

Economic Share of Agroforestry in Boosting Living Status of Farmers Community: A Case Study of District Faisalabad

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Abstract: Agroforestry (AF) is a traditional land management system in Pakistan that has the potential to boost agriculture and cope with wood shortage. Being a forest deficit country Pakistan has to improve the tree cover which is just less than 5%, about which 2.1% is productive and is unable to meet the local needs and to improve the social fabric of the community. Along with deforestation, urbanization, industrialization, and climate change have imposed disastrous effects on the forest resources of the country. Thus, to create awareness among rural masses about the importance of trees on farmlands, a comprehensive survey-based study was designed for two tehsils of District Faisalabad, Pakistan; to investigate the role of Social forestry and the impact of climate change upon it and, to recognize its importance in socioeconomic condition of rural communities. After the data analysis by using (SPSS 8.1 Software), results showed that about 80% of respondents were willing to grow trees on their farmlands if they were provided with technical support. However, 50% of the educated/literate respondents have shown more interest in growing trees on their farmlands. About 90% of the total respondents have shown interest in tree plantation on farmlands and social forestry is helpful in a sense to aid in the socioeconomic condition of rural/farming communities. Moreover, 82% and 61% of respondents from Faisalabad and Chak Jhumra respectively were aware that tree plantations can mitigate climate change. Therefore, social forestry-related projects especially agroforestry need the hour for the mitigation of adverse climate change, uplifting the socioeconomic of farmers, and meeting the local industrial and fuel wood needs.

Keywords: Agroforestry, Farmer perception, Urbanization, Climate change

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1. Introduction

In an agricultural-based economy like Pakistan livelihood and development of the rural population depends on the growth of agriculture and allied industry such as livestock and poultry production. In Pakistan, the existing forest cover is not enough to overcome the demand for wood and wood-based products in the community. In 1998, there was a large gap between the production and consumption of wood (Baig *et al.*, 2008). Social forestry is an integrated land use system where trees and crops are grown on the same piece of land to get numerous benefits in terms of food, fiber, and fuel. Forest resources in developing countries can play a vital role in supporting the livelihood of the rural community by the provision of several tangible and intangible and generating direct cash income to meet household needs on a daily basis (Angelsen *et al.*, 2014; Mukul *et al.*, 2016).

Several factors such as deforestation, urbanization, and industrialization are responsible for rapid climate change across the globe. Greenhouse gases such as carbon are considered the main culprits of this climate change. In the recent decade changes in precipitation pattern and rise in global temperature has been observed due to severe climate changes (Nema *et al.*, 2012).

Pakistan is considerably poor in forest wealth, this is because most parts lie under arid and semi-arid climatic conditions. In 1992, according to the Forestry Sector Master Plan (FSMP), out of the total 87.98Mha of the land area of the country, there were only 4.34Mha (5.01%) area was under forest cover. Out of the total, natural forest cover was 4.2Mha (4.8%), and irrigated plantations and rangelands contributed about 103,000ha (0.117%) and 28.507Mha (32.40%), respectively.

According to FAO (2007), the total forest-covered areas was 5.01% (4.34Mha) of the total land area; state-owned forests and privately owned forests or farmlands contribute about 3.44Mha and 0.781Mha, respectively. With the passage of time, tree felling is increasing day by day to clear the forested land for agricultural use and colonization which leads to shrinkage of the overall forest cover of the country. Moreover, deforestation leads to high levels of erosion hazards in plain areas and land sliding in mountainous areas that may result in the loss of foothill agricultural practices and the human population as well (Clarke and Thaman, 2006).

To cope with problems and threats related to deforestation and the degradation of fertile lands, the rural community should adopt

afforestation and reforestation practices on their own and with the help of NGOs or Governmental institutions for the conservation of forest cover. The Ministry of Agriculture collaborates with different national and international organizations and has started many social forestry and agroforestry projects for tree plantation on farmlands and community lands. The main objectives of these activities are to cover the basic needs of fuel wood, construction materials, and fodder from trees grown outside the forests, reduction in soil resources degradation and enhance the productivity of lands for agricultural crops, and reduce the stress from remaining natural resources of forests and conservation of biodiversity. Social forestry practices play a vital role in achieving such objectives for the development of rural areas (Hussain *et al.*, 2019).

When we compare agricultural crops with trees for soil reclamation and productivity, the leguminous trees planted under social forestry systems not only fix the nitrogen but also play an important role in the improvement of soil structure and soil fertility. (Chaturvedi, 1981; Verinumbe, 1987). Previous work has identified many complex factors of AF covering socio-economic and environmental impacts. Being an agriculture-based economy, crop

production in Pakistan is reducing due to several factors, among the most prominent are population expansion and climate change which are threatening food security (Tingju *et al.*, 2014). Farmers of rural communities can earn more income by adopting social forestry than by growing just pure agricultural crops or by forest crops. A number of studies internationally prove that social forestry and agroforestry are more profitable to rural communities than the cultivation of agricultural crops and growing of trees separately on a specific area of land (Chandra, 1986; Pillai, 1983; Mathur *et al.*, 1984).

Pakistan, now a day facing a major is facing a major environmental hazard of deforestation due to many reasons which is the main cause of desertification, thus marked as a serious threat socially and economically. In rural areas deforestation leads to the destruction of the environment and weakens the basis of economic growth and results can be seen in the form of biodiversity destruction (FAO, 2007b). Social forestry is planting trees along croplands in rural areas, whereas along railway tracks, national highways including local roads, canal sides, cantonment boards, hospitals, public or community parks, schools, colleges, and universities in an urban context.

Tree plantation practices are highly linked with the level of awareness, education, and experience of the farming community. The study was conducted in two tehsils of District Faisalabad, Faisalabad, and Chak Jhumra to get the farmer's perception of different aspects related to social forestry. Here are some points that are included in this study: (a) Respondent views about awareness of social forestry; (b) Social forestry uplifting socio-economic conditions of respondents; (c) Soil fertility increases through tree plantation; (d) Trees control environmental pollution; (e) Trees can mitigate climate change; (f) Agroforestry can fulfill the basic needs of fuel wood; (g) Wood shortage covered by practicing social forestry; (h) Tree plantation under different projects; (i) Methods for increasing social forestry; (j) Purpose of tree plantation on farmlands.

The results of this study highlighted the strengths, opportunities, threats, and future prospects of social forestry adoption on a massive scale. It may help the policymakers, technocrats, forestry officials, local farmers, non-governmental organizations (NGOs), and private institutions to set up measures and management in accordance with social forestry (Agro-Forestry) adoption to fulfill the international standards (of developed countries) with a forest cover of 25% of the

total land area. It may also mitigate climate change and its disastrous effects like massive erratic rainfalls in arid and semi-arid regions of the country. In Pakistan, the massive floods of 2010 (Fahad and Wang, 2020) and 2022 are prominent examples of this uncertain climate change.

2. Materials and Methods

2.1. Study site

Based on climatic conditions, soil types, physiography, water availability, and land use, Pakistan is divided into ten agroecological zones (Agroecological zones of Pakistan, 2020). According to the Pakistan Bureau of Statistics 2017, District Faisalabad is known as the city of textiles; the second largest city of Punjab Province and third of Pakistan. Faisalabad lies under a Semi-arid, sub-tropical climate with warmer summers and relatively moderate winters. The soil of Faisalabad is alluvial deposits that are mixed with the loess soils. In addition, due to the calcareous characteristics of these soils are considered fertile soils (Aziz *et al.*, 2018).

Survey-based research methodology is more applicable to collect data on performance, expectation, awareness, and interests of the farmers towards adaptation of social forestry practices. The key objective of the research was to assess the behaviors of farmers of rural communities towards tree plantation

through social forestry on their farmlands in Faisalabad. The study was conducted in two tehsils of district Faisalabad (Faisalabad and Chak Jhumra) located between longitude 73-74° (East), latitude 30-31.5° (North) at the elevation of 184m above sea level.

2.2. Sampling and Data Collection

Villages were selected through purposive sampling techniques. Six villages were selected for data collection and from each particular village; randomly twenty farmers were selected for data collection who were actively engaged in farming and tree plantation activities. The research data was collected via interviews with the local farming community. A comprehensive questionnaire with two points Likert scale (yes=1 or no=2) was used to collect data from farmers for adaptation of social forestry (Ahmed, 2021). The respondents were interviewed in person at their homes and farms by the researcher team. The questionnaire was designed in English but questions were asked according to their local language (Urdu, Punjabi) for ensuring the required quality information with maximum reliability.

2.3. Statistical Analysis

The collected data was analyzed by using Statistical Package for Social Sciences (SPSS) software (SPSS-8.1), on the basis of the results suggestion will be given for the

promotion of social forestry to cope with climate change and wood shortage (Muneer, 2008).

3. Results and Discussion

3.1. Respondents view about awareness of social forestry

Data The findings of the current study are divided into 10 parts, which elaborate on several aspects of social forestry such as adoption, benefits, and most importantly long-term benefits to the environment, society, and socio-economic condition of the country. The adoption of climate change mitigation strategies is directly linked to the level of awareness of the local farming community. Strong beliefs of farmers towards integration of tree plantation with crop farming are highly influenced by several factors such as level of education and awareness; soil and environmental conditions, and capital for long-term investment (Buyinza *et al.*, 2020). Mostly, the people belonging to rural areas have a lack of awareness about social forestry, especially agroforestry. Respondents were asked about their views regarding social forestry. The results indicated that 45% of farmers from Faisalabad were aware of social forestry and agroforestry practices but 55% of farmers have no awareness about the social forestry practices shown in Fig. 1. While from Chak Jhumra 38.33% of farmers

have awareness about social forestry and 61.66% were lacking awareness about social forestry and agroforestry practices. The data showed that very few people were aware of social forestry; mostly farmers have no awareness about social forestry and agroforestry practices both in Faisalabad and Chak Jhumra tehsil. Hence, awareness seminars, farmer meetings, and involvement of the local community are compulsory to be aware of and guide the people about the importance of social forestry and agroforestry practices.

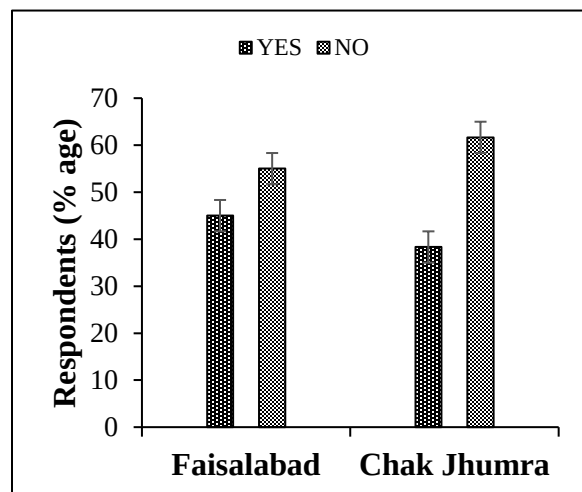


Fig.1. Level of awareness of respondents on social forestry

3.2. Social forestry uplifting socio-economic conditions of respondents

Social forestry practices can increase the vegetation cover in the country and improve the socioeconomic condition of farmers in rural communities. Moreover, it has the potential not only to increase the tree cover

on the farmlands and provided different benefits like fuel wood, timber, and forage for livestock but also generate income through byproducts obtained from trees (i.e. honey, medicinal valued parts and sticks for basket making) for peoples of the rural community and thus to uplift the socio-economic conditions of farming community (Muhammad *et al.*, 2011). In Fig. 2 results show that from tehsil Faisalabad and Chak Jhumra showed that 91.66% of respondents from Faisalabad accepted that social forestry can uplift the socio-economic condition of farmers after detailed interview session but 8.33% were not agreed with this due to lack of awareness. While in Chak Jhumra 85% of farmers respond positively about social forestry uplifting the socio-economic condition and 15% disagree with the concept.

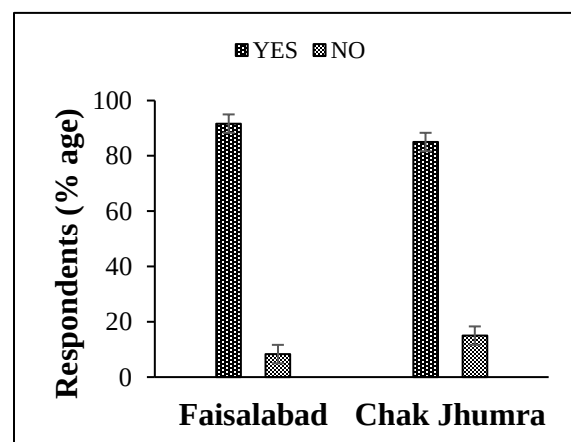


Fig.2. Respondents' opinion on social forestry adoption is involved in uplifting their socio-economic conditions

3.3. Soil fertility increases through tree plantation

Trees play an important role in soil fertility and trees can improve soil structure, soil texture and increase soil fertility by adding leaf litter in soil. Deciduous trees and nitrogen fixing trees shed their leaves on soil surface as biomass to increase the fertility of soil (Muhammad *et al.*, 2011; Rahim and Hasnain, 2010). Roots of trees hold soil particles with each other and strengthen the soil. Tree plantations overcome the problems of lands degradation in different regions. The fig. 3 showed the response of Faisalabad respondents about tree plantation may enhance soil fertility, on the other hand we got less response of farmers of tehsil Chak Jhumra. About 53.33% respondents from tehsil Faisalabad accepted the fact that trees plantation (Agro-Forestry) can enhance soil fertility and 46.66% were not agree to this concept. However, in tehsil Chak Jhumra 55% respondents accepted that soil fertility may increase through tree plantation but 45% respondents shown less or no interest in this matter.

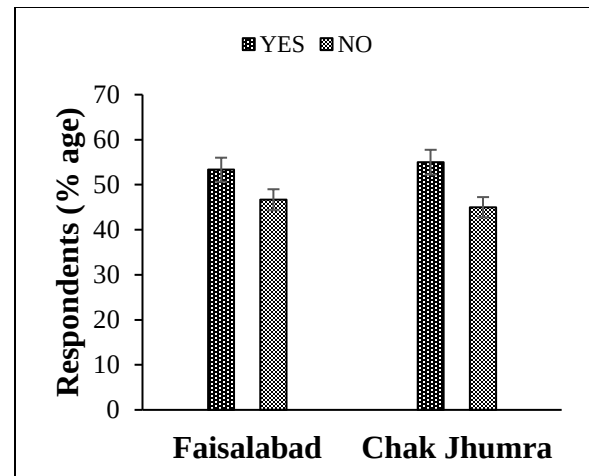


Fig.3. Perception of respondents on tree plantation can improve soil fertility.

3.4. Trees control environmental pollution

As we know the climate is changing day by day due to several reasons but the most important one is deforestation. Thus, due to this the concentration of CO₂ increases in the atmosphere which results in an increase in temperature (Kouser and Subhan, 2020). Fig. 4 shows that in Faisalabad tehsil 63.3% of respondents agreed with the concept of tree plantation control environmental pollution and 36.6% of respondents weren't agree with this. Moreover, in tehsil, Chak Jhumra about 61.3% of respondents agreed and about 38.3% didn't agreed that trees can control environmental pollution due to a lack of awareness of locals by conducting interactive sessions by technical foresters.

3.5. Trees can mitigate climate change

Faisalabad the city of textiles is the third biggest city in Pakistan and air pollution is

increasing in terms of increased lead (Pb) and Total suspended particulate (TSP) due to heavy traffic and industries is creating serious problems for the citizens. It was found that the levels of TSP and Pb are above the ambient air quality standards with up to 506 $\mu\text{g}/\text{m}^3$ and 18 $\mu\text{g}/\text{m}^3$, respectively. The pollution levels are high in those areas with dense traffic and industrial as compared to residential areas but it is causing serious health effects to the people (Niaz *et al.*, 2012). According to Tooichi (2018), it is reported that, in forested lands along with agro-forests the atmospheric and soil carbon sequestration is carried out through tree biomass.

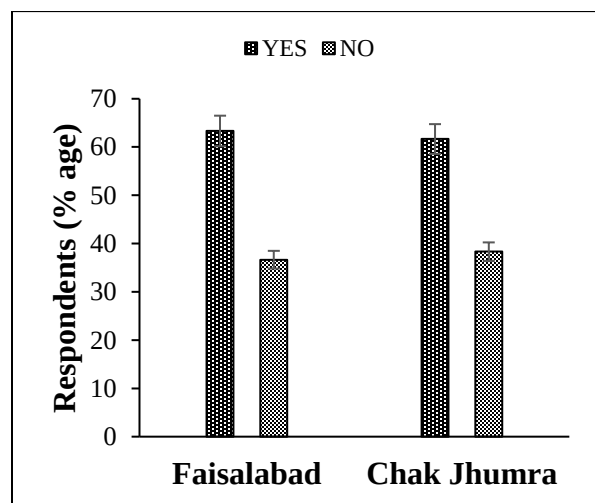


Fig.4. Perception of locals masses on “can trees control environmental pollution?”

Trees store more carbon in various tissues such as leaves, branches, trunks, and roots in large volumes because of their size and long life span than agronomic crop plants. With

these unique characteristics of trees, they are involved in increasing soil infiltration & fertility; helping to decrease wind and water erosion hazards; playing their role in decreasing C emissions, and most importantly improving water and environment quality. In short, carbon sequestration by the establishment of compact plantations and agro forests is the only way forward to have a healthy life in the era of massive traffic loads, industrialization, and colonization (Solomon, 2007).

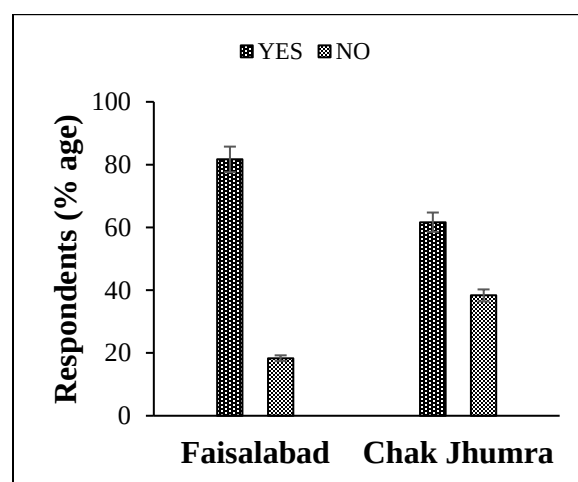


Fig.5. Response of local farmers on “Can trees help to mitigate climate change?”

When respondents were interviewed it was observed that farmers from Faisalabad were more aware about 81.6% that trees can mitigate climate change and on the other hand due to lack of awareness only 18.3% were not well aware of this matter. While in tehsil Chak Jhumra 61.6% of farmers had

knowledge about the mitigation of climate change through tree plantation and 38.3% of farmers were not agreed with our opinion that trees can mitigate climate change.

3.6. Agroforestry can fulfill the basic needs of fuel wood

Farmland trees and social forestry provide firewood for making food, charcoal and to make agricultural implements, etc. Wood is considered a big source of energy for rural areas where there is no other source exists as an alternative to that. A wearisome activity that women perform for making food is collecting firewood for making food after cleaning houses and taking care of their children and animals as well (Njenga *et al.*, 2021). The current study revealed that about 98.3% of respondents from Faisalabad accepted that the basic needs of fire/fuelwood are only fulfilled by tree plantation through social forestry and agroforestry projects and only 1.66% of respondents disagreed with it. However, in tehsil, Chak Jhumra 88.33% of farmers accepted that trees fulfill their fuel/firewood needs and 11.6% of farmers disagreed that social forestry can fulfill their basic needs of fire/fuel wood because they mostly use crop stubbles and cotton sticks.

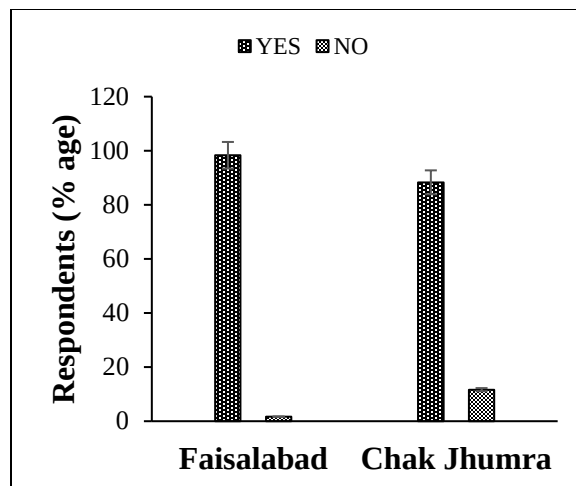


Fig.6. Respondents' views on agroforestry can fulfill basic needs of fuel/firewood

3.7. Wood shortage covered by practicing social forestry

Trees provide wood for fuel and timber purposes. The increasing population and illegal cutting of trees are causes of local wood shortage and shrinkage of tree cover in Pakistan. Social forestry practices are helpful in overcoming the wood shortage for the community. Agroforestry initiatives aiming to aid the local community's socio-economic aspects are need of the hour. Moreover, it can reduce the total import costs of wood if local wood is surplus in local wood markets (Sekhar and Jorgmsen, 2003). It was concluded that 95% of respondents from Faisalabad showed a positive trend towards the fulfillment of wood shortage through social forestry practices and only 5% of respondents disagreed with the idea. However, in Chak

Jhumra 83.3% of respondents were in favor of social forestry practices to overcome the wood shortage, on the other hand, due to a lack of proper knowledge only 16.66% disagreed shown in Fig. 7.

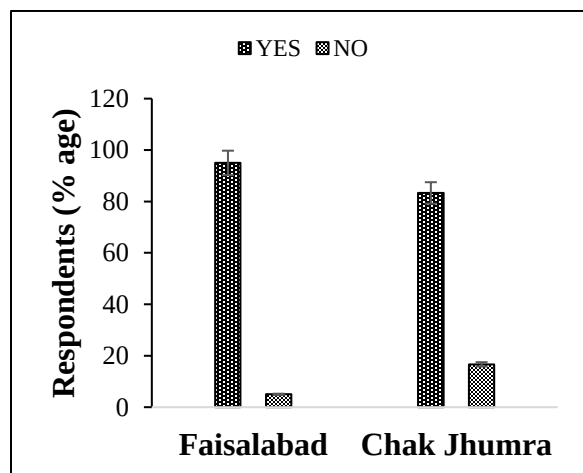


Fig.7. Farmers' opinion on "Wood shortage can be covered by adopting social forestry"

3.8. Tree plantation under different projects

According to Mpokigwa *et al.*, (2011) different pilot projects running under private and government organizations for tree plantation under social forestry initiatives not only contribute to tree cover improvement but also ensure the provision of byproducts and most importantly conservation of biodiversity. Tree cover expansion can only be possible through social forestry, and any of such projects can't be successful until the involvement of

the local community is ensured. To increase the tree cover in the country, it is necessary to involve the community with awareness programs by the technical foresters.

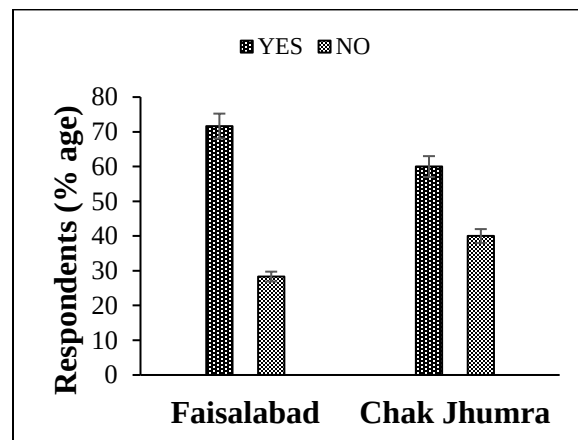


Fig.8. Respondent's opinion on "Tree plantation can only be done under the supervision of Governmental and Non-Governmental institutions"

The findings of the current study indicated that in Faisalabad 71.66% of respondents were satisfied and showed positive behavior towards the initiation of tree plantation projects under the supervision of Govt. and Private organizations but 28.3% did not agree with such practices. Moreover, about 60% and 40% of respondents from Chak Jhumra showed satisfactory and unsatisfactory views respectively, based on the level of awareness and education shown in Fig. 8.

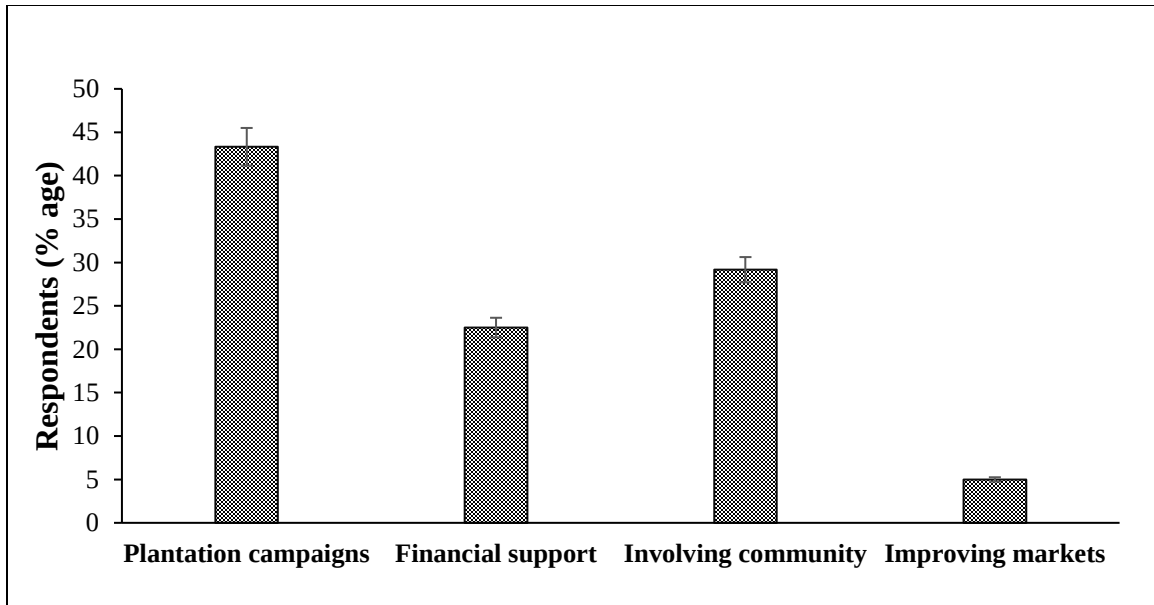


Fig.9. Respondents opinion for “methods or factors for increasing social forestry plantations”

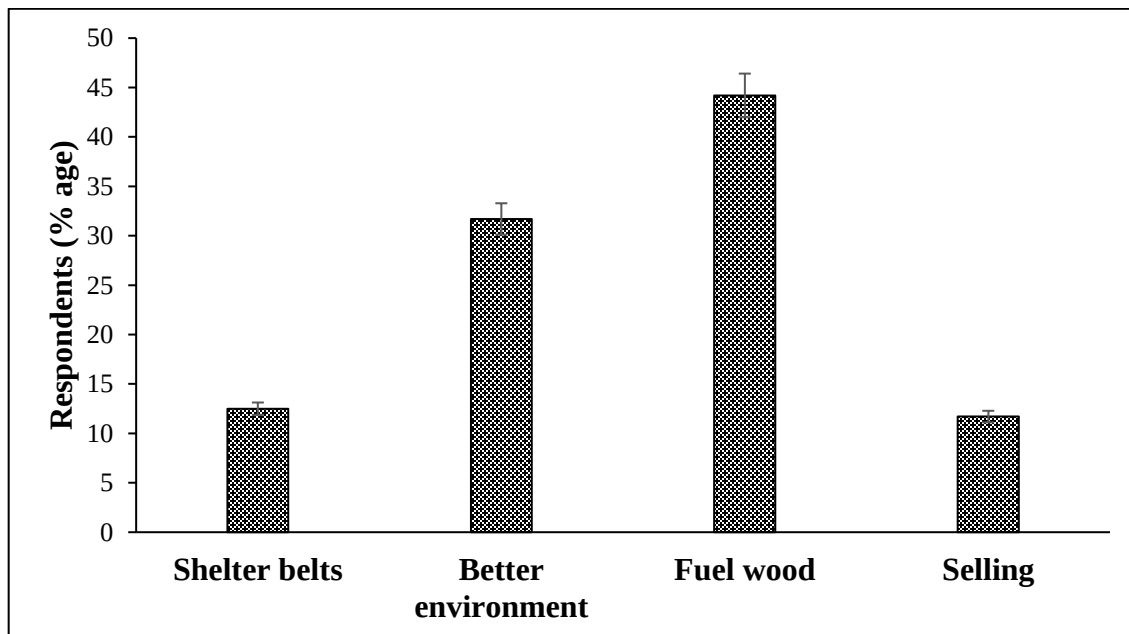


Fig.10. Respondent's views on “Purpose of tree plantation on farmlands”

3.9. Methods for increasing social forestry

Various factors are considered while initiating a social forestry project some of the key factors are Plantation campaigns, capital for financial support, involvement of

the local community, and establishment of new and improvement of existing wood markets. Favoritism in species selection, provision of a nursery at an accessible distance, and technical support are also of

great importance. It is shown in Fig. 9 that about 43.3% of respondents from the farming community of Faisalabad and Chak Jhumra that social forestry (Agro-Forestry) can be increased by plantation campaigns, and 22.5% answered “yes” that financial support is helpful to achieve the goals. About 29.16% of respondents agreed on the involvement of the local community in tree plantation projects and only 5% of respondents gave their opinion that the lack of markets for selling the produce is the only hurdle in the promotion of Social Forestry (AF) initiative.

3.10. Purpose of tree plantation on farmlands

Trees are a blessing because they provide numerous tangible (Wood, resin, oils, gums, fruits, nuts, flowers, and bark; honey as a by-product) and intangible (fresh air, pollution control, improving the water quality, fertility improvement, provision of home to certain wildlife species; micro-climate and soothing effect to eyes during hot summer days; shelterbelts and windbreakers to protect farmland crops) (Chinyimba, 2012). Traditionally, farmers grow trees on cropland in a scattered manner just for shade for the cart-pulling animals and family who work a whole day on farmland but nowadays, the concept is changing with the compact plantations,

shelterbelts, and windbreakers. It has become common in most countries (Hanif *et al.*, 2018; Quandt *et al.*, 2017; Okullo *et al.*, 2003). Fig. 10 shows that 44.2% of farmers grow trees to fulfill their needs of fire/fuelwood for domestic uses and 31.7% of respondents agreed with the idea of trees improve environmental conditions. However, only 12.5% grow trees for shelterbelts as a key objective to protect their crops from strong winds and storms and only 11.7% of farmers grow trees for selling purposes in local wood markets to generate revenue for improving their socio-economic status.

4. Conclusion

Pakistan is facing severely adverse climate change caused by global warming due to the shrinkage of state and public forests. The area under crop cultivation is decreasing day by day because the estate developer mafia occupies fertile lands for colonies and commercial markets. Population expansion is also increasing pressure on local wood produce thus due to insufficient supply to local markets a huge revenue is used to import wood and wood products from neighboring countries. Social forestry and agro-forestry have great potential to cope with the wood shortage. Due to a lack of facilitation in terms of awareness, public campaigns, level of education, lack of

potential market and brokers mafia, lack of technical knowledge on proper planting, management, and harvesting of farm forests, lack of financial support along with the nursery facilities, and most prominently the species selection for agro-forests are some major factors that create hindrance in the way of adoption, management and generating revenue from farm forests. In the current study, we have highlighted issues and their perception towards the adoption of social forestry which is not only socio-economically beneficial but can help to mitigate climate change. On the basis of the results, it is suggested that the Government and Non-Governmental agencies should come forward to conduct seminars, farmer meetings, and sessional tree plantation campaigns to aware the farmers about the benefits of Social forestry in the form of agro-forestry to mitigate climate change. If we set a target to motivate at least 50% of the farming community to adopt agro-forestry that will be a great breakthrough in Pakistan's tree cover improvement.

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