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Abstract: *This study examines the socioeconomic, cultural, and ecological aspects of herbal plant use in Siran Valley, focusing on their contribution to household livelihoods and potential for sustainable development. A mixed-method approach was employed, combining quantitative data from a household survey of 50 respondents with qualitative insights from interviews and field observations involving local traditional healers. Quantitative analysis described demographic characteristics, household size, education levels, livelihood sources, and the extent of reliance on herbal plants, while qualitative analysis explored harvesting practices, knowledge transmission, market access, and sustainability concerns. Findings reveal that herbal plants serve both as a primary source of income for some households and as a supplementary safety net for others, with multigenerational participation and medium-to-large household sizes supporting labor-intensive activities. The study also identifies challenges such as limited market access, dependence on intermediaries, insufficient price information, partial knowledge of sustainable harvesting, and minimal institutional support. Traditional knowledge plays a central role in guiding harvesting and medicinal use, though younger generations show declining engagement. The research highlights the economic and cultural importance of herbal plants, emphasizing the need for market development, capacity building, cultivation support, knowledge preservation, and stronger institutional engagement. These measures are essential to enhance income opportunities, ensure sustainable resource use, and safeguard the continuity of local medicinal traditions. The study provides a foundation for policy interventions and future research aimed at improving both livelihoods and ecological sustainability in rural communities.*

Introduction

Herbal plants are an essential resource for rural communities in mountainous environments such as Siran Valley, where formal employment opportunities are limited. These plants contribute to household income, nutrition, and healthcare, complementing agriculture and livestock rearing, and enhancing

economic resilience (Umar et al., 2020; Albouchi et al., 2018). In the Hazara region of Khyber Pakhtunkhwa, non-timber forest products (NTFPs), including herbal plants, form a substantial part of the rural economy. These resources support households through direct sales, medicinal use, and livestock health management (Nosheen & Ahmad, 2026). Despite their significance, quantitative studies on the economic impact of herbal plants in Siran Valley remain scarce, limiting understanding of their full potential for rural development.

Herbal plants provide direct economic benefits through sales of raw or processed products and indirect benefits by reducing expenditures on healthcare and veterinary services. For instance, communities in Tamil Nadu, India, use medicinal plants to treat livestock, lowering veterinary costs and increasing disposable income (Albouchi et al., 2018). In Nigeria, residents near Wawa Zange Forest Reserve derive both cash income and health benefits from medicinal plants, reflecting their dual socioeconomic role (Umar et al., 2020).

Market access critically affects the economic benefits derived from herbal plants. Smallholders often face challenges such as intermediary control over pricing, limiting income potential (Xhoxhi et al., 2020). Studies on Tulsi (*Ocimum sanctum*) cultivation show that access to urban markets and quality standards knowledge can substantially increase farmer incomes (Shah et al., 2019). Sustainable harvesting practices are necessary to prevent resource depletion and secure long-term income streams (Chen et al., 2016). Herbal plants also contribute to economic resilience by offering alternative income during agricultural or climatic adversities (Gurung et al., 2021).

Socio-cultural factors, including local knowledge and traditional practices, shape the use and commercialization of herbal plants (Ambu et al., 2020; Hariharan et al., 2025). Institutional support through extension services, policies, and certification schemes further enhances the capacity of households to convert herbal resources into sustainable livelihoods (Emeana et al., 2019; Walker & Fatur (2025)). Global demand for herbal products underscores their economic potential, though governance challenges remain (Timoshyna, & Drinkwater (2021)).

This study addresses knowledge gaps by evaluating the socioeconomic determinants of herbal plant use and their economic contributions in Siran Valley. Findings aim to guide sustainable resource management, rural development policies, and interventions enhancing market access and institutional support.

Literature Review

Herbal plants have long been recognized as an essential component of rural livelihoods, particularly in regions where formal employment is scarce. In mountainous and forested areas, these plants provide not only subsistence resources but also a source of income and health security. Siran Valley, located in the Hazara region of Khyber Pakhtunkhwa, Pakistan, represents such a context where local communities have relied on herbal plants for generations. In this region, non-timber forest products (NTFPs), including medicinal and aromatic plants, contribute significantly to household economies through collection, cultivation, and sale. These resources supplement traditional farming and livestock activities and provide safety nets during periods of low agricultural productivity (Nosheen & Ahmad, 2026).

Studies from other developing countries reinforce the socioeconomic value of herbal plants. For example, research conducted near Wawa Zange Forest Reserve in Nigeria revealed that households heavily depend on medicinal plants for both income and health needs. Similarly, in Tamil Nadu, India, indigenous communities employ medicinal plants to treat livestock, reducing veterinary costs and thereby indirectly increasing disposable income (Umar et al., 2020; Albouchi et al., 2018). These examples illustrate the dual role of herbal plants: they serve as a source of revenue while

simultaneously supporting household health and food security.

Medicinal and aromatic plants also play a critical role in income diversification and economic resilience. Antunes et al. (2022) highlighted that in the Brazilian Amazon, communities rely on wild and cultivated herbal resources to buffer against agricultural uncertainties and climate-related shocks. By providing an alternative source of income, these plants reduce vulnerability to market fluctuations, poor harvests, and other risks affecting primary agricultural production. This function of herbal plants is particularly important in rural mountainous areas, where alternative income-generating opportunities are limited, and natural resources often constitute the main form of household wealth.

The ability of households to gain economically from herbal plants depends strongly on market access and the structure of the value chain. Xhoxhi et al. (2020) documented that in Albania, intermediaries often control the trade of medicinal plants, limiting smallholder income and bargaining power. Similarly, Shah et al. (2019) showed that in India, the economic benefits from Tulsi (*Ocimum sanctum*) cultivation are greatly enhanced when farmers have access to urban markets and understand quality standards. These findings suggest that improving market information, reducing dependency on intermediaries, and establishing transparent value chains are essential for maximizing income from herbal resources.

Global trade presents both opportunities and challenges for communities engaged in herbal plant collection and cultivation Timoshyna and Drinkwater (2021), Trukhachev and Dzhikiya (2023). As demand for herbal products grows internationally, households can potentially increase income by supplying urban and export markets. However, global trade also introduces governance challenges, including the risk of exploitation, inconsistent pricing, and weak regulatory oversight (Timoshyna, & Drinkwater. (2021).). These factors can reduce equitable benefit sharing, emphasizing the need for policies and institutional mechanisms that protect smallholders and promote sustainable commercialization.

Sustainability is another critical dimension of herbal plant use. Overharvesting and habitat degradation threaten both the ecological and economic viability of medicinal plants (Chen et al., 2016; Derebe & Alemu, 2023). When high-value species are collected excessively or harvested at inappropriate stages of growth, plant populations decline, affecting future availability and household income. In the Himalayan context, Gurung et al. (2021) noted that communities face similar challenges, and sustainable harvesting practices are vital to maintain both biodiversity and livelihoods. These practices include selective harvesting, seasonal collection, and rotational gathering, all of which help ensure long-term resource availability.

The socio-cultural dimension of herbal plant use is also significant. Traditional knowledge, passed down through families and local healer networks, determines which plants are used, how they are harvested, and how they are prepared for medicinal or commercial purposes. Ambu et al. (2020) highlighted the role of ethnic knowledge in shaping plant use and market practices in Nepal, while Hariharan et al. (2025) documented cultural norms in southern India that influence harvesting patterns and conservation behavior. This knowledge not only guides sustainable practices but also underpins the trust and acceptance of herbal medicines within communities. Preservation of traditional knowledge is therefore critical, particularly as younger generations increasingly migrate toward urban centers and formal employment opportunities.

Institutional support, including extension services, training programs, and certification schemes, has been shown to enhance the economic benefits of herbal plants. In Nigeria, Emeana et al. (2019) found that extension services helped farmers improve cultivation methods, access markets more effectively, and increase household income from medicinal plants. Certification of herbal products, improves

market credibility and opens access to higher-value markets. For smallholders in regions like Siran Valley, such institutional interventions can provide technical guidance, market connections, and assurance of sustainable harvesting, all of which contribute to the resilience and growth of herbal plant-based livelihoods.

The economic potential of herbal plants is further reinforced by studies in sub-Saharan Africa. Adelesi (2024) and Adeyanju et al. (2022) emphasized that communities in the region derive significant income from non-timber forest products, including medicinal plants, which play a key role in reducing poverty and supporting household welfare. These findings resonate globally, showing that when managed sustainably, herbal plants can provide both short-term income and long-term ecological benefits.

Climate change adds another layer of complexity to herbal plant utilization. Changing precipitation patterns, rising temperatures, and extreme weather events can affect plant growth, availability, and quality. Integrated management approaches that combine traditional knowledge, scientific guidance, and institutional support are essential to ensure that communities can continue to benefit from herbal plants under shifting environmental conditions. Antunes et al. (2022) highlighted that adaptive strategies, such as home cultivation of high-value species and community-based resource management, are effective in mitigating climate-related risks while preserving ecological integrity.

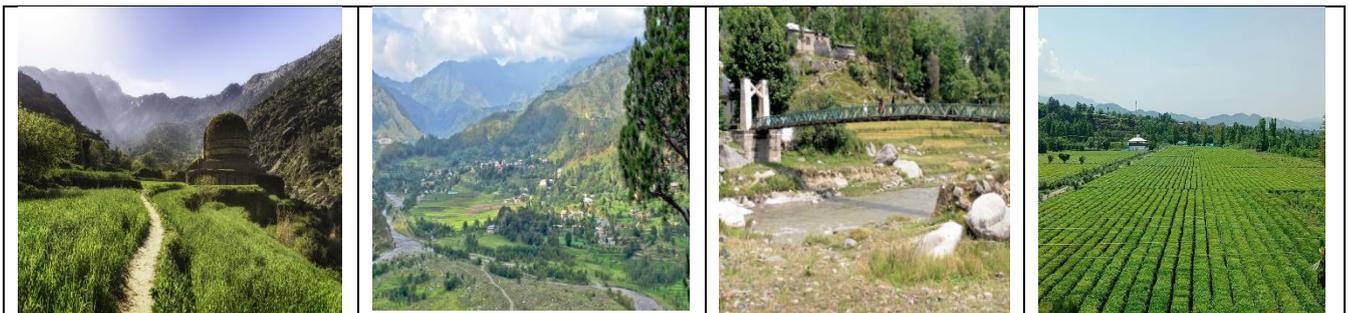
Despite the growing recognition of the socioeconomic value of herbal plants, quantitative studies in regions like Siran Valley remain limited. Most existing research is descriptive or focuses on specific species or market dynamics, leaving gaps in understanding the broader household-level economic contributions and the influence of socioeconomic factors such as education, household size, and market access. Addressing these gaps is crucial for designing effective interventions that enhance livelihoods, conserve resources, and support sustainable rural development.

Herbal plants serve as a multifunctional resource in rural and mountainous areas, contributing to income, health, and resilience. Their economic benefits are influenced by access to markets, value chain efficiency, cultural knowledge, and institutional support, while sustainability depends on responsible harvesting and ecological management. Understanding these dynamics is essential to inform policies, community programs, and development initiatives that aim to strengthen livelihoods, promote sustainable resource use, and conserve biodiversity. The evidence from global and regional studies underscores the potential of herbal plants to support rural development when combined with appropriate technical guidance, market linkages, and governance mechanisms.

Methodology

Study Area

Siran Valley, situated in the Hazara region of Khyber Pakhtunkhwa, Pakistan, is a mountainous region renowned for its rich biodiversity and long-standing dependence on natural resources. Local communities primarily practice agriculture, rear livestock, and collect both wild and cultivated herbal plants. The unique terrain, climate, and cultural traditions provide an ideal context to explore the socioeconomic importance of medicinal plants in rural livelihoods.



Fifty households were selected from various villages across Siran Valley, including Shinkiari, Dadar, Mundi and Bhogarmang, using a stratified random sampling approach. This method ensured that households from different altitude zones, family sizes, and socioeconomic backgrounds were adequately represented.

Data was gathered using structured questionnaires, covering:

- Household demographics (age, education level, family size, occupation)
- Knowledge and utilization of herbal plants
- Income obtained from collection, cultivation, and sale of herbal resources
- Access to markets and support from government or non-governmental organizations

In addition, semi-structured interviews were conducted with 10 local herbal practitioners, including traditional healers (hakeems) and herbal sellers (pansars). These discussions focused on traditional knowledge, methods of harvesting and preparation, therapeutic uses, market engagement, and sustainability challenges. Interviews were conducted in the local language, lasted 45–60 minutes, and were with consent for accurate documentation.

This study adopted a mixed-method approach to better understand the use of herbal plants and their contribution to household income. Quantitative data were analyzed using descriptive statistics to outline household characteristics, income sources, and the extent to which families depend on herbal plants. Percentages and frequency distributions were used to present information such as age categories, education levels, family size, and levels of reliance on plant resources. In addition, qualitative data from interviews and open-ended questionnaire responses were examined through thematic analysis, allowing recurring ideas and community perspectives to emerge gradually through careful review. Participation in the research was voluntary, and informed consent was obtained from every respondent. Cultural values were respected during interviews, and confidentiality of participants was maintained throughout the process. All collected information was stored securely and used strictly for academic purposes. Although the sample included 50 households and may not reflect every variation within Siran Valley, and seasonal changes may influence plant availability and income patterns, the overall research design provides meaningful insight into how herbal plants support rural livelihoods.

Data Analysis

The data gathered for this study were examined through both quantitative and qualitative procedures to allow for a well-rounded interpretation of the findings. Initially, descriptive statistical methods were used to outline the demographic and socioeconomic profile of the respondents. Measures such as frequencies and percentages were calculated to present variations in age distribution, educational attainment, family size, livelihood strategies, and the extent of dependence on herbal plant resources. This stage of analysis offered a clear picture of the social characteristics of the sample and highlighted the role of herbal plant activities in household income structures.

Alongside the quantitative analysis, qualitative information obtained from interviews and open-ended survey responses was reviewed carefully and organized through thematic coding. Issues related to marketing challenges, harvesting methods, and the availability of institutional support were examined in depth. Common concerns such as unstable prices, dependence on middlemen, and limited access to technical advice were grouped into broader thematic categories. Integrating statistical findings with participants' experiences enhanced the credibility of the study by linking measurable trends with lived realities.

Overall, the research design combined household survey data from 50 respondents with qualitative

insights from interviews and field observations. Quantitative techniques were used to identify patterns and test relationships between socioeconomic characteristics and income derived from herbal plants, while qualitative analysis helped explain the social and institutional factors underlying these patterns. Together, these approaches provide a detailed understanding of the contribution of herbal plant resources to rural livelihoods in Siran Valley.

Table 1: Socioeconomic Profile of Respondents (N = 50)

Variable	Category	Frequency (n)	Percentage (%)
Age	< 30 years	14	28%
	30–50 years	22	44%
	> 50 years	14	28%
Education	No formal education	19	38%
	Primary to secondary	21	42%
	Higher education	10	20%
Household Size	≤ 5 members	20	40%
	6–8 members	22	44%
	> 8 members	8	16%
Total Respondents		50	100%

Table 2: Household Reliance on Herbal Plants (N = 50)

Usage Type	Frequency (n)	Percentage (%)
Primary source of income	14	28%
Supplementary income	30	60%
Not used for income	6	12%
Total	50	100%

Table 3: Main Livelihood Categories in Siran Valley (N = 50)

Livelihood Category	Frequency (n)	Percentage (%)
Agriculture (non-herbal)	18	36%
Herbal Plant Collection/Cultivation	14	28%
Other Sources (small enterprises, labor, etc.)	11	22%
Business	4	8%
Livestock/Wage Labor	3	6%
Total	50	100%

Table 4.1: Access to Formal Markets (N = 50)

Access to Formal Markets	Frequency (n)	Percentage (%)
Yes	16	32%
No	34	68%
Total	50	100%

Table 4.2: Dependence on Middlemen (N = 50)

Dependence on Middlemen	Frequency (n)	Percentage (%)
Yes	30	60%
No	20	40%
Total	50	100%

Table 4.3: Access to Reliable Price Information (N = 50)

Access to Price Information	Frequency (n)	Percentage (%)
Yes	24	48%
No	26	52%
Total	50	100%

Table 4.4: Knowledge of Sustainable Harvesting Practices (N = 50)

Knowledge Level	Frequency (n)	Percentage (%)
Adequate	26	52%
Limited	24	48%
Total	50	100%

Table 4.5: Contact with Extension Services/NGOs (N = 50)

Institutional Contact	Frequency (n)	Percentage (%)
Yes	15	30%
No	35	70%
Total	50	100%

The demographic data presented in Table 1 show that the surveyed households in Siran Valley are predominantly within the economically active age group. Respondents aged 30–50 years account for 44% of the sample, while both younger (<30 years) and older (>50 years) groups represent 28% each. This distribution suggests that herbal plant activities engage multiple generations, with older individuals contributing traditional knowledge and younger members performing labor-intensive tasks such as harvesting, processing, and marketing. Education levels are relatively low, with 38% of respondents reporting no formal schooling and 42% completing only primary or secondary education. Only a minority (20%) achieved higher education, indicating limited access to formal knowledge that could enhance market participation and value addition. Household size further influences participation in herbal plant activities, with most families being medium-sized (6–8 members, 44%) and 40% having five or fewer members. Larger households provide sufficient labor for labor-intensive tasks, reducing the need for hired workers and allowing income to remain within the family unit.

Household Reliance on Herbal Plants

Table 2 indicates that herbal plants play a significant economic role in the livelihoods of Siran Valley households. Twenty-eight percent of households rely on herbal plants as their primary source of income, while a majority of 60% use them as a supplementary income source. Only 12% of respondents reported no financial reliance on herbal activities. These figures highlight the dual role of herbal plants: for some families, they are essential for daily sustenance, while for others they function as an important safety net, particularly during periods of agricultural scarcity or off-season months. Qualitative observations confirm that households value herbal income for its stability, especially in months when crop-based earnings decline.

Distribution of Livelihood Sources

As shown in Table 3, agriculture remains the dominant livelihood activity, engaging 36% of households, followed by herbal plant collection and cultivation, which supports 28% of the sample. Other sources of income, including small enterprises, casual labor, and informal business activities, account for 22%, while business and livestock or wage labor are less common at 8% and 6%, respectively. This distribution indicates that while traditional farming continues to dominate, herbal plants have emerged as a substantial secondary economic sector. Their role in income diversification provides households with alternative revenue streams and helps reduce vulnerability to agricultural risks.

Market Access and Institutional Support

The findings presented in **Table 4.1** show that access to formal markets is limited among the sampled households. Only 16 out of 50 respondents reported regular access to established markets, while 34 households continue to rely on informal selling arrangements. This imbalance suggests that most producers operate outside structured market systems, which may restrict their ability to secure stable demand and competitive prices.

As indicated in **Table 4.2**, dependence on middlemen is widespread. Thirty households reported relying on intermediaries for the sale of herbal products, compared to 20 households who sell independently. This pattern implies that a majority of collectors and small-scale traders have limited direct contact with buyers, which can reduce their control over pricing and overall earnings.

Information gaps are further highlighted in **Table 4.3**. More than half of the respondents (26 households) stated that they lack reliable access to price information. In contrast, 24 households reported having some level of price awareness. Limited access to accurate market information weakens negotiation power and increases vulnerability to price manipulation.

Knowledge of sustainable harvesting practices, presented in **Table 4.4**, shows a relatively balanced distribution. While 26 households demonstrated adequate knowledge, 24 households reported limited understanding of sustainable methods. This indicates that although awareness exists within the community, a considerable proportion of households may still require training to ensure long-term resource conservation.

Finally, **Table 4.5** reveals weak institutional engagement. A significant majority, 35 households, reported no contact with extension services or non-governmental organizations, while only 15 households had received some form of institutional support. The absence of technical guidance, training programs, and formal assistance limits opportunities for capacity building and market development.

Taken together, the results across Tables 4.1 to 4.5 demonstrate that herbal plant activities are carried out under constrained market conditions, characterized by limited formal access, reliance on intermediaries, insufficient price transparency, partial technical knowledge, and minimal institutional support.

The findings indicate that herbal plant activities play a significant role in supporting the livelihoods of households in Siran Valley, both as a primary and supplementary source of income. The demographic profile shows that these activities engage multiple generations, with older members contributing traditional knowledge and younger members performing labor-intensive tasks, while medium-to-large household sizes provide sufficient labor without relying heavily on outside help. Despite the economic importance of herbal plants, participation is influenced by limited formal education, which may constrain the adoption of advanced processing, marketing, and value-addition practices.

Herbal plants also contribute to income diversification alongside agriculture, small enterprises, and other livelihood sources, helping households reduce vulnerability to seasonal or agricultural shocks.

However, the sector faces multiple structural challenges. Most households lack access to formal markets, rely on intermediaries, and have insufficient knowledge of market prices, which limits their bargaining power and income potential. While some households are aware of sustainable harvesting practices, nearly half still lack adequate technical knowledge, and institutional support from government or non-government organizations is minimal.

Qualitative Research Methodology

This study aimed to explore the knowledge, practices, and economic significance of medicinal plant use among traditional healers in Siran Valley. The research focused on understanding both cultural and ecological aspects of herbal medicine, as well as the potential for sustainable cultivation and market development. The study population consisted of 10 practitioners, including six hakeems and four pansars, selected purposively based on their reputation, experience, and willingness to share detailed insights about their herbal practices. Participants were chosen from different villages across Siran Valley to ensure variation in experience, age, and locality, capturing a diverse perspective of local medicinal knowledge.

Data collection was conducted through semi-structured interviews, each lasting between 45 and 60 minutes. Interviews were conducted in the local language, audio-recorded with consent, and later transcribed for analysis. The discussions focused on the types of medicinal plants used, methods of harvesting and preparation, therapeutic applications, economic practices, and sustainability concerns. Practitioners were also asked about challenges in knowledge transmission and their views on cultivating herbs versus wild harvesting. The collected data were analyzed using thematic analysis, identifying recurring patterns and concepts related to cultural knowledge, economic value, ecological sustainability, and market interactions. Coding was done inductively, with themes refined through repeated review of transcripts and validation with participants to ensure authenticity.

Emerging Themes from Interviews

Theme 1: Cultural and Therapeutic Knowledge

All participants demonstrated deep-rooted traditional knowledge about medicinal plants and their therapeutic applications. Common herbs included *Podeena* for digestive problems, *Patrees* for respiratory infections, and *Ratan Jok* for back and joint pain. One hakeem stated, "People trust what their ancestors used. *Podeena* is something everyone knows; it works for stomach problems and has no side effects." This knowledge is primarily passed down through families, emphasizing the cultural embedding of herbal medicine within the community. Many participants stressed that local herbs are preferred because they are accessible, affordable, and well-known, fostering trust between healers and patients.

Theme 2: Wild Harvesting Practices and Ecological Awareness

Practitioners reported that most medicinal plants are harvested from forests, hillsides, and streambeds. Seasonal knowledge plays a key role in ensuring plant efficacy, and participants emphasized the importance of careful collection methods to avoid overharvesting. One pansar remarked, "We pick the leaves or roots only when the plant is mature. If we take too much too soon, the forest will have nothing left." Despite such awareness, economic necessity sometimes overrides sustainable practices, particularly for high-demand or high-value species like *Kala Zeeri*.

Theme 3: Economic Value and Price Variability

Interviewees highlighted considerable variation in the economic value of different herbs. High-value species, including *Kala Zeeri* and *Patrees*, command premium prices in urban markets, while more common herbs provide modest but steady income. A hakeem explained, "Collectors sell herbs to us

quickly because they need cash, but a kilo of Kala Zeeri in the city is worth ten times what they get here.” This variation affects harvesting intensity and shapes local market dynamics, creating both opportunities and risks for collectors and small-scale farmers.

Theme 4: Cultivation Potential and Challenges

Some participants have started small-scale cultivation of herbs in home gardens or village plots. Cultivation is viewed as a promising way to stabilize supply and reduce pressure on wild populations. One pansar commented, “If we can grow Kala Zeeri and Podeena here, we won’t have to go into the forest so often. It will help both the plants and our income.” Challenges to wider adoption include limited irrigation, lack of formal training in cultivation techniques, and initial investment costs. Practitioners expressed interest in structured support programs to expand cultivation while maintaining quality and sustainability.

Theme 5: Knowledge Transmission and Community Networks

Knowledge is shared primarily through families and local networks of healers. Older practitioners expressed concern about younger generations losing interest in traditional medicine. As one hakeem noted, “The children are more interested in shops and phones; they don’t learn about plants anymore. If we don’t teach them, this knowledge will vanish.” Participants suggested community workshops or documentation projects to ensure that knowledge is preserved and systematically transferred.

Theme 6: Market Access and Information Gaps

Local collectors sell primarily to hakeems, who act as intermediaries and link them to urban markets. Practitioners identified a major challenge in market access: collectors often do not know the true value of herbs outside the valley, leading to reduced bargaining power. A pansar said, “We never know what the prices are in Abbottabad or Rawalpindi; we sell what we have quickly, or it will rot.” Participants recommended establishing market information systems and cooperative marketing to improve income and reduce exploitation.

Theme 7: Sustainability Risks and Long-term Viability

Overharvesting, habitat degradation, and climate variability were identified as key threats to the long-term availability of medicinal plants. Practitioners noted that certain slow-growing or high-value species are becoming harder to find. “Some roots we used to get easily are now deep in the hills. It takes hours to find a few kilos,” one hakeem explained. Interviews suggested that proactive interventions, such as community nurseries, cultivation training, and structured harvesting guidelines, are essential to ensure sustainability and continued economic benefits for local communities.

Conclusion

The findings of this study demonstrate that herbal plants are a vital component of rural livelihoods in Siran Valley, contributing both as a primary source of income for some households and as a supplementary source for many others. The demographic data indicate that these activities engage multiple generations, combining the traditional knowledge of older individuals with the labor capacity of younger family members. Household size further supports participation, enabling families to manage labor-intensive tasks without reliance on external workers. Despite this, limited formal education constrains opportunities for improved processing, value addition, and effective market engagement.

Herbal plants complement agriculture and other livelihood activities, offering households alternative income streams that reduce vulnerability to seasonal fluctuations and agricultural risks. However, the sector faces significant structural challenges. Market access is largely informal, with most households dependent on intermediaries and lacking reliable price information. Knowledge of sustainable harvesting practices is uneven, and engagement with extension services or non-governmental

organizations is minimal. Qualitative insights from traditional healers further reveal that overharvesting, seasonal limitations, and variable market prices create both economic and ecological pressures. While some small-scale cultivation initiatives are underway, the lack of technical support, investment, and structured market linkages restricts their potential impact.

Collectively, these findings highlight that herbal plant resources provide substantial economic and cultural value but are currently underutilized due to limited knowledge, market constraints, and weak institutional support. Without targeted interventions, households may continue to face challenges in maximizing income while ensuring long-term sustainability of medicinal plant resources.

Policy Implications

To improve the livelihoods of households engaged in herbal plant activities and ensure the sustainable use of these resources, several policy measures are needed. Strengthening formal market linkages is critical for increasing income, and this can be achieved through cooperative marketing arrangements, establishment of local collection centers, and digital platforms that provide timely price information, reducing reliance on intermediaries. At the same time, capacity-building programs should be implemented to enhance knowledge of sustainable harvesting methods, post-harvest handling, and small-scale cultivation. These programs should target both younger and older community members, combining traditional knowledge with modern techniques to increase productivity and preserve cultural practices. Promoting home- and community-based cultivation of high-value herbs can alleviate pressure on wild populations, and support such as seedlings, irrigation facilities, and technical guidance from extension services or NGOs can facilitate sustainable production while maintaining ecological balance. Preservation of traditional medicinal knowledge is equally important, and initiatives such as community workshops, mentorship programs, and documentation projects can ensure that this heritage is passed on to future generations. Finally, institutional strengthening through greater coordination between government agencies, NGOs, and local communities can provide advisory services, financial support, and market facilitation. Such structured engagement would improve access to information, training, and investment opportunities, ultimately enhancing economic returns for households while promoting responsible management of herbal plant resources.

Future Research

While this study provides valuable insights into the economic, cultural, and ecological aspects of herbal plant use in Siran Valley, several areas warrant further investigation. Future research could focus on long-term monitoring of plant populations to assess the impact of harvesting practices on biodiversity and resource sustainability. Detailed market studies are also needed to better understand price fluctuations, supply chains, and consumer demand, which would help optimize income for collectors and small-scale traders. Additionally, exploring the potential for large-scale cultivation of high-value medicinal plants could inform strategies to reduce pressure on wild populations while increasing economic returns. Comparative studies between different valleys or regions could highlight variations in traditional knowledge, harvesting practices, and market access, providing a broader perspective for policy and development planning. Finally, research on knowledge transmission mechanisms, particularly the role of younger generations and formal education in preserving traditional medicinal practices, would help ensure the continuity of cultural heritage while promoting sustainable livelihoods.

References

- Adeyanju, M. M., Saheed, I. A., Oyelekan, O. I., Dele-Osibanjo, T. A., Adelegan, A. A., Raimi, A. J., ... & Alli, K. M. (2022). Sesamum indicum diet prevents hyperlipidemia in experimental rats. *Food Chemistry: Molecular Sciences*, 4, 100092.

- Albouchi, F., Ghazouani, N., Souissi, R., Abderrabba, M., & Boukhris-Bouhachem, S. (2018). Aphidicidal activities of *Melaleuca styphelioides* Sm. essential oils on three citrus aphids: *Aphis gossypii* Glover; *Aphis spiraeicola* Patch and *Myzus persicae* (Sulzer). *South African Journal of Botany*, 117, 149–154.
- Antunes, C., Arbo, M. D., & Konrath, E. L. (2022). Hepatoprotective native plants documented in Brazilian traditional medicine literature: Current knowledge and prospects. *Chemistry & Biodiversity*, 19(6), e202100933.
- Chen, S. L., Yu, H., Luo, H. M., Wu, Q., Li, C. F., & Steinmetz, A. (2016). Conservation and sustainable use of medicinal plants: Problems, progress, and prospects. *Chinese Medicine*, 11(1), 37.
- Gurung, L. J., Miller, K. K., Venn, S., & Bryan, B. A. (2021). Contributions of non-timber forest products to people in mountain ecosystems and impacts of recent climate change. *Ecosystems and People*, 17(1), 447–463.
- Hariharan, M., Rathinavel, T., Haritha, S., Nallapa, H., Vadivel, P., Singaravelu, R., ... & Raja, R. K. (2025). A comprehensive review on current and future trends of nanoemulsions in modern cosmetics and pharmaceuticals. *Int J Adv Sci Eng*, 11(3), 4257.
- Nosheen, M., & Ahmad, S. (2026). Economic analysis of herbal plants in the Hazara region. *Policy Journal of Social Science Review*, 4(2), 44–58.
- Shah, S. M. A., Akram, M., Riaz, M., Munir, N., & Rasool, G. (2019). Cardioprotective potential of plant-derived molecules: A scientific and medicinal approach. *Dose-Response*, 17(2), 1559325819852243.
- Timoshyna, A., & Drinkwater, E. (2021). Understanding corruption risks in the global trade in wild plants. *Targeting Natural Resources Corruption*, 1–15.
- Trukhachev, V., & Dzhikiya, M. (2023). Development of environmental economy and management in the age of AI based on green finance. *Frontiers in Environmental Science*, *10*, 1087034. <https://doi.org/10.3389/fenvs.2022.1087034>
- Tseng, M. L., Bui, T. D., Lim, M. K., Tsai, F. M., & Tan, R. R. (2021). Comparing world regional sustainable supply chain finance using big data analytics: A bibliometric analysis. *Industrial Management & Data Systems*, *121*(3), 657–700. <https://doi.org/10.1108/IMDS-09-2020-0526>
- Umar, M., Sajid, M., Zahra, K., Bashir, I., Bashir, G. K., Mudassar, M., ... & Ali, U. Role of plant extracts to control *Mycobacterium tuberculosis*. *Medicinal Plants and Aromatics: A Holistic Health Perspective*, 62.
- Walker, K., & Fatur, K. (2025). Legal use of potentially poisonous plants: The case of British herbalism. *Economic Botany*, 79(1), 108–117.
- Xhoxhi, O., Stefanllari, A., Skreli, E., & Imami, D. (2020). How intermediaries' power affects contract farming decisions: Evidence from the medicinal and aromatic plant sector in Albania. *Journal of Agribusiness in Developing and Emerging Economies*, 10(5), 529–544.