

Uses of Rangelands and the Relationship Between Demographic Factors and Rangeland Consumption Patterns

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ABSTRACT

Rangelands are one of the most important renewable natural resources in rural Afghanistan. They are crucial for the livelihoods of rural communities, especially farmers and pastoralists, because they provide forage for livestock, fuel, industrial and medicinal materials, and numerous ecosystem services. This study examines the importance and uses of rangelands from the perspective of local communities in Daykundi Province (case study: Nili District) and analyses the relationship between demographic factors and rangeland use patterns. By understanding the various uses of rangelands, the study aims to develop effective, well-planned management strategies to prevent rangeland degradation and decline. The study addresses a practical problem and employs a descriptive-analytical method. Data were collected through 377 questionnaires based on local residents' perceptions and analyzed using chi-square tests in SPSS. Major rangeland uses comprised winter forage provision (87.3%), fuel materials (77.2%), livestock grazing (76.7%), and therapeutic use of medicinal plants (77.2%). The Chi-Square Tests revealed that gender, age, level of education, and type of occupation are significant in certain patterns of rangeland use, but most relationships were weak to moderate. The findings emphasize the need to consider social factors in rangeland management and conservation and suggest that participatory and education-based approaches, along with introducing alternative sources of forage, fuel, and other uses, can help ensure the sustainability of these resources. These findings provide actionable insights for resource managers to develop targeted rangeland policies aligned with local socio-demographic needs.

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INTRODUCTION

Rangelands in Afghanistan are among the most important natural resources and constitute a fundamental pillar of the rural economy and livestock-based livelihood systems. Estimates indicate that rangelands cover approximately 47% of the country's total land area and play a vital role in providing animal forage, maintaining vegetation cover, stabilizing soils,

regulating hydrological cycles, and sustaining ecological balance (FAO, 2025; World Bank, 2018). Beyond their ecological functions, rangelands support the production of livestock products such as meat, milk, and fibers, contributing significantly to food security and household incomes in rural areas. In Afghanistan's central mountainous regions, including Daykundi Province, local livelihoods depend heavily on rangelands, and traditional livestock husbandry is inseparable from local communities' social and economic life.

Daykundi Province, characterized by a semi-arid climate with cold winters and moderately warm summers, encompasses rangeland ecosystems that naturally supply forage for both small and large livestock species. In recent years, however, these rangelands have experienced increasing anthropogenic and environmental pressures. Reynolds et al. (2007) describe rangeland degradation as a key component of desertification in arid and semi-arid regions, driven by interactions among human, climatic, and institutional factors. Population growth and increasing livestock numbers intensify grazing pressure, while climate variability, reduced rainfall, rising temperatures, and recurrent droughts further weaken rangeland resilience. The authors emphasize that weak policies and ineffective natural resource management accelerate rangeland degradation, underscoring the need for integrated, sustainable management approaches. Rangelands in the Near East and North Africa (NENA) region face increasing pressure from population growth, expanding livestock herds, climate variability and climate change, reduced precipitation, rising temperatures, and weaknesses in both formal and community-based natural resource management systems. According to FAO, these interacting drivers have led to overgrazing, vegetation loss, soil erosion, and accelerated rangeland degradation across the NENA region (FAO, n.d.). These pressures have reduced vegetation cover, intensified soil erosion, lowered soil fertility, and diminished forage production capacity, posing significant risks to the long-term sustainability of pastoral livelihoods.

Studies in the region indicate that overgrazing and a lack of effective scientific and institutional management alter plant species composition, degrade soil structure, and reduce the ecological capacity of rangelands (Phelps et al., 2017; Rahmanian et al., 2019). A key concept in this context is rangeland carrying capacity, the neglect of which can significantly slow down or even prevent the natural regeneration of vegetation cover (Rouquette et al., 2023). In Afghanistan, particularly in Daykundi Province, rangelands are predominantly communally owned and used under customary and traditional practices (Swiss Agency for Development and Cooperation [SDC], 2022). As extensive ecosystems in arid and semi-arid regions, rangelands play a fundamental role in supporting rural communities' livelihoods, economy, culture, and social cohesion (Twine, 2013). Changes in how these resources are managed and used directly affect household food security and economic well-being (Mahdavi et al., 2023).

Recent studies have focused on the role of demographic and social factors in rangeland use patterns. Variables such as age, education level, livestock-keeping experience, household size, and livelihood type influence users' attitudes and behaviors toward livestock grazing and

rangeland conservation. For instance, studies in Iran have shown that local knowledge and knowledge-driven practices of shepherds—often correlated with age and livestock experience—play a significant role in sustainable rangeland management and conservation (Mahdavi et al., 2023).

Studies conducted in Mongolia have also shown that age and livestock grazing experience are significantly associated with shepherds' willingness to cooperate in rangeland management, highlighting the importance of social parameters in conservation behaviors (Ulziibaatar & Matsui, 2021). Furthermore, research on social-ecological governance indicates that local social networks and institutional cooperation can enhance the resilience and sustainability of rangeland systems (Shariatyniya et al., 2025). On the other hand, values, beliefs, and social norms also play a decisive role in shaping rangeland conservation behaviors (Savari, 2023).

Despite the fundamental role of rangelands in the livelihoods of rural communities in Daykundi province, no comprehensive study has yet addressed both rangeland use patterns and the demographic characteristics of resource users simultaneously. This research gap highlights the need for case studies based on local data. The present study focuses on the Nili district of Daykundi province and utilizes data collected from 377 questionnaires to examine rangeland uses and the influence of demographic factors on their utilization. By identifying the current status, prevailing use patterns, and the factors affecting them, this study aims to provide a scientific and practical basis for improving rangeland management and sustainable use. The findings can serve as a foundation for decision-making and policy development by responsible institutions, including the Natural Resources Department and the Ministry of Agriculture, to support ecological sustainability and enhance local livelihoods.

METHODS AND MATERIALS

Research Design

The study aims to solve a practical problem and employs a descriptive-analytical method. The main objective of this research is to investigate rangeland use and analyze the role of demographic factors in its exploitation in the villages of Nili District, the capital of Daykundi Province. Several professors supervised the questionnaire development to ensure validity. We tested its reliability in SPSS, yielding a Cronbach's alpha of 0.713, indicating acceptable reliability. The data of this study are based on the perceptions and understanding (human perception) of the respondents of the status and management practices of the rangelands.

Data Collection Methods

This study collected data using both library-based and field-based methods. In the field-based approach, a structured questionnaire was employed as the primary data collection tool. The questionnaire was designed to gather information on rangeland uses and to examine the influence of demographic factors on utilization patterns. It was distributed

among residents of Nili District, and the collected data reflect local people's perspectives, experiences, and attitudes toward rangeland use.

Given the multiple-response nature of the variables in this study, we conducted a separate chi-square test for each type of rangeland use to determine whether a statistically significant association existed between each specific type of use and demographic variables, including gender, age, education level, and occupation. We adopted this approach because the study aimed to examine the association between each type of rangeland use and respondents' demographic characteristics. Therefore, separate tests do not imply that the use options were mutually exclusive; instead, we analyzed each use type independently as a binary variable. Furthermore, to avoid misinterpretation, we interpreted each test's results solely as associations between variables.

Study Area

This research covers the Nili district. According to the National Statistics and Information Authority of Afghanistan, the population of Nili district in 1402 AH was reported as 45,109, comprising 23,013 males (51.016%) and 22,096 females (48.983%).

Statistical Population and Sampling

The statistical population includes all residents of Nili County aged 15 and over. These individuals vary in occupation, age, gender, and education level. Approximately 21,899 individuals meet these criteria. The researchers determined the sample size online using Cochran's sample size formula, with a 95% confidence level and a 5% margin of error. Based on the Cochran formula, the required sample size was calculated as 377 respondents. Accordingly, 377 individuals were selected as the sample for this study.

The sampling process was conducted in two stages. In the first stage, we determined the number of questionnaires allocated to each village proportionally to the number of households in that village. In each village, we selected households with greater involvement in and use of rangeland resources. In the second stage, we randomly distributed questionnaires to eligible individuals in the selected households in 2024. All household members aged 15 years or older were eligible to participate, and completed questionnaires were collected. This sampling method improved population representativeness and reduced sampling bias.

Data Analysis

The collected questionnaire data were initially reviewed, coded, and prepared for analysis. Data analysis focused on identifying rangeland use patterns and examining the relationships between demographic variables (age, gender, education, and occupation) and rangeland uses by using the chi-square test in SPSS.

FINDINGS

This section presents the study results, highlighting patterns of rangeland use and the influence of demographic factors on utilization practices. The findings provide insights into the behaviors, perceptions, and characteristics of the local rangeland users, forming the basis for subsequent discussion and interpretation.

Distribution of Respondents by Gender

Of the 377 respondents, 325 were male, and 52 were female. The low participation of women and girls was mainly due to religious and cultural restrictions, which may have affected the study's findings, as shown in Figure 1.

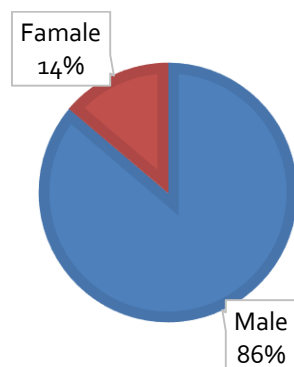


Figure 1. Number of respondents by gender

Distribution of Respondents by Age

Figure 2 shows that the highest number of respondents are in the 26-35 age group, while the lowest are in the 36-45 age group.

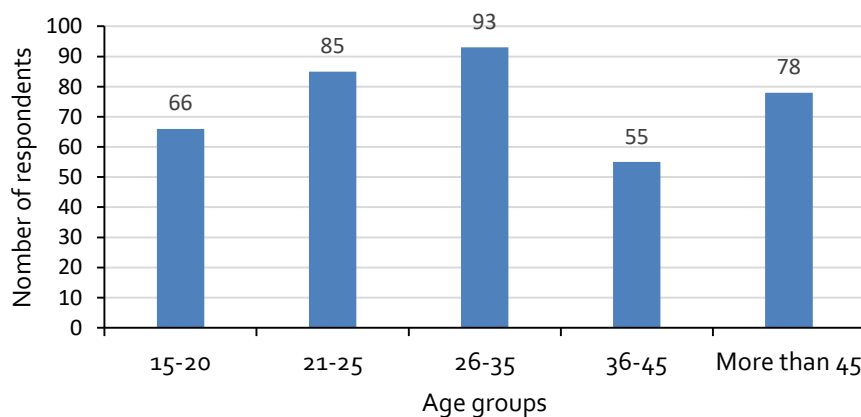


Figure 2. Number of respondents by age

Distribution of Respondents by Education Level

Figure 3 shows that the highest number of respondents belong to the uneducated group, and the lowest number belong to the religiously educated.

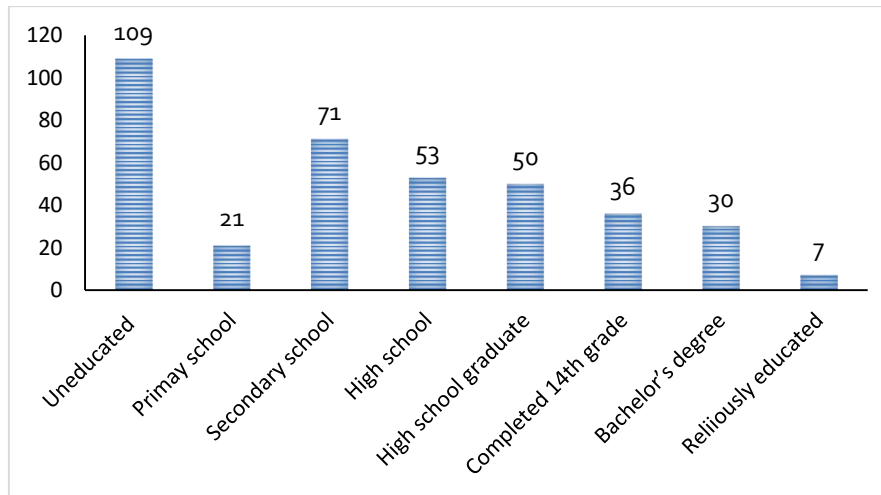


Figure 3. Distribution of respondents by education level

Distribution of Respondents by Occupation

Table 1. Number of respondents by occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farming	140	37.1	37.9	37.9
	Laboring	53	14.1	14.4	52.3
	Livestock Farming	40	10.6	10.8	63.1
	Self-employment	121	32.1	32.8	95.9
	Government employee	15	4.0	4.1	100.0
	Total	369	97.9	100.0	
Missing	99	8	2.1		
	Total	377	100.0		

Table 1 shows that farmers constitute the largest group of respondents, while government employees represent the smallest. Furthermore, 8 cases of missing data were recorded.

Patterns of Rangeland Use

Based on the observed patterns of rangeland use, the most frequent use of rangelands in Nili District, Daykundi Province, is providing fodder to domestic animals (Table 2). Out of 377 respondents, 329 reported using rangelands for this purpose. In contrast, the least common use is collecting and selling medicinal plants in the market, with 240 respondents reporting it as a use and 137 indicating they do not use rangelands for this purpose.

Table 2. Cases of rangeland uses

Number	Type of use	Number of respondents (yes)	percentage	Number of respondents (no)	percentage
1	Provision of winter fodder for domestic animals	329	87.3	48	12.7
2	Provision of fuel materials	291	77.2	86	22.8
3	As a recreational area	282	74.8	95	25.2
4	As a grazing area for animals	289	76.7	88	23.3

5	As material for mud house construction	243	64.5	134	35.5
6	Collection and sale of rangeland medicinal plants	240	63.7	137	36.3
7	Use of rangeland medicinal plants for treating diseases	291	77.2	86	22.8

Statistical Significance of Gender and Types of Rangeland Utilization

The chi-square test results indicate that the relationship between gender and certain rangeland use activities varies across significance levels (Table 3). The use of rangelands to provide winter fodder for domestic animals is significant at both the 95% and 99% confidence levels, showing a notable difference between men and women. Similarly, the use of rangelands for fuel collection is significant at both levels, highlighting the importance of gender in access to these natural energy resources.

Regarding recreational activities, the use of rangelands as recreational areas is significant only at the 95% confidence level and not at the 99% level. This suggests gender differences exist in this activity but are less pronounced than in other rangeland uses. Livestock grazing is significant at both the 0.05 and 0.01 levels, indicating a clear gender-based difference in participation.

In contrast, the use of rangelands to construct mud houses and to collect and sell medicinal plants is not significant at either the 0.05 or 0.01 level, suggesting that gender does not play a distinct role in these activities. However, the use of medicinal plants for treating illnesses is significant at the 95% level but not at the 99% level, indicating a moderate gender difference in this practice.

Overall, based on Cramer's V, the associations between gender and all types of rangeland utilization were weak, except for the use of rangeland resources as material for mud house construction and the collection and sale of medicinal plants, where the associations were negligible. No moderate or strong associations were observed.

Table 3. Relationship between Gender and Rangelands Utilization

Number	Type of use	N	χ^2	Df	Cramer's V	p-value
1	Provision of winter fodder for domestic animals	377	4.097 ^a	1	0.193	0.000 ^{**}
2	Provision of fuel materials	377	10.579 ^a	1	0.168	0.001 ^{**}
3	As a recreational area	377	4.115 ^a	1	0.104	0.043 [*]
4	As a grazing area for animals	377	12.125 ^a	1	0.179	0.000 ^{**}
5	As material for mud house construction	377	0.224 ^a	1	0.024	0.636 ^{ns}
6	Collection and sale of rangeland medicinal plants	377	0.427 ^a	1	0.034	0.514 ^{ns}

7	Use of rangeland medicinal plants for treating diseases	377	8.390 ^a	1	0.149	0.004 ^{**}
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Statistical Significance of Age and Types of Rangelands Utilization

The chi-square test results indicated that age is not significantly associated with rangeland use in most activities (Table 4). Specifically, rangeland use for providing winter fodder for domestic animals and for fuel collection is not significant at either the 95% or 99% confidence level. This suggests that age differences do not substantially affect these activities. However, rangeland use for leisure or recreation and for livestock grazing is significant at the 0.05 level but not at the 0.01 level. This indicates that age differences play a moderate and notable role in these activities, implying that different age groups may exhibit distinct patterns in rangeland use for recreation and grazing.

For other activities, including constructing mud houses, collecting and selling medicinal plants, and using medicinal plants to treat illnesses, age showed no significant relationship. This suggests that these activities are largely independent of age, and age differences are not significantly associated with their utilization.

The strength of association varied across rangeland utilization types. Most utilization activities showed weak associations, whereas recreational use and grazing showed moderate associations. No strong associations were identified.

Table 4. Relationship between Age and Rangeland Utilization

Number	Type of use	N	X ²	Df	Cramer's V	p-value
1	Provision of winter fodder for domestic animals	377	5.312 ^a	4	0.119	0.257 ^{ns}
2	Provision of fuel materials	377	3.102 ^a	4	0.091	0.541 ^{ns}
3	As a recreational area	377	9.990 ^a	4	0.163	0.041 [*]
4	As a grazing area for animals	377	9.797 ^a	4	0.161	0.044 [*]
5	As material for mud house construction	377	0.937 ^a	4	0.050	0.919 ^{ns}
6	Collection and sale of rangeland medicinal plants	377	4.672 ^a	4	0.111	0.323 ^{ns}
7	Use of rangeland medicinal plants for treating diseases	377	4.067 ^a	4	0.104	0.396 ^{ns}

Statistical Significance of Education and Types of Rangeland Utilization

"The results of the chi-square tests indicated that education level has varying associations with rangeland use across different activities (Table 5). The use of rangelands for providing winter fodder for domestic animals and for using medicinal plants to treat illnesses was not significant at either the 0.05 or 0.01 levels, suggesting that educational differences are not substantially associated with these activities. However, the use of rangelands for materials in constructing mud houses is significant at both the 95% and 99% confidence levels. This

indicates that education plays a strong role in these activities, and education level can be significantly associated with access to and use of rangeland resources.

The use of rangelands for recreation and fuel materials was significant at the 0.05 level. Individuals with different education levels may show distinct patterns in using rangelands for recreation. Grazing and livestock grazing were not significant at either level, although they were very close to the 0.05 significance level. Finally, the use of rangelands for collecting and selling medicinal plants is significant at the 95% confidence level, indicating that educational differences are related to this activity.

The strength of association varied across rangeland utilization types. Moderate associations were observed for providing winter fodder and using rangeland medicinal plants to treat diseases. In contrast, large associations were found for providing fuel materials, recreational use, grazing activities, mud house construction, and collecting and selling medicinal plants. No negligible or small associations were observed.

Table 5. Relationship between Education and Rangelands Utilization

Number	Type of use	N	χ^2	Df	Cramer's V	p-value
1	Provision of winter fodder for domestic animals	377	10.262 ^a	7	0.165	0.174 ^{ns}
2	Provision of fuel materials	377	17.008 ^a	7	0.212	0.017 [*]
3	As a recreational area	377	15.659 ^a	7	0.204	0.028 [*]
4	As a grazing area for animals	377	13.998 ^a	7	0.193	0.051 ^{ns}
5	As material for mud house construction	377	24.544 ^a	7	0.255	0.001 ^{**}
6	Collection and sale of rangeland medicinal plants	377	16.337 ^a	7	0.208	0.022 [*]
7	Use of rangeland medicinal plants for treating diseases	377	9.749 ^a	7	0.161	0.203 ^{ns}

Statistical Significance of Occupation and Types of Rangeland Utilization

The chi-square test results showed that occupation significantly influences many rangeland use activities (Table 6). The use of rangelands for providing winter fodder for domestic animals and for fuel collection is significant at the 0.05 level, while at the 0.01 level, only fuel collection approaches strong significance. This indicates that occupation has a moderate relationship with rangeland use for accessing energy and fodder resources.

The use of rangelands for livestock grazing and for materials in constructing mud houses is significant at both the 0.05 and 0.01 levels. In other words, individuals with different occupations exhibit distinct patterns in grazing livestock and collecting construction materials from rangelands.

In contrast, the use of rangelands for recreation, collecting medicinal plants, and using medicinal plants to treat illnesses are not significant at either the 0.05 or 0.01 level. This suggests that occupation is not related to these activities, and individuals across occupations behave similarly in these contexts.

The magnitude of association differed across the various rangeland utilization practices. Moderate associations were found for winter fodder provision, recreational use, and collecting and selling medicinal plants. In contrast, we observed large associations for fuel provision, grazing activities, and mud house construction. A small association was found for using medicinal plants for disease treatment.

Table 6. Relationship between Occupation and Rangelands Utilization

Number	Type of use	N	χ^2	df	Cramer's V	p-value
1	Provision of winter fodder for domestic animals	369	11.430	4	0.176	0.022 [*]
2	Provision of fuel materials	369	13.299	4	0.190	0.010 [*]
3	As a recreational area	369	8.683	4	0.153	0.070 ^{ns}
4	As a grazing area for animals	369	19.301	4	0.229	0.001 ^{**}
5	As material for mud house construction	369	14.623	4	0.199	0.006 ^{**}
6	Collection and sale of rangeland medicinal plants	369	6.308	4	0.131	0.117 ^{ns}
7	Use of rangeland medicinal plants for treating diseases	369	2.037	4	0.074	0.729 ^{ns}

DISCUSSION

The findings indicate that rangelands in Nili District, Daykundi Province, play a multidimensional role beyond being merely an ecological resource, serving as a core pillar of livelihoods, culture, and daily life for local communities. The diverse patterns of rangeland use—including provision of winter fodder, livestock grazing, fuel collection, medicinal plant harvesting, recreational use, and even construction purposes—align with the perspectives presented in *The Science of Rangelands* by Kouhestani & Hakimi (2017) and *Natural Resource Economics* by Fazl (2017), reflecting the deep and structural dependence of local populations on this natural resource. While this dependence underscores the importance of rangelands for food security and livelihood sustainability, it also increases pressure on these ecosystems' natural capacity. These findings align with the literature, which identifies rangelands as the backbone of rural economies in arid and semi-arid regions (Bedunah & Angerer, 2012; Dong et al., 2016).

The predominance of rangelands as a source of winter fodder among respondents highlights traditional livestock systems' heavy dependence on these resources. This pattern is common in many mountainous and semi-arid areas, reflecting a lack of sufficient

alternative feed sources for livestock during winter. From a sustainable management perspective, this dependence can be risky, as increases in livestock numbers or reductions in vegetation cover due to climate change could quickly disrupt rangeland ecological balance. Previous studies emphasize that mismatches between grazing pressure and carrying capacity are a key driver of rangeland degradation in developing countries (Rouquette et al., 2023). Therefore, this study underscores the critical need to determine and respect rangeland carrying capacity in Daikundi.

Statistical findings showed that gender plays a significant role in certain rangeland use patterns, particularly in activities such as providing winter fodder, fuel collection, livestock grazing, recreational use, and medicinal use of rangeland plants. These differences can be explained through the gendered division of labor in rural communities. In many traditional societies, men handle livestock-related activities, grazing, and major decisions about natural resource use. At the same time, women play a larger role in household tasks, fuel collection, medicinal plant harvesting, and therapeutic applications. This pattern aligns with studies conducted in Iran, Mongolia, Ethiopia, and other Central Asian regions, which highlight differences in perception, access, and gender roles in natural resource management (Meinzen-Dick et al., 2014; Joshi et al., 2017; Flintan & Eba, 2023; Ulziibaatar & Matsui, 2021). From a policy perspective, these findings indicate that ignoring gender roles in rangeland management programs may reduce their effectiveness. Cramer's V indicated small associations between gender and most rangeland utilization practices, and negligible associations with mud house construction and the collection and sale of medicinal plants. This suggests that although some associations were statistically significant, their practical strength was generally limited.

Regarding age, results showed that although no significant differences were observed in many activities across age groups, age plays a notable role in recreational use and livestock grazing. Cramer's V also showed small associations between age and most rangeland utilization practices, while moderate associations were observed for recreational use and grazing activities. This indicates that age is more strongly associated with these two practices, although the overall strength of the associations remains limited. Previous studies have also indicated that with increasing age and experience, individuals develop a greater understanding of rangeland ecological limitations and heightened sensitivity to natural resource degradation (Bestelmeyer et al., 2017). These findings highlight the importance of involving elders and experienced individuals in educational programs and transferring indigenous knowledge for sustainable rangeland management.

The analysis of the association with education level revealed that education is significantly associated with several rangeland utilization practices. In Daykundi, education level was significantly associated with fuel collection, the use of rangeland plants for mud house construction, recreational use of rangelands, and the sale of natural plants. Respondents with higher education levels showed less tendency toward destructive resource use and adopted more cautious approaches to vegetation exploitation. This may reflect

greater awareness of the environmental, recreational, and economic values of rangeland resources. A study in the Xilin Gol grasslands of China also found that education influences perceptions of cultural and recreational ecosystem services (Luo et al., 2020), while research in Afghanistan highlights the economic and trade value of natural and medicinal plants (Ayoubi et al., 2024). These findings align with the broader literature emphasizing environmental education and awareness as key factors in promoting conservation behavior and reducing pressure on natural resources (Pretty & Smith, 2004; Bestelmeyer et al., 2017). Therefore, investment in formal and informal education, particularly in natural resource management, can contribute to sustainable rangeland use and help mitigate rangeland degradation.

The results showed statistically significant associations between occupation and winter fodder provision, fuel provision, grazing activities, and mud house construction. In contrast, the associations with recreational use, collection and sale of medicinal plants, and the use of medicinal plants for disease treatment were not statistically significant. In terms of strength, Cramer's V indicated moderate associations for winter fodder provision, recreational use, and collection and sale of medicinal plants, large associations for fuel provision, grazing activities, and mud house construction, and a small association for the use of medicinal plants for disease treatment. International research emphasizes that policy design that does not consider livelihood and occupational differences among resource users often leads to policy failure (Reed et al., 2018). These findings also align with studies in Iran, which show that low income, large livestock numbers, economic poverty, and a lack of alternative livelihood options significantly contribute to rangeland degradation (Razaqi & Sarabadi, 2008).

Overall, the results indicate that rangeland use patterns in Nili district are associated with socio-demographic factors in most cases. This suggests that sustainable rangeland management cannot be designed solely based on technical or ecological criteria but must also incorporate the social, cultural, and economic dimensions of resource users. Participatory approaches that emphasize active community involvement, integrate indigenous knowledge, and strengthen local natural resource governance can effectively reduce pressure on rangelands and enhance their sustainability. Successful experiences in other countries show that participatory rangeland management, when supported by appropriate institutional and educational measures, can improve rangeland ecological conditions while enhancing local livelihoods (Flintan & Eba, 2023; Wu et al., 2025).

Finally, this study provides local-level empirical evidence and underscores the need to integrate demographic factors into rangeland management policies and planning. Ignoring these factors may exacerbate resource degradation and undermine rural livelihood sustainability. Conversely, considering users' social characteristics, environmental education, livelihood diversification, and stronger local governance can create conditions for sustainable rangeland use and reduce local communities' vulnerability to climate change.

CONCLUSION

This study showed that, from the perspective of residents of Nili district in Daykundi province, rangelands are a multifunctional and vital resource, providing livelihoods, livestock fodder, fuel, medicinal plants, and support for various social activities. Households' heavy dependence on rangelands highlights the resource's critical importance to the local economy and livelihood security. The statistical results indicate that demographic variables such as gender, age, education level, and occupation are significantly related to certain patterns of rangeland use. This suggests that rangeland utilization is not uniform but is shaped by resource users' social and economic conditions.

The findings indicate that rangelands are used at different times and for various aspects of rural community life, including providing winter fodder, livestock grazing, supplying fuel materials, recreation, traditional construction, and medicinal plants. Therefore, we can apply the results of this study to plan sustainable rangeland management, formulate natural resource policies, and enhance the livelihoods of local communities.

Based on these findings, we recommend that rangeland management programs consider demographic factors, support and strengthen public environmental education initiatives, and that the government introduce alternative sources of fodder and fuel for farmers and livestock keepers. Implementing these recommendations could help reduce resource degradation, enhance rangeland productivity, and improve the livelihoods of local communities in Daykundi province.

One limitation of this study was some respondents' limited willingness to provide certain personal information, particularly occupation, which resulted in missing observations in the occupation variable. In addition, the limited willingness of some respondents, particularly women and girls, to provide information and complete the questionnaire, as well as illiteracy among some respondents, made data collection challenging and may have affected the completeness and accuracy of some responses. The authors considered these limitations when interpreting the findings. Future research should investigate suitable alternatives to rangelands to reduce pressure on these resources and prevent their degradation and decline. Further studies should also identify and analyze the major factors contributing to rangeland degradation, providing a basis for effective rangeland management, conservation, and restoration strategies.

Authors' Contributions

Yadullah Mahmodi carried out all parts of this article, including study conceptualization, methodology, data collection, data analysis, and writing of the article. Yasin Kawsar contributed to reviewing and revising the article. Rahmatullah Karimi and Mohammad Bonyadi helped distribute and collect the questionnaires. All authors reviewed and approved the final version.

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Conflict of interest statement

The authors declare no conflicts of interest related to this paper.

Data Availability Statement

Data will be made available on request.

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