other areas in addition to farmers by providing raw materials to the wood industry(SRINIVAS Sri Kiran Biotech KHAMMAM, n.d.). Agroforestry systems consist of each conventional and modern-day land-use gadget dynamics and are ecologically based and totally naturally aid control structures that diversify and sustain production to be able to increase social, monetary, and environmental blessings for land customers in any respect scales(Bhandari et al., 2021). Mainly three types of agroforestry systems are being practiced in the region: "agro-silviculture", "horticulture" and "silvopastoral". In the district Saharanpur, agroforestry systems are largely determined by economic returns, land holding size, and socioeconomic issues. There is a variety of agroforestry systems found in the district, including block plantation, boundary planting, food, fodder, fuel, and agroforestry systems catering to small logs, raw materials for wood-based industries, etc. Agricultural silviculture is more popular among farmers due to the convenience of marketing timber and the sustainable income that comes from it. As a result of limited information about industrial agroforestry and tree maintenance, some farmers practice traditional agroforestry. It is not well known whether farmers who practice traditional agroforestry systems benefit economically beyond meeting their daily needs. Typically, boundary trees include poplars, eucalyptus, Sheesham, bamboo, etc. to serve multiple purposes. Small timber can be obtained from them as well as fuel, etc.

3. Methodology

3.1 Study area

This present study was conducted in 10 different villages of the district Saharanpur. It covers a geographical area of 3,589 km2 and is situated between 29°34′ and 30°23′N and 77°05′ and 77°58′E. With an elevation of 284 meters above sea level, it is the highest point in the city. Between the holy rivers of the Ganges and the Yamuna, the Saharanpur district forms the most northern part of Doab land. Saharanpur District is surrounded by Shivalik hills in the north and northeast and the Yamuna River forms the boundary in the west, which separates it from the Karnal and Yamunanagar districts of Haryana. The geographical area of the district is 3860 sq. km. Saharanpur has a tropical climate because of the proximity of the Himalayan region across this northern district. It is a sub-humid region, especially in the upper Ganga plain area. Saharanpur records an average temperature of about 23.3°C during the year. June is the hottest month, and January is the coldest. Humidity is more in the western area compared to the eastern region of Saharanpur. Agriculture plays an important role in the economy of the district. Roughly 70% of the land is under agricultural use. The important food crops of the region are wheat, rice, jawar, maize, and bajra. Sugarcane is the main commercial crop.

This study was conducted in the district of Saharanpur where a large number of farmers adopted agroforestry at present. There is huge popularity for popular among farmers, and wheat (Triticum aestivum) is one of the most important rabi crops. It was found that poplar-based agroforestry yields a higher return on investment than other crop rotation strategies.
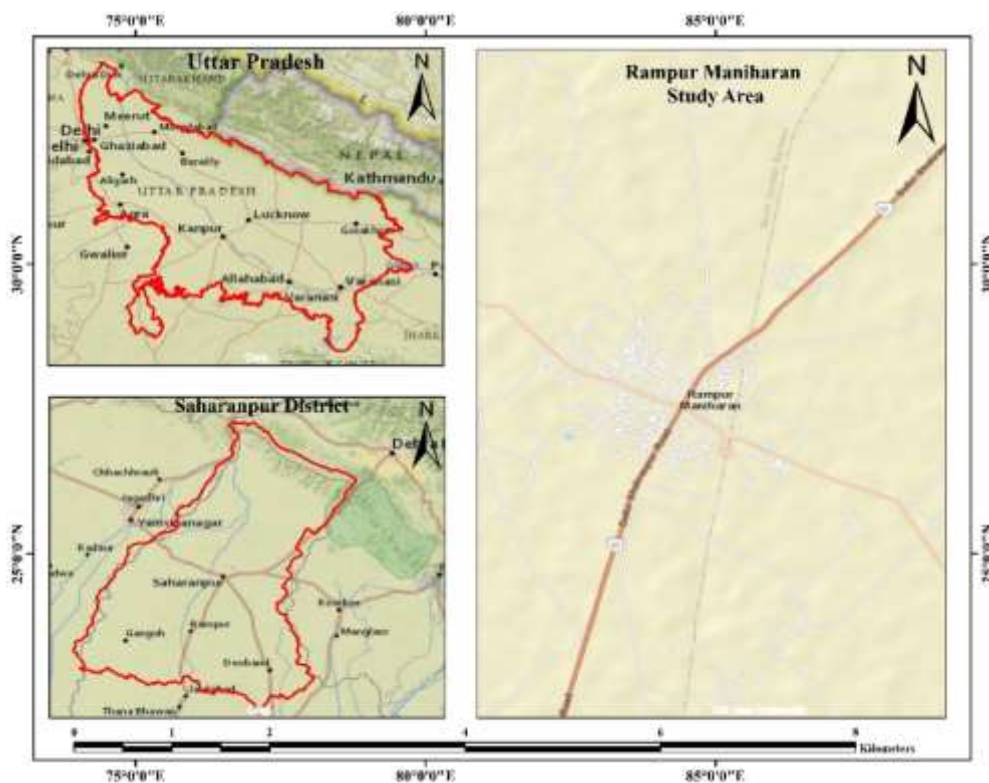
Fig. 1. Location map of the study area

3.2 Survey

For this study survey was done in 10 villages of the district Saharanpur. Agriculture is widely spread in Saharanpur, which is why this study was undertaken there. The survey was done through field visits and direct interviews with farmers. A questionnaire was pretested to collect information. 10 farmers were randomly selected from each village (a total of 100 farmers) for the survey and heads of the family were interviewed. To accomplish this, a list of villages was prepared that come under the range of 50 km from the district. A survey of 100 randomly selected households was conducted in 10 selected villages to determine the area under various agricultural land uses and different types of crops and trees retained for various purposes and agroforestry practices. Five adjacent villages with farmers adopting and not adopting agroforestry were surveyed to see whether the questions were clear and valid before they were put to the final test. Questionnaires have been modified slightly or additionally based on input from the pretesting exercise. We surveyed villages selected at random after making necessary adjustments to the questionnaire.

3.3 Data collection

For primary data collection, a semi-structured questionnaire was prepared. The purpose of the survey was to capture basic demographic information by using semi-structured and simple questionnaires. On their farm, the majority of these farmers practiced agroforestry in the study area. The questionnaire was related to the information about the land size, agricultural details, and personal details of farmers. To gain farmers' perspectives on agroforestry practices, some discussions were conducted with them. Participants are asked to describe how well they know about agroforestry practices and their benefits. The questionnaire also included an open-ended questionnaire. We interviewed 100 farmers on socioeconomic status and economic analysis during the household survey. farmers have been authorized fully expressed themselves and respond to the expectations or opinions of the analysts.

3.4 Observation during the survey

It was observed that a large number of farmers adopted agroforestry and poplar is the growing species along with crops. Trees are growing mostly in the boundary system on fields.

3.5 Data analysis

The data was collected from 10 villages in the district Saharanpur and then it was converted into numbers. Tables were created and filled using this data. Statics were used to assess the data like frequency count, mean, percentage and average, etc. Data were analyzed using MS excel.

4. Result and discussion

4.1 Percentage of agroforestry practices

According to a study by TERI (2000), the adoption level of agroforestry in the Saharanpur district was **over 90 percent.** Mainly three types of agroforestry practiced were being practiced in the district Saharanpur, "agro-silviculture", "horticulture" and

Table 1. The percentage of different agroforestry systems

Agroforestry system	Percentage	Rank in district
Agro-silviculture	88%	1
Horticulture	5%	2
silvopastoral	7%	3

This table is showing the percentage of different agroforestry practices in the district according to the response of farmers.

I. Agro-silviculture: According to the survey, it is confirmed that agro-silviculture is the most practiced system in the study area. Agrosilviculture, which made up 88% of all practices used in the research region, included boundary and block plantations of several tree species with other crops. The incorporation of timber and plants that are able to biologically beautify soil nutrients like nitrogen is reasonably not unusual in tropical agroforestry systems (Indu Murthy et al., 2016). It intentionally combines agriculture and forestry to create integrated and sustainable land-use systems(Uleh & Usman, 2020). In this system, different species of trees (Populus deltoides, Eucalyptus tereticornis, Dalbergia sissoo, etc.) grow with crops, like wheat and rice.

II. Horticulture: It was observed, that only 5% of farmers are practicing horticulture (farming of fruit trees) in that region. Different types of seasonal fruits are growing in the fields like; mango, guava, Jamun, etc. Horticulture is also tree-based, farmers are growing trees like eucalyptus with fruit tree species. Instead of harvesting trees depending on their rotation age, farmers that follow these patterns in horticulture species-based approaches leave their tree species in orchard plantations/home gardens for an endless period (Himshikha, n.d.).

III. Silvopastoral: Farmers grow fodder on their fields for selling purposes or for their livestock. Fodder growing with tree species is known as silvopastoral. They are acknowledged as an integrated strategy for sustainable land use since they permit the intensification of cattle production based on natural processes (Nair et al. 2009). Farmers that practice agroforestry grew the principal fodder species berseem. Sorghum and other fodder species are also growing with tree species. These fodder species are seasonal, berseem is winter is a winter crop and sorghum are summer fodder crop. From November to April berseem is growing on the fields and from June to August or September sorghum and other fodder species are growing.

5. Tree species growing in agroforestry practices

Agroforestry trees offer food, fodder, industrial raw materials, lumber, fuel, and mulch, as well as varying diets and generating money. Poplar and eucalyptus are major tree species that are growing with crops in agro-silviculture practice. Tree species are economically more beneficial for the farmers. In the district Saharanpur it was observed that most farmers are growing poplar trees with crops (table 2.).

Table 2. The percentage of tree species growing with crops

Tree species	Number of adopters	Percentage of adopters
Popular	81	81%
Eucalyptus	15	15%
other	4	4%
Total	100	100%

This table is showing, that poplar is the most favored tree species for agroforestry practices among local farmers. The price of poplar wood in the timber market of that region is comparatively higher, this is the major reason to choose the poplar tree for growing on the fields. In addition to being planted in wood plantations to produce wood, poplar is also grown in agroforestry systems as a quick-growing windbreak and/or as an extra source of revenue. Most farmers are growing trees on the boundary of their fields.

6. Details of agricultural crops

Table 3. Percentage of agricultural crops

Agricultural crops species	Number of farmers	Percentage
Wheat	87	87%
Paddy	68	68%
sugarcane	45	45%

It is shown in table 3. According to reports, the most popular crops recorded for growth were wheat, paddy, and sugarcane. Wheat was the most prevalent crop in terms of the total number of farmers involved because it was cultivated by every responder agroforestry farmer. These agricultural crops are growing for food requirements. However, excess crop debris and grain content are also sold in nearby markets for economic benefits.

7. Conclusion

it was confirmed that in the district Saharanpur mainly three types of agroforestry systems are being practiced. The most adopted agroforestry system in that region is agrosilviculture and in agrosilviculture poplar tree is the most favored tree species. Boundary plantations are very common among farmers in agroforestry systems. According to the survey, it is been observed that a large number of farmers are adopting different agroforestry systems. The study's findings demonstrated that the majority of farmers—more than three-fourths of respondents—plant in border patterns, one-fourth in block patterns, and roughly one out of every ten respondents in this category render trees in scattered shapes. Very few farmers are practicing horticulture on their lands and that is in scattered form. Along with implementing agroforestry, farmers in the study area also raised various breeds of cattle. According to the study, wheat is a most growing agricultural crop. The second dominant crop is paddy and then sugarcane takes place. Berseem and sorghum are the major fodder crops that were growing along with tree species. In addition to meeting the farmers' personal and commercial requirements, agroforestry systems have several positive effects on the environment.

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