



Forest Landscape Restoration and Its Impact on Social Cohesion, Ecosystems, and Rural Livelihoods: Lessons Learned from Pakistan

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Abstract

This paper explores community perspectives on forest landscape restoration (FLR) initiatives and their impacts on ecosystems, livelihoods and social cohesion. The study is based on data collected from 08 focus group discussions (FGDs) conducted in local communities involved in FLR activities. A coding process was used to identify key themes and patterns that shed light on the impacts of FLR. The results show that FLR initiatives have led to social cohesion and conflict resolution, including the establishment of community-based organizations (CBOs), the involvement of community volunteers in various FLR tasks, a cooperative/collaborative approach to forest management, conflict resolution, and the empowerment of local communities. In addition, the results of the study showed that FLRs have successfully regenerated and restored the forest ecosystem, including restoration of biodiversity, plant diversity, improvement of animal populations and livestock health, soil health, and water quality. Ecosystem restoration has improved community livelihoods, including increased crop productivity, access to education, affordable health care, improved economic conditions, and food security. Based on the findings, policy recommendations include strengthening support for community FLR initiatives, promoting stakeholder collaboration, and promoting social equity.

Keywords Forest landscape restoration · Social cohesion · Biodiversity · Livelihood sustainability · Stakeholder collaboration

Introduction

Forested landscapes are essential for supporting diverse ecological systems. They are a source of vital ecosystem services and livelihoods for communities around the world (Ullah et al. 2022a). However, the world's forests are being severely impacted by deforestation and land degradation (Nguyen et al. 2023). The global problem of deforestation and land degradation has undermined the well-being of local communities that depend on forests for their livelihoods (Wassie 2020). It has resulted in the loss of biodiversity and ecosystem services (Yadeta et al. 2022). In

addition, deforestation continues to have a negative impact on climate change, which further disrupts the well-being of local communities (Wolff et al. 2018). The main drivers of deforestation worldwide are agricultural expansion, logging, infrastructure development, and population growth (Lim et al. 2017). As deforestation occurs, the associated impacts on biodiversity, soil erosion, water cycling, and carbon sequestration are felt, reducing ecosystem services and negatively affecting human livelihoods and well-being (Wolff et al. 2018).

In response to these challenges, FLR has emerged as a holistic approach to the restoration and sustainable management of forest ecosystems with the active participation of local communities (Ullah et al. 2021). FLR is implemented by governments, NGOs, and communities to promote biodiversity conservation, forest ecosystem improvement, and sustainable livelihoods (Ullah et al. 2023a). FLR involves the restoration of ecological processes through reforestation and sustainable management of forest resources (Löf et al. 2019). FLR interventions are characterized by their multifunctionality, achieving environmental, social, and economic

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objectives simultaneously (Burivalova et al. 2017). With the active participation of local communities, FLR initiatives aim to restore forest ecosystems, improve livelihoods, enhance biodiversity conservation, and promote social cohesion (Ullah et al. 2021; Rauf et al. 2019).

Local communities involved in FLR initiatives can experience a variety of benefits beyond ecological restoration. In particular, these initiatives have the potential to improve the livelihoods and food security of local communities (Adams et al. 2016). By actively participating in FLR, communities can foster social cohesion by bringing people together to work toward the common goal of restoring forest ecosystems (Ullah et al. 2022a). In addition, outcomes directly linked to FLR efforts include biodiversity conservation and the provision of essential ecosystem services (Mori et al. 2017). Such initiatives also contribute to building community resilience. They equip communities to face the challenges of climate change and other environmental threats (Buma and Wessman 2013). Engaging local communities in FLR not only achieves ecological restoration, but also benefits livelihoods, food security and social cohesion, making it a holistic approach to sustainable development.

Previous research has examined the ecological and environmental aspects of FLR (Chazdon and Uriarte 2016; Erbaugh and Oldekop 2018). However, to our knowledge, understanding of the social and economic impacts of these initiatives from the perspective of local communities is limited. This study makes a unique and valuable contribution to the existing literature by focusing on the community perspective. In addition, this study examines the impact of FLR on livelihood diversification. The novelty of this study is that these specific aspects have received limited attention in previous research. By addressing these research gaps, this study provides insights that can be used to inform policy and practice, and ultimately support more inclusive and sustainable FLR initiatives.

For these reasons, understanding community perspectives on FLR is critical to designing and implementing successful restoration programs. By incorporating local knowledge, addressing community concerns, and fostering collaboration among stakeholders, FLR initiatives can achieve long-term sustainability and contribute to the well-being of both ecosystems and communities (Ullah et al. 2023b). Therefore, the research questions addressed in this study include 1) How do community members perceive the impact of FLR initiatives on the forest ecosystem, particularly the appearance of new plant species and the recovery of lost species? 2) What improvements in livelihoods do communities involved in FLR initiatives experience, including access to education, health care, and changes in income sources? 3) Finally, what is the role of FLR in building social cohesion, i.e. community participation and cooperation

in FLR initiatives, decision-making processes, volunteerism, and the effectiveness of Village Development Committees (VDCs) and Joint Forest Management Committees (JFMCs)? By addressing these research questions, this study aims to provide a comprehensive insight into community perspectives and outcomes of FLR initiatives, thereby contributing to the development of informed policies and practices for effective landscape restoration strategies.

Methodology

Study area

The study was conducted in the Dir-Kohistan area of Khyber Pakhtunkhwa (KP) (Fig. 1). Geographically, Dir-Kohistan is an elevated region in the far north of Khyber Pakhtunkhwa province, located between 350-9' and 350-7' N latitude and 710-2' to 720-2' E longitude. With an area of 412,570 acres or 645 square miles, 140,351 acres of which are coniferous forests, Dir Kohistan is one of the most densely forested areas in Pakistan. The altitude of the coniferous forests ranges from 1,833 m to 3,833 m above sea level and plays an important role in biodiversity and local livelihoods. Located in Pakistan's Hindu Kush Himalayas, the Dir Kohistan Forest is an opulent forest of *Cedrus deodara*, *Abies pindrow*, *Pinus wallichiana*, *Picea smithiana* and *Pinus gerardiana*. As a result, the region has been the target of reforestation efforts since 2014, particularly through the Billion Trees Afforestation Project (BTAP). There are deep-rooted links to forests, livestock and agriculture among the communities living in the study area. The majority of these communities depend on agriculture for their livelihoods. They rely on shifting forests and pastures for their crops and collect forest products for domestic use and trade. Efforts to restore the forest landscape in Pakistan have been undertaken with the dual purpose of improving people's livelihoods and rejuvenating the natural landscape. CBOs such as VDCs and JFMCs played a pivotal role in mobilizing communities for FLR with the aim of restoring landscapes and improving livelihoods through the involvement of local people (Ullah et al. 2023b).

Data collection

From September to December 2019, I conducted a series of randomly selected focus group discussions (FGDs) with village elders involved in the FLR. These FGDs took place

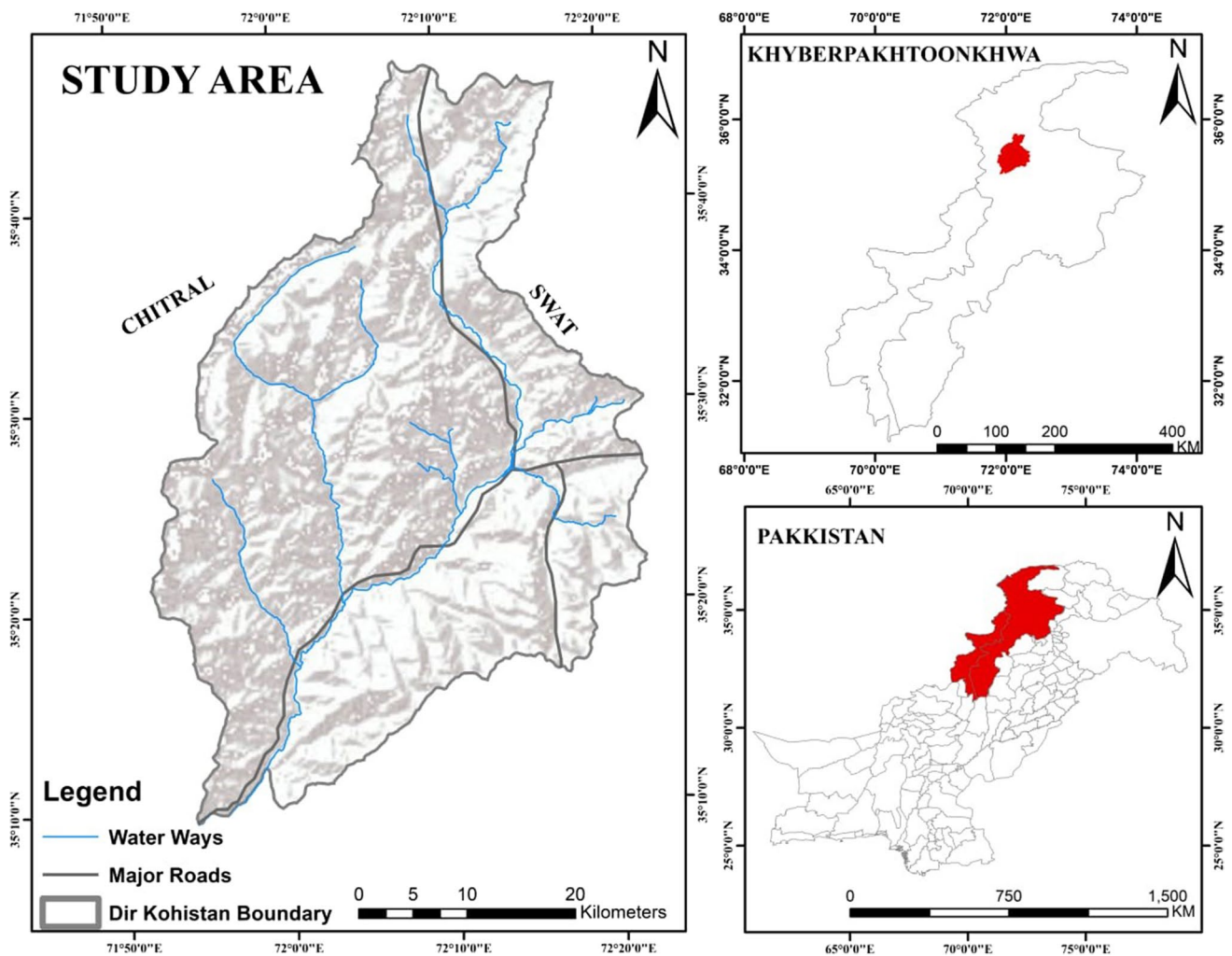


Fig. 1 Map of the study area

in 8 villages: Dad-Kan (FGD-01), Ater-Koon (FGD-02), Dad-Band (FGD-03), Kisan Khel (FGD-04), Ashrit (FGD-05), Siasan (FGD-06), Barikot (FGD-07), and Bar Kalay (FGD-08). A key role in organizing and facilitating these FGDs and ensuring the active participation and interaction of village elders, was played by the local forest staff, who were predominantly from these communities. The FGDs were also attended by forest officials and the author. During the FGDs, only elders from each village participated and discussed the given topics and issues in detail. Note-taking, and participant observation were used to document the discussions (Kokorsch and Gísladóttir 2023). All work was conducted by the author in the presence of the respective village communities, accompanied by local field staff. Each group discussion involved 25-30 participants, mostly individuals between the ages of 40 and 60 who held respected positions within their communities. A comprehensive script focusing on village-level participation in FLR activities and their impact on livelihoods,

biodiversity, and social cohesion guided all group discussions. For example, questions exploring the establishment of CBOs, the role of community volunteers, and perceptions of a collaborative approach to forest management were included. Ecological issues such as biodiversity, crop diversity, animal populations, soil health, and water quality were also addressed. Livelihood-related questions covered access to education and health, diversification strategies, fuelwood marketing, and food security implications. This script provided a structured framework for exploring the key themes and sub-themes identified in Table 1, ensuring a systematic analysis of the social, ecosystem and livelihood impacts of FLR. The selection of focus group members was based on a consensus of 70% of the entire community, which was announced during the Friday mass meetings. Youth and women did not participate in the FGDs due to local traditions. The author ensured an inclusive environment that encouraged active participation from all participants, and each group discussion lasted 2-4

Table 1. Key topics and themes identified through thematic analysis of FLR's social, ecosystem and livelihood impacts

Themes and sub-themes
Social cohesion and conflict resolution
Establishment of CBOs
Community volunteers' involvement
Cooperative/collaborative approach to forest management
Conflict Resolution
Local community empowerment
Ecosystem restoration
Biodiversity
Crop diversity
Animal Populations and Livestock Health
Soil Health
Water quality
Livelihood Improvement
Access to education and health
Livelihood Diversification
Marketing of firewood
Food Security

hours. The FGDs took place in community-based settings such as mosques, community halls, and village grounds. These FGDs provided insight into the perspectives of village elders and served as valuable sources of information. It is important to note that all group discussions were conducted in the local language of the community. The data collection method employed in this study has been widely utilized in the literature, demonstrating its efficacy in similar contexts (Bavorová et al. 2023; Kokorsch and Gísladóttir 2023).

Data Analysis

In this study, data were analyzed using NVivo 12 software to increase efficiency and rigor. All field observations and notes from the FGDs were meticulously transcribed, allowing for a seamless transition to digital analysis. The coding process was conducted within NVivo 12, where key themes and subthemes were identified, categorized, and coded (Loivaranta 2023). This approach, complemented by manual checks, allowed for a comprehensive exploration of community perspectives on FLR and its impacts on livelihoods, biodiversity, and social cohesion. The thematic analysis was conducted in two stages. First, a holistic understanding was gained through a thorough review of transcriptions within the software. Next, recurring themes and patterns related to FLRs were extracted and systematically organized using NVivo 12's coding features. The creation of specific labels (codes) based on the research questions facilitated the

structured organization of the data into major themes. This coding process not only ensured a more systematic analysis, but also facilitated efficient retrieval of information in subsequent stages (Loivaranta 2023). The qualitative analysis techniques within NVivo 12 are used to explore relationships and connections among the identified themes. The software's capabilities allowed for a nuanced examination of similarities, differences, and multiple perspectives expressed by community members. This methodological approach in NVivo 12 aligns with contemporary trends in qualitative research methods and enhances analytical rigor and transparency (Montana et al. 2016; Mayer 2019). Through this software-assisted analysis, I aimed to provide a robust examination of the impacts of FLR on the forest ecosystem, community livelihoods, and social cohesion.

Results

Social cohesion and conflict resolution

To restore forest landscapes, communities established CBOs such as VDCs and JFMCs. The establishment of VDCs and JFMCs played an important role in mobilizing community members, fostering cooperation, and ensuring the long-term sustainability of restoration efforts. Through these CBOs, the active participation of each household in decision-making processes and shared responsibility for FLR work was ensured, creating a sense of ownership and accountability within the community. Respondents in a FGD reported:

The success of FLR initiatives was strongly linked to community participation and cooperation, which was established/strengthened through the establishment of VDCs and JFMCs. Such CBOs showed great potential to enhance the effectiveness of restoration initiatives and strengthen community resilience. (FGD-03, October 18, 2019)

The FLR initiatives through VDCs and JFMCs brought a sense of unity among the villagers, as we worked together to plant saplings and revive our shared land. (FGD-02, October 25, 2019)

The results of our FGDs reported that the FLR initiatives played an important role in mobilizing community members in all restoration activities, from decision making to implementation of various plans. To carry out landscape restoration activities, regular meetings were convened that involved every household in discussing landscape restoration and village issues. The effectiveness of community involvement in finding solutions to problems was suggested by local communities, and each community provided volunteers to carry out different activities. The involvement of community

volunteers for forest resource protection strengthened FLR initiatives, ensured the accountability of each household, and fostered a sense of shared responsibility for restoration efforts. Respondents in FGDs reported:

With the help of VDCs, local communities hold monthly meetings to discuss landscape restoration initiatives (along with other village issues). In these meetings, the volunteers provided by different communities for various restoration activities proved the drivers of FLR and the solution to village many problems. With the help of community volunteers, forest guards protected at least 40 hectares of forest land in each village. (FGD-01, October 11, 2019)

Community volunteers' involvement in FLR has strengthened FLR efforts and promoted local ownership, skill development and social cohesion. (FGD-02, October 25, 2019)

Participants of the FGDs reported that there had been a shift from conflict over forest resources to a cooperative and collaborative approach to restoring and managing their forests. Participants in the FGDs reported:

FLR initiatives have created a deep bond between people and between people and forests. Together, through cooperation and coordination, communities have successfully restored large areas of forest over long periods of time. Communities have taken collective control of reforestation and afforestation efforts. Continued cooperation and coordination have been instrumental in transforming barren land into fertile land. (FGD-05, September 20, 2019)

Through cooperation and collaboration, our entire community has supported each other in this process. (FGD-02, October 25, 2019)

The results of our FGDs reported that the FLR initiatives resolved conflicts (especially over land and forest) among community members. Respondents in the FGDs reported that the shift from conflict over forest resources to cooperation among community members represents the positive impact of FLR on social cohesion. Respondents in a FGD reported that:

The FLR initiatives have transformed conflict into cooperation and promoted social cohesion in our community. (FGD-04, September 13, 2019)

Indeed, actions have changed. Prior to FLR activities, community members competed in forest harvesting. After the FLR project, community members collaborated on forest protection. (FGD-07, December 6, 2019)

The results of our FGDs indicated that FLR initiatives through VDCs and JFMCs empowered local communities,

which played a key role in advancing FLR efforts in our region. The empowerment of local communities was seen through knowledge sharing and local capacity building, which facilitated the transition from disputes over land and forest resources to peaceful cooperation. This collaborative/cooperative approach to decision-making and knowledge sharing not only enhances the success of our FLR initiatives, but also strengthens social cohesion, ensuring a better and greener future for all. Respondents in a FGD reported that:

The VDCs and JFMCs promoted through FLR empowered local communities to collectively manage resources and pursue sustainable development. (FGD-08, December 13, 2019)

FLR has strengthened local communities by fostering active participation, sharing knowledge, and building local capacities for sustainable development. (FGD-07, December 6, 2019)

Ecosystem restoration

The FGDs revealed that new species of plants, which were not present in the forests before, have been observed by the communities involved in the FLR initiatives. The participants expressed that they were not able to identify these new species. Respondents in a FGD reported:

These species were not present during the period of dense forest cover. (FGD-03, October 18, 2019)

The loss of plant species due to deforestation was also acknowledged. However, the reappearance of plant species that had disappeared was observed, which is an indication of successful regeneration and recovery of the forest ecosystem as a result of collective restoration efforts by the communities. Participants in an FGD reported that:

FLR has introduced new plant species to our region. Some were lost due to deforestation, but we've restored and discovered more. (FGD-08, December 13, 2019)

Results of our FGDs also revealed that community members involved in FLR initiatives had diversified the crops. In the past, timber from the forest was the main source of income for the majority of households. However, after the implementation of FLR, farmers shifted to agroforestry and farm forestry practices. They started cultivating fast-growing tree species such as *Populus ciliate* and willow. This shift has led to increased income from timber while protecting the forest from further degradation. Respondents in a FGD reported:

By working to restore the landscape, the community has begun to diversify its crops. In the past, all house-

hold income came from forest timber. Now, every farmer has taken up agroforestry and is planting fast growing trees such as Populus ciliate, willow, and so on. By adopting agroforestry, income from timber has increased and forest damage has been prevented. (FGD-02, October 25, 2019)

Inspired by FLR, the community shifted from timber to growing trees like Populus ciliate and willow—boosting income and becoming forest guardians for a sustainable future. (FGD-04, September 13, 2019)

Participants in the FGDs reported a significant increase in the number of animals kept in the community following the FLR efforts. This had increased from a maximum of five animals per household to up to 15 animals per household. Importantly, it was emphasized that this increase did not appear to be detrimental to the FLR initiatives undertaken. FGD participants reported:

As a result of FLR initiatives, there is an increase in the number of animals in the village. Before, there was a maximum of five animals in each household in our village. Now this number has increased to 15 animals in each household. This increase in the number of animals has been done in a way that has not affected forest landscapes. (FGD-02, October 25, 2019)

As farmers, we have seen a remarkable increase in our livestock numbers, all thanks to the positive changes brought about by FLR's efforts. Our fields are no longer just crops; they're thriving havens for animals, demonstrating the true success of sustainable land restoration. (FGD-07, December 6, 2019)

The results of the FGDs showed that the FLR initiatives have improved soil organic matter and soil erosion control as a result of the construction of gabions and retaining walls. In the past, soil erosion from slopes (terraces) was common in the region, which also had an impact on soil fertility (due to loss of soil organic matter/nutrients). However, soil conditions have improved since the implementation of FLR. Agricultural productivity and pasture quality have increased with this improvement in soil quality. FGD participants reported:

The construction of gabions and retaining walls as part of the FLR initiatives increased organic matter in the soil and controlled soil erosion, further improving the quality of the landscape. (FGD-03, October 18, 2019)

As evidenced by our FGD results, FLR innovation has brought about remarkable changes in terms of improving water quality. In exploring the profound results of implementing FLR initiatives, FGD participants eloquently captured the profound changes they observed in the face of previously overwhelming water stress challenges. They

highlighted the transformative resolution of drought and water stress through the enhanced interplay of snowfall, rainfall and improved water availability. The following quote captures the essence of the FGD observations:

Drought and water stress issues have been addressed through increased snow and rainfall following FLR initiatives. Increased water availability has improved crop production. (FGD-05, September 20, 2019)

Livelihood Improvement

Comments from the FGDs highlighted that FLR initiatives have had a positive impact on livelihoods. Participants noted that their family members now have better access to education, which has enabled them to attend school. Better access to health care was also mentioned, as was the affordability of medical treatment in good public hospitals. The transition from forest-based livelihoods to crop farming after deforestation had initially posed significant challenges. This was particularly true for wealthier farmers who experienced lower crop yields and frequent flooding. But after implementing FLR, these farmers were able to benefit from increased crop productivity, reduced flooding, and the ability to market firewood. The economic conditions of these people improved as a result of the restoration, leading to a shift back to crop- and forest-based livelihoods.

FLR changed our lives. Education and healthcare improved. Deforestation devastated our infrastructure and livelihoods. Flooding made farming impossible. FLR brought relief: Flooding stopped, yields increased, and forest-based livelihoods returned. (FGD-05, September 20, 2019)

FLR encourages livelihood diversification by offering new income sources, such as eco-tourism, non-timber forest products. (FGD-2, October 25, 2019)

Marketing of firewood from restored forests provided sustainable livelihoods while promoting responsible and efficient resource management. (FGD-1, October 11, 2019)

Participants of the FGDs reported that community food security has been positively impacted by FLR initiatives. In the past, crops and forests could not provide enough food, but after FLR was implemented, they became a reliable source of food for animals and community members. Agricultural production increased, allowing households to adequately feed their families and host guests through forest restoration and improved agricultural practices. Respondents in FGDs reported:

Before our crops and forests could not feed us, now they feed our animals and guests. (FGD-06, November 15, 2019)

FLR has contributed to food security by increasing income from agroforestry, conserving biodiversity, and increasing the availability of nutritious food. (FGD-5, September 20, 2019)

Discussion

The FGDs conducted in the study communities provided valuable insights into the outcomes and impacts of FLR initiatives. Social cohesion and conflict resolution were reported in our study communities as a result of FLR initiatives. This took the form of the establishment of CBOs, the involvement of community volunteers in various FLR activities, a collaborative/cooperative approach to forest management, conflict resolution, and empowerment of the local community. Efforts to promote social cohesion among local communities involved in the formulation of restoration plans are reported in many studies. For example, similar to our findings, the results of other studies in Pakistan by Rauf et al. (2019), in Bangladesh by Aryal et al. (2020), and in Malawi by Djenontin and Zulu, (2021) reported the impact of FLR projects on social cohesion. These studies reported that FLR initiatives played a pivotal role in promoting the establishment and strengthening of CBOs, involving community volunteers in various FLR activities, promoting a cooperative approach to forest management, resolving conflicts, and ultimately empowering local communities. A study conducted by Ullah et al. (2023c) has reported that CBOs such as VDCs and JFMCs serve as a platform for farmers to come together, volunteer their services, and collectively address their common challenges. Similarly, a study conducted by Sacande and Berahmouni, (2016) highlighted that FLR is a platform for building social cohesion. They reported that the involvement of community volunteers in various FLR activities developed a cooperative/collaborative approach to forest management, which reduced conflict and empowered local people by building social cohesion. These findings provide valuable insights for the global forest conservation community, suggesting that farmers involved in FLR projects enhance social cohesion and cooperation. This enhanced social cohesion can help design more effective and inclusive approaches to sustainable forest restoration, providing valuable guidance to practitioners and policymakers worldwide. In addition, engaging local communities and stakeholders throughout the restoration process can significantly improve the effectiveness and long-term sustainability of FLR initiatives.

Our study also found evidence of the ecosystem restoration effects of FLR, including reported improvements in biodiversity, plant diversity, animal populations and animal health, as well as soil health and water quality. The emergence of new plant species in restored forest areas is one of the key indicators of the success of FLR initiatives in promoting ecological regeneration. This observation provides evidence that FLR efforts are effective in restoring and revitalizing ecosystems. The impacts reported by the FGD participants in this study were consistent with previous scientific findings. For example, Brancalion and Holl (2020) and Wang et al. (2023) reported the importance of FLR projects in achieving successful ecological outcomes. Similarly, consistent with our study, Zhang et al. (2021) and Mansourian et al. (2021) have reported that the FLR approach has been successfully implemented in several ecological restoration initiatives around the world. Studies by Mansourian et al. (2021) and Zafar et al. (2023) report that engaging local communities in restoration efforts can yield remarkable results in terms of ecosystem recovery and resilience. This evidence supports the importance of investing in community-based approaches to FLR for successful ecological restoration around the world.

By reintroducing lost species and observing new species in restored areas, our study demonstrates the resilience of forest ecosystems. However, these species could not be identified by the participants in our study. This highlights the need for further research and documentation to assess the ecological importance of these species and their potential benefits to the community. This underscores the importance of ongoing monitoring and evaluation in FLR initiatives, which will allow for a deeper understanding of the ecological changes taking place and their impact on the local communities involved. In our study, the significant increase in livestock numbers within the community, with no negative impact on FLR, suggests a successful balance between conservation efforts and livestock management. Previous studies consistently show a strong correlation between sustainable FLR and increased crop diversity (Meadows et al. 2013; Wiegant et al. 2022), increased livestock populations and improved animal health (Crouzeilles and Curran 2016; Nghiem et al. 2021), improved soil health (Zhang et al. 2019; Gatica-Saavedra et al. 2023), and improved water quality (Pires et al. 2017; Ma et al. 2022), with conclusions drawn from the observed positive effects of FLR on these important ecological elements.

FLRs also help improve livelihoods by increasing access to education and making health services more affordable. A positive change in socio-economic conditions is evident in the ability of community members to send their family members to school and seek medical treatment in public hospitals. This improvement can be attributed to the restoration of

forest resources, which in turn has provided opportunities for livelihood diversification and increased economic resilience. Similar to our study, previous literature has shown that restoration of forest landscapes through FLR initiatives has created favorable conditions for various livelihood activities, leading to positive outcomes for poor land users (Weston et al. 2015; Dang et al. 2020). These initiatives have not only led to environmental improvements but have also contributed to sustainable economic development. Studies by Erbaugh and Oldekop (2018), Harrison et al. (2020), and Kandel et al. (2023) suggest that forest restoration has enabled communities to engage in activities such as agroforestry, non-timber forest products, and ecotourism, which have provided additional income and livelihood opportunities. Studies by Ullah et al. (2022b) and Biland et al. (2021) report that communities can better cope with economic shocks by diversifying their livelihood strategies. For example, during droughts or crop failures, agroforestry communities can rely on forest products for food and income (Ullah et al. 2020). The adoption of agroforestry practices and crop diversification reported by participants highlights the positive impact of FLR initiatives on food security and income generation. The integration of fast-growing trees, such as *Populus ciliate* and willow, with traditional crop farming has increased timber production while protecting the forest from further damage. This diversification has not only increased farmers' income potential, but also improved their food security by relying on both forest and crop resources. The results suggest that FLR can play a critical role in supporting sustainable agricultural practices and ensuring a more resilient food system.

Conclusion and policy recommendation

This study examines the impact of FLR activities on social cohesion, ecosystems, and rural livelihoods in participating communities in Pakistan. The study highlights that afforestation efforts have had a significant positive impact on social cohesion within communities, transforming conflicts over forest resources into cooperation among community members. FLR facilitated the establishment of VDCs and JFMCs, mobilization, cooperation and shared responsibility within the community. The active participation of each household in decision-making processes and the involvement of community volunteers further strengthened the FLR initiatives. Ecosystem restoration through FLR initiatives includes the restoration of biodiversity, with the emergence of new plant species and the recovery of vanished species. In addition, the restoration of animal populations and health, soil health, and water quality were attributed to the implementation of FLR in the FGDs, underscoring its role in ecosystem restoration. FLR initiatives have had a positive impact on community livelihoods. Increased access to education

and improved affordability of health care are evidence of improved socio-economic conditions. Restoration of forest resources has provided opportunities for diversified livelihoods and increased economic resilience. The shift back to crop- and forest-based livelihoods has led to improved economic conditions for people previously affected by reduced crop yields and frequent flooding. FLR promotes community empowerment by involving local people in reforestation efforts, providing access to forest resources, and promoting sustainable land management practices, which in turn improves livelihoods and builds community resilience.

Based on the findings of this study, several policy recommendations are proposed to enhance the effectiveness and sustainability of FLR initiatives. Strong community ownership and participation are critical to the success of FLR initiatives, and appropriate policies should be implemented to facilitate community-led restoration activities. It is important to implement programs that support the transition from single income sources, such as timber harvesting or pastoralism, to diversified livelihoods that include agroforestry, ecotourism, non-timber forest products and sustainable agriculture. Addressing the concerns and grievances of marginalized groups through inclusive policies and targeted interventions is necessary for effective FLR. Consider implementing benefit-sharing mechanisms that ensure the inclusion and participation of all community members in decision-making processes and the distribution of benefits derived from FLR initiatives. Provide resources to support research initiatives that focus on the long-term environmental, social and economic impacts of FLR interventions.

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Data Availability In accordance with institutional ethical guidelines, the summarized and anonymized data are presented in the article.

Declarations

Ethics approval and consent to participate All the procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee. Informed consent was obtained from all the individual participants involved in the study.

Conflicts of interest The authors have no relevant financial or non-financial interests to disclose.

Consent for publication The participants have consented to the submission of the FGDs results to the journal.

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