# THE IMPACTS OF AGROFORESTRY PRACTICES ON FARMERS IN TEHSIL THANA, DISTRICT MALAKAND, KHYBER PAKHTUNKHWA

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## ABSTRACT

A variety of biotic and abiotic processes are contributing to the global decline in forest ecosystem and health. The country's expanding population (>208 million) is putting increasing strain on Pakistan's food production systems and forest resources, and this is having a negative impact on the nation's forest ecosystems. It is necessary to have efficient food systems that promote social acceptability, productivity, economic outputs, and the environment. Effective use of the right communication tools, together with the right message, messenger, and target audience, are additional requirements for successful promotion. To improve agroforestry in Pakistan, corrective steps to simplify the current systems and develop long-term sustainable methods and methodologies are recommended. This study was conducted in District Malakand to learn the effects of agroforestry practices on farmers and the significant reasons for planting as well as the primary advantages obtained from agroforestry in order to comprehend the effects of agroforestry practices on farmers in Tehsil Thana, District Malakand, KP. A structured questionnaire was used to gather the necessary data from 40 respondents using a two-stage random sampling procedure. According to our findings, 72% of respondents are farmers, 20% work for the government, and 8% are labourers. Poplar is the species most frequently used in agroforestry, accounting for 52% of all plantings, followed by Eucalyptus at 16%. 10% of the seedlings for planting came from the Forest Department, and 90% came from private nurseries. 30% of respondents plant for shelterbelt purposes, 10% for land stabilisation, and 60% of respondents plant primarily for economic gain.

**Keywords:** Agroforestry, Respondents, Households Fuelwood.

## INTRODUCTION

In the context of climate change, increasing population, deforestation, reduced landholdings and declining soil productivity, Agriculture is emerging as an affordable and accessible science-based solution that will help smallholders protect and enrich soils, increase food production, adapt to climate change and reduce greenhouse gas emissions (Garrity *et al.,* 2009). According to Rahman *et al.* (2014), there are several causes of deforestation in Pakistan, including the country's fast population increase, the development of agricultural, market demands, shifting land ownership laws, and political instability. Farmers use intensive agricultural techniques and frequently clear forests on steep slopes to cultivate very marginal land. In Pakistan, it's estimated that around 39,000 acres of forest are destroyed each year Hasan (2007). Agroforestry allows farmers to manage their fields in a way that mimics natural ecosystems by integrating trees or shrubs into farming systems in a succession that is comparable to what

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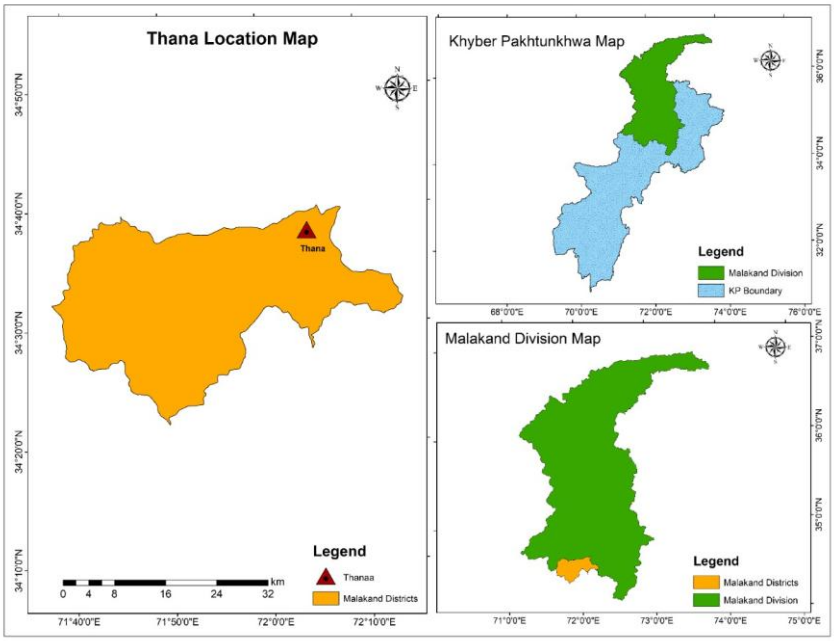
happens in natural systems. According to Garrity and Swallow (2009), agroforestry technologies have the potential to boost farmers' output as well as their standard of living. According to Chao (2012) 1.2 billion people in poor nations depend on agroforestry practices to maintain agricultural output and generate revenue. Due to its location in a dry and hyper-dry area of the world, Pakistan lacks commercially valuable natural forest resources (Rahman *et al.,* 2014). According to the Government of Pakistan (2013), just 5% of the nation is covered with woods for local farmers who practice irrigated and rainfed agriculture in Pakistan's northern zones, especially in the steep hills of Malakand, agricultural development and improvement is a difficult challenge. The productivity of soils is quite high. The majority of Pakistan's hilly regions rely on monsoon rains for agricultural production, yet under such circumstances, crop yields are high and reliable. Several local farmers were inspired to adopt agroforestry in Malakand in recent years by the growth of the practice in the vicinity of Hills. Additionally, growing trees in the hills can help meet the region's growing need for firewood, boost the local timber industry, and create more job opportunities. Despite the clear advantages of agroforestry in the Malakand Region, many local farmers continue to grow conventional, non-irrigated crops on the steep slopes. Therefore, a good understanding of why some farmers choose to practice agroforestry in mountainous locations and why others do not is essential in the area. Regarding the elements influencing the adoption of agroforestry practices (Mercer, 2004). The majority of household production frameworks have been included in theoretical models of agroforestry adoption to represent the adoption of agroforestry as an investment decision based on maximization of projected utility or profit, given different labour and financial restrictions (Mercer, 2004). According to Adesina and Chianu (2002), adoption is most likely when a farmer has the necessary resources (such as land, labour, and revenue) to start using a new agricultural practice. Adoption by neighbours and education both have an impact. In order to understand why agroforestry is being adopted, adoption studies frequently focus on external factors like commodities markets and governmental regulations. For smallholder farmers in underdeveloped nations, like the farmers in our research, these characteristics are particularly important. A wide range of other factors also influence the decision, even if economic concerns are essential in the adoption process. Market involvement is also connected with the original circumstances surrounding several aspects of the home and farm, such as the size of the land, asset ownership, affluence, and the current agro-ecological environment (Amrouk *et al.,* 2013). For instance, a study of Nigerian farmers' choices to embrace alley farming revealed that both economic factors and farmer traits were important in explaining choices Adesina and Chianu (2002). Similar to this, it was discovered that smallholder farmers' decisions to incorporate woody plants in Ethiopia depended on resource-based factors like a lack of land and seedlings, competition with important cash crops, access to infrastructure and support services, as well as individual farmer characteristics (Krause *et al.,* 2007).

Furthermore, Nouman *et al.* (2006) concluded that farmers were adopting agroforestry practices mainly to meet their fodder and fuelwood needs. Farmers often adjust the technology and can play an important role in the development and adoption of agroforestry practices (Douthwaite *et al.,* 2002; Thangata and Alavalapati 2003; Ajayi *et al.,* 2003). In recent past researchers have focused on socio psychological factors, e.g. farmers' perceptions, to explain adoption behavior. Farmers' perceptions of what they need for adopting agroforestry and which risks are connected with agroforestry adoption can play a major role. Uncertainty inhibits adoption, assuming farmers are often risk averse, given that doubt can drive incorrect predictions of the expected benefits from adoption (Pannell 2003). The study aims to assess the impacts of agroforestry practices in district Malakand and to know farmers perceptions towards economic importance of agroforestry.

## MATERIAL AND METHODS

### Study Area

Malakand District is a district of Pakistan's Khyber Pakhtunkhwa province's Malakand Division, located at 34.5030° N and 71.9046° E. The district joined Malakand Division in 1970. The Malakand District is strategically significant since it serves as the entrance to Bajaur, Lower Dir, Swat, and Buner. It is bordered by mountains, which were once thickly covered with a variety of trees but now appear bare.




**Map of Malakand Division**

## Data collection and sampling strategy

To obtain the data, a properly crafted questionnaire was created. The study's goals were taken into consideration when creating the questionnaire. For the purpose of gathering responders, a two-stage random sample procedure was used. From a list of 50 union council in tehsil, five were first chosen randomly. Ten farmers were chosen at random from each chosen hamlet for the second stage. In order to acquire the necessary data for the study's goal, interviews with fifty farmers in total were conducted. In the table, the union council's specifics and the total number of responders are listed (Table 1).

Table 1. List of Union Councils' Sample

| S.No | Name of union council | No of respondents |
|---|---|---|
| 1 | Alladand | 10 |
| 2 | Thana Jadeed | 10 |
| 3 | Thana Bandajat | 10 |
| 4 | Thana Proper | 10 |
| 5 | Totakan | 10 |

The sampling intensity was kept at 12% out of 50 union councils during the first stage, which involved choosing union councils, and five union councils were picked at random. After that, ten respondents were picked at random from each union council using a 1% sample intensity and the assumption that there were 1000 households in each union council. A field survey was conducted in July 2022 from July 10 to July 25. Information was gathered from forty different respondents using a structured questionnaire with 30 questions. We had a 100% response rate.

## Data Analysis and compilation

It was necessary to transfer all of the collected data into a tally sheet in order to compile and tabulate the data. Using simple statistical techniques like the average and percentage, the data were analyzed and discussed, conclusions were drawn, and then appropriate recommendations and proposals were written.

## RESULTS

The majority of respondents (30%) are between the ages of 31 and 40, while 26% are between the ages of 41 and 50. Although the respondents to the survey had a variety of sources of income, farming accounted for the majority of them. In a total of 40 respondents, 26% had farming as their primary source of income, 25% worked for the government, and 10% were workers, as shown in the table below.

## Livestock composition

According to the study, various respondents have diverse preferences when it comes to raising livestock. Of the respondents, 61.9% are raising cows, whereas 19% are raising buffaloes, 10.7% are raising goats, and 8.3% are raising horses, donkeys, or mules. The table below displays the information.

Table 2. Livestock composition

| Livestock Composition | Frequency | Percentage |
|---|---|---|
| Number of cow | 52 | 61.9 |
| Number of buffaloes | 16 | 19 |
| Number of goats | 9 | 10.7 |
| Horse/Donkey/Mule | 7 | 8.3 |
| Total | 84 | 100 |

## Land holding size in kanal

Following completion of the survey, various respondents have varying land holding sizes. In the table below, 28% of respondents have land that is between 11 and 20 canals, 18% have land that is between 21 and 30 kanals, 14% have land that is between 31 and 40 canals, and 8% have land that is between 41 and 50 kanals.

Table 3. Land holding size in Kanal

| Area in kanal | No of Respondents | Percentage |
|---|---|---|
| 1 to 10 | 13 | 26 |
| 11 to 20 | 14 | 28 |
| 21 to 30 | 9 | 18 |
| 31 to 40 | 7 | 14 |
| 41 to 50 | 4 | 8 |
| Above 50 | 3 | 6 |

## Species for agroforestry and source of seedlings

Varying people in the study region have different opinions on the best species to use for agroforestry, but overall, 52% of respondents said they preferred poplar species, while 14% said they preferred poplar and mulberry species and 34% preferred Mixed Species for agroforestry. When asked where they got their plants, 45 respondents (90%) said they got them from private nurseries, whereas 5 respondents (10%) said they got them from public nurseries, as indicated in the table 4 and fig 1 below.

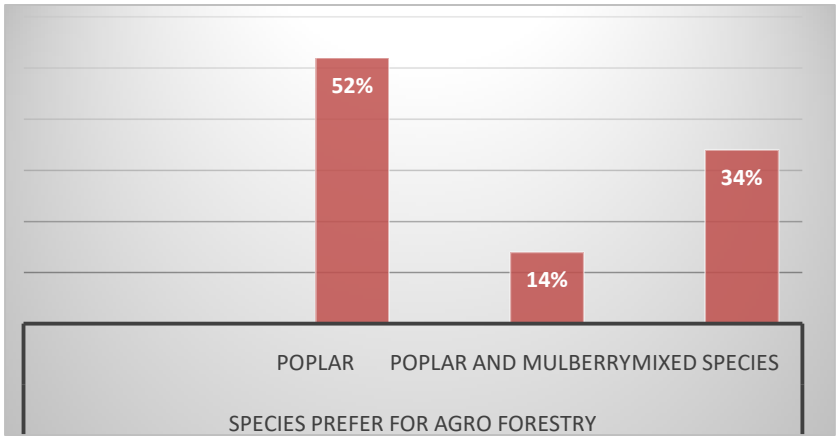



Fig.1 Species for agroforestry by farmers

Table 4. Source of Seedling

| Source of Seedling | No of Respondents | Percentage |
|---|---|---|
| private nursery | 45 | 90 |
| forest department | 5 | 10 |

**Primary reason of planting**

A total of 50 respondents were questioned about the main reason they planted, of which 30 (or 60%) said it was for the financial gain, 15 (or 30%) said it was for a shelter belt, and 5 (or 10%) said it was for land stabilization as shown in Fig 2 below.

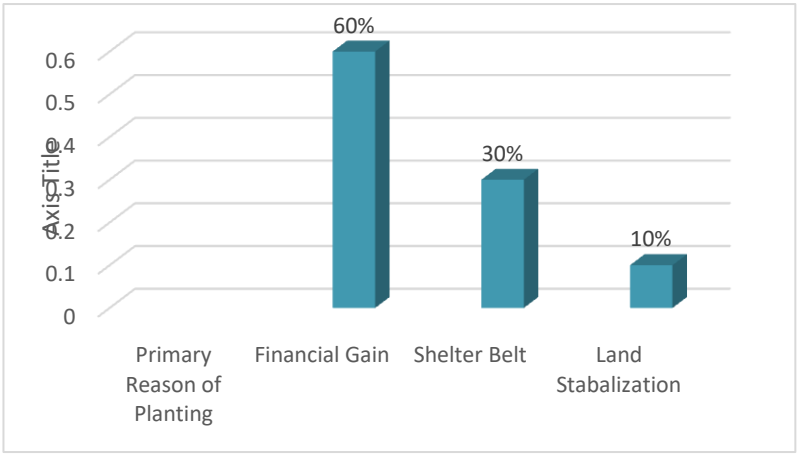



Fig.2 Primary Reason of Planting

## Benefits from agroforestry

People tend to believe that agroforestry has a wide range of advantages for us. Agroforestry provides both income and fuel wood to about 18 respondents (36%); 9 respondents (18%) receive cash directly from the activity, while 23 respondents (46%) receive fuel wood.

Table 5. Benefits from agroforestry

| Benefits from Agroforestry | No of respondents | Percentage |
|---|---|---|
| Cash and Fuel wood | 18 | 36 |
| Fuel wood | 9 | 18 |
| Cash | 23 | 46 |

## Source of fuel wood and fuel wood consumption per annum

Different responses use wood from various sources. In accordance with the data collection, out of 50 respondents, 21 respondents (42%) used fuel wood from their farmland, 14 respondents (28%) bought fuel wood from the market, and some people used both farmland and the market for fuel wood, respondents and represents 30% of the total. Different classifications were created to know how much fuel wood each household uses annually for data collection on fuel consumption, and some families also use LPG. Generally, 12 respondents (24%) used fuel wood weighing between 1600 and 2500 kg, 9 respondents (18%) used fuel wood weighing between 2600 and 3500 kg, and 9 respondents (18%) used LPG as a fuel source. Additional classifications and their consumption of fuel wood are listed in the table 6 and Fig 3 below.

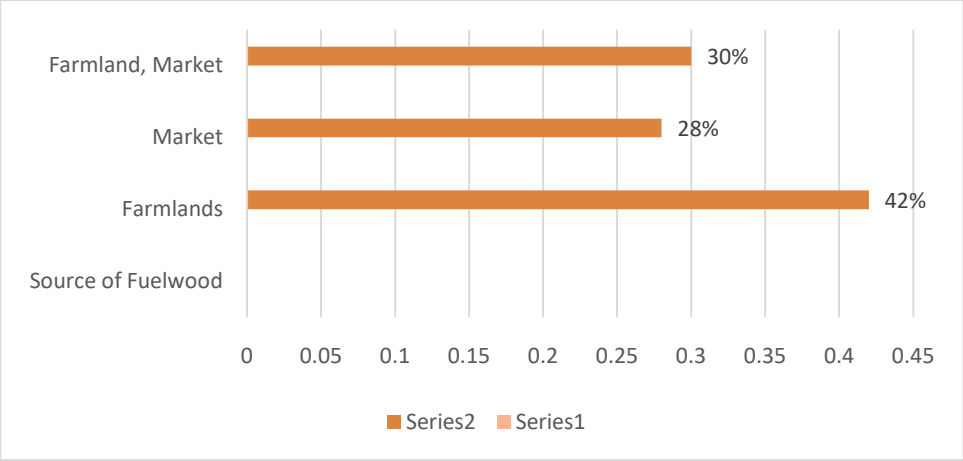



Fig.3. Source of Fuel Wood

Table 6. Fuel wood consumption per Annual

| Fuel wood consumption per Annum | No of Respondents | Percentage |
|---|---|---|
| 500-1500 kg | 3 | 6 |
| 1600-2500 kg | 12 | 24 |
| 2600-3500 kg | 9 | 18 |
| More than 3600 | 12 | 24 |
| Use 0f LPG | 14 | 28 |
| Total | 50 | 100 |

## Monthly income before and after agroforestry

Farmers were questioned about their monthly income before and after agroforestry in order to understand the value of the practice and how it helped them address their financial issues and enhance the standard of living for their communities. According to the data, the monthly income from the same land before agroforestry was lower than it was after agroforestry, so the income from the same land after agroforestry grew, as indicated in table 7 below.

Table 7. Monthly incomes before and after agroforestry

| Number of respondents | Monthly Income before Agroforestry | Area in kanal before and after agroforestry | Monthly Income After Agroforestry |
|---|---|---|---|
| 7 | 8000-12,000 | up to 3 canals | 10000-15000 |
| 19 | 13,000-17,000 | 4 to 5 | 17000-22000 |
| 9 | 18,000-22,000 | 6 to 7 | 24000-29000 |
| 5 | more than 20,000 | More than 8 | More than 30000 |

## Farmer’s perspective regarding agroforestry

Out of 50 participants in the poll, 36 (72%) expressed favorable opinions about agroforestry, while 14 (28%) expressed unfavorable opinions as shown in Fig 4 below.

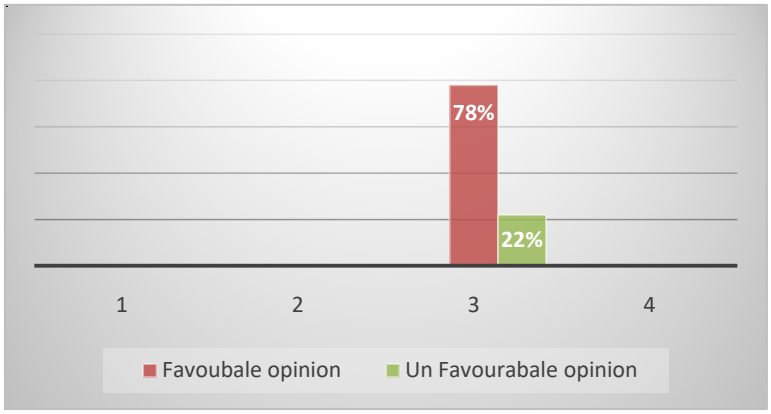



Fig. 4. Farmers Perspective regarding Agroforestry

## DISCUSSIONS

According to our findings, 72% of respondents are farmers and have understanding of agroforestry and participate in it. The local farmers either planted trees on borders and bunds (sequentially with crops) or planted them such that they intercropped on irrigated land that was once utilised for growing grain. Trees require a long maturation period before they can be utilised for agriculture, in contrast to cereal crops. However, according to Hasan *et al.,* 2007, the majority of the local farmers have a traditional understanding of agroforestry, and the percentage of farmers who participate in it accounts for about half of the population (60.5%) which is consistent with our findings.

According to our findings Poplar is the species most frequently used in agroforestry, accounting for 52% of all plantings, followed by Eucalyptus at 16%. 10% of the seedlings for planting came from the Forest Department, and 90% came from private nurseries. 30% of respondent's plant for shelterbelt purposes, 10% for land stabilization, and 60% of respondents plant primarily for economic gain. While according to a survey carried out in East Java, Indonesia, 58.7% of the respondents have implemented agroforestry practices and the main specie accounting is Eucalyptus which is accounting 42%, which is contrary with our findings. Although a research carried out in Tanzania in 2021, revealed that a much lower proportion of farmers (only 10.19% of farmers) had adopted agroforestry or planted at least one new tree on their properties.

Our Research finding also shows that 36% of families profit from agroforestry in terms of money and fuel wood. 40% of it is coal, and 18% of it is fuel wood. On contrary Irshad *et. al.,* 2011 illustrated that about low population (25%) is practicing agroforestry and are completely dependent on Agroforestry.

In our findings 17.85% of respondents reported that agroforestry is a difficult practice, while 34.52% claimed that agroforestry techniques decreased the output of cash crops. The research recommends promoting the advantages of agroforestry practices while also offering technical support. On contrary Suman Saha *et al.* (2018) reported that respondents believed agroforestry would raise agricultural output by 82.14%, household income by 73.8%, and food security by 30.95% of respondents. While A.H. Tokede *et al.* (2020) noted that the majority of respondents (66%) had little knowledge of and no experience in agroforestry activities. The respondents had negative opinions on the practice. Additionally, it was found that agroforestry adoption intentions in the study area are influenced by attitudes toward and comprehension of the technique. The study's conclusions state that in order to change farmers' perceptions and hasten the adoption of agroforestry, extension agents and other stakeholders should step up their efforts to inform them about the benefits and practices of agroforestry in the clearest terms possible.

Other findings of Wasif Nouman and colleagues (2008) came to the conclusion that farmers' ignorance of the advantages that trees might bring to their fields was the main reason why they did not adopt agroforestry. They believed that both the loss of their fields and the fact that crops had to fight with the trees for water and nutrients contributed to the ruin of their fields. The government should begin developing programs to increase capacities which is consistent with our findings.

Rahman *et al.,* 2014 illustrated the socioeconomic characteristics of the respondents are presented. There results show that 60.5% of the respondents adopted agroforestry. The respondents' average age was 42 years. Their education levels were categorized as illiterate, primary, ordinary level, intermediate level, and university education. In these categories, 35.75% of the respondents had attained an ordinary level of education, around 24.25% had an intermediate level of education, 22.75% attained a primary level of education, and 9.25% had achieved a higher level of education, including technical college and university. About 8% of the respondents were illiterate (could not read or write). Most of the households surveyed had an average of 6 members which is in line with our research findings. Previous research found similarities and differences between our findings regarding socioeconomic variables.

## CONCLUSION

Agroforestry includes different agriculture crops that are simultaneously cultivated with multiple forest trees in order to improve the farmer's financial position and the state of the environment. According to our findings, approximately 72% of respondents are farmers, 20% work for the government, and 8% are labors. Poplar is the species most frequently used in agroforestry,

accounting for 52% of all plantings, followed by Eucalyptus at 16%. 30% of respondent's plant for shelterbelt purposes, 10% for land stabilization, and 60% of respondents plant primarily for economic gain. The survey also shows that 36% of families profit from agroforestry in terms of money and fuel wood. 40% of it is coal, and 18% of it is fuel wood. The survey also revealed that 42% of families obtain their fuel wood from farms. Households receive 28% of their fuel wood from the market, and 30% do both. While different people in the research region have diverse opinions regarding the species selection for agroforestry, the majority of people (60%) choose poplar species, and 15% prefer poplar and mulberry species, 10% of people choose *Acacia modesta* and *Dalbergia sisso*, 7.5% percent of respondents prefer eucalyptus and 7.5% of people choose poplar and eucalyptus both. People were interviewed about source of seedling about 45 respondents (90%) bring seedling from private nurseries and 5 respondents (10%) bring seedling from government nurseries. To promote agroforestry on national level it is necessary to implement policies that improve forestry and agriculture extension services as well as education pertaining to agriculture.

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