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Factors affecting the downturn of traditional livestock husbandry in local communities of northwestern rangelands of Iran

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Currently, a combination of natural and human factors has led to the lack of cost-effective production, resulting in the downturn of traditional animal husbandry (DTLH) in rural regions. This research aims to investigate the factors contributing to the DTLH in indigenous communities in northwestern Iran. The statistical population consisted of pastoralists residing in the villages of Namin-Ardabil, Iran. The research method employed was descriptive-analytical, and a questionnaire was used as the data collection tool. The sample size was determined by selecting approximately 5–10% of households in each village, preferably the household head. Friedman's test was utilized to prioritize the most significant factors influencing DTLH. The findings reveals that the most crucial economic criteria contributing to the DTLH were "the high cost of providing inputs and fodder required for livestock (mean rank = 11.12)," "more economic opportunities and access to well-paying employment opportunities in the city (mean rank = 8.99)", and "low profit from livestock farming in the rangeland (mean rank = 10.60)". Moreover, the most important social criteria were "uncertainty regarding the future well-being of children and the social and economic situation in the village (mean rank = 14.12)", "motivation for academic and career development in urban areas (mean rank = 14.10)", and "access to specialized and professional training opportunities in cities (mean rank = 13.80)". Furthermore, the most crucial ecological criteria impacting the DTLH were "drought" (mean ran = 7.96)" and "non-implementation of range management plans and grazing permits" (mean rank = 6.07)". In general, the results indicated that the ecological criteria had the highest impact on the DTLH, followed by social and economic criteria, with values of 41.1%, 34.6%, and 24.29%, respectively. Overall, understanding the challenges faced by traditional livestock husbandry and identifying the factors contributing to its decline is crucial for developing effective strategies to support and sustain this industry in rural areas.

Livestock husbandry is a widespread human activity, which exerts direct and indirect impacts on biodiversity at different levels, from individuals to landscapes, including populations and ecosystems[1]. This activity is a key indicator of economic development, environmental protection, and food security in the world[2]. Livestock husbandry practice is having varied reasons like producing food to produce a regular supply of nutrient-rich animal source food that provide a critical supplement and diversity to staple plant-based diets, generate income to meet an urgent need of cash, to provide manure so as to contribute a greater crop production for food and income, to provide traction power for transportation and crop production, to serve as financial instruments and enhance social status as an indicator of social importance within the community, to strengthen social bonds (including the use of livestock as dowry or bride price) etc.[3], in developing countries including Iran.

One of the methods of livestock husbandry in different regions, especially in developing countries including Iran, is traditional livestock husbandry. This industry, known as traditional herding, is an ancient practice that has been carried out since the early days of human life on earth[4]. In this method, the farmer maintains his livestock with basic facilities and equipment and does not pay for the purchase of special equipment such as industrial

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livestock husbandry. The livestock feed on the fodder available in the meadows, rangelands and forests, and the cost of preparing livestock feed is much lower than in industrial animal husbandry.

However, in recent decades, various factors have contributed to a decline in production and the downturn of traditional livestock husbandry. One of the main challenges faced by this industry is the decreasing carrying capacity of meadows, rangelands and forests and the degradation of rangeland ecosystems in various ways. The rapid growth of human and livestock populations, along with the increasing demand for livestock products, has put immense pressure on rangeland ecosystems as the main source of food for livestock husbandry[5]. Moreover, in recent decades, social, economic, technological, and cultural changes that are intertwined have led to dramatic transformations of natural ecosystems, agricultural systems, and land use in rural areas[6–8]. Additionally, there are gaps in social infrastructure and significant differences in income levels. Therefore, many individuals have been compelled to migrate from villages to urban areas, causing a decrease in population and the loss of active workforce in rural regions in different regions of the world[9–11].

The import of products of traditional livestock husbandry also greatly impacts the decline of the livestock industry in Iranian villages[12,13]. Besides, among the most important challenges facing traditional livestock husbandry are the recent droughts and the lack of fodder caused by it, the lack of social dignity of pastoralism and livestock husbandry, the traditionality of milk production, the lack of livestock inputs and its unfair distribution, the inflation of recent years and the increase in the price of livestock inputs, the lack of industrial slaughterhouses, and lack of productive livestock with favorable production, in Iran[14]. It is important to acknowledge that the influence of economic, social, managerial, and ecological factors on the DTLH is unavoidable. Therefore, it is crucial to analyze the challenges faced by traditional livestock husbandry from various perspectives, encompassing economic, social, managerial, and ecological considerations[15]. In general, limited research has been conducted globally and in Iran on the ecological, economic, and social factors contributing to the DTLH, several researches that have been conducted in Iran are mentioned below.

Mirjalili et al.[16] stated that the low income of livestock farming, the tendency of young people to non-pastoralism jobs, and the lack of fodder caused by grazing more than the capacity of livestock from rangelands, and drought had the greatest impact on the DTLH in the Yazd province, Iran. Moreover, Ahmadi et al.[17] in the study of factors affecting the economic stagnation of pastoralists in Belban Abad rangelands (Dehgolan city, Kurdistan province, Iran) reported that the lack of job diversity, the limitation of granting credits to low-income pastoralists in order to reduce the income dependence of pastoralists on rangelands, the vulnerability of traditional livestock husbandry due to drought and lack of fodder and lack of trust between pastoralists in cooperative activities had the greatest effect on the stagnation of pastoralists. Bayat et al.[15] during a study titled recognition and analysis of factors affecting the stagnation of livestock economy in rural areas (Case Study: Parider and Mahdavieh Villages—Malayer, Iran) stated that extreme vulnerability to social diseases, rural-city migration, the weak financial ability of the villagers to buy livestock that have higher economic efficiency, the limitation of granting credits and bank facilities to low-income villagers for the establishment of new and up-to-date livestock husbandry, and the extreme vulnerability of traditional livestock husbandry to drought and lack of fodder have the greatest impact on the stagnation of the livestock husbandry economy.

The ecoregions of northwestern Iran, including the Namin region of Ardabil, holds great economic, social, and ecological significance. This area includes vast rangelands that are one of the most essential rangelands of Iran and are play a crucial role in preserving soil quality, providing fodder for livestock, housing medicinal plants, conserving genetic resources, contributing to the economy, and offering opportunities for ecotourism[18–20]. One of the main and important jobs in this region is traditional livestock husbandry related to rangelands. One of the main pillars of Iran's economy has been dependent on livestock husbandry since the past, and currently, livestock products have a significant share of it. In recent years, due to various problems, traditional livestock husbandry in Iran has stagnated, which will have adverse effects on the economy of the exploiting communities and the economy of the country. In general, there have been limited studies on the ecological, economic, and social factors influencing the downturn of traditional livestock husbandry (DTLH) globally, particularly in Iran and the region under investigation in this study. Therefore, this research aimed to address two main questions: (1) Did ecological, economic, and social factors in the area under study impact the DTLH? (2) According to local communities, which ecological, economic, and social factors played the most significant role in the DTLH?

Material and methods

Study area

This study was conducted in the Namin region of Ardabil, located in the northwestern part of Iran (Fig. 1). These maps of studied areas were generated by the researchers using ArcGIS version 10.1[21]. The unique geographic features, significant differences in elevation, and proximity to the Caspian Sea have created ideal conditions for the growth of various species and the development of diverse plant communities in this ecotone area[22]. Moreover, this region serves as an ecotone between the semi-arid climate of Ardabil and the humid climate of northern Iran. Characterized by mountainous terrain, expansive grasslands, wooded rangelands, forests, and gardens, this region's climate is influenced by the Caspian Sea and the mountainous barrier of the western Alborz range in Iran. These factors contribute to increased relative humidity, formation of fog, reduced evapotranspiration rates, and ultimately support proper plant diversity in the region[19,20]. The nearest station provides data indicating that the average annual rainfall in the region is 272.21 mm, while the average annual temperature stands at 10.90 °C[19]. All these conditions have contributed to the region playing a significant role in traditional livestock husbandry and meeting the protein needs of both the local population and the country as a whole since ancient times. As per the 2015 census, the population of this region amounts to 60,659 individuals, encompassing 17,836 households. Of these households, 43% reside in urban areas, while the remaining 57% are distributed across 91 rural areas.

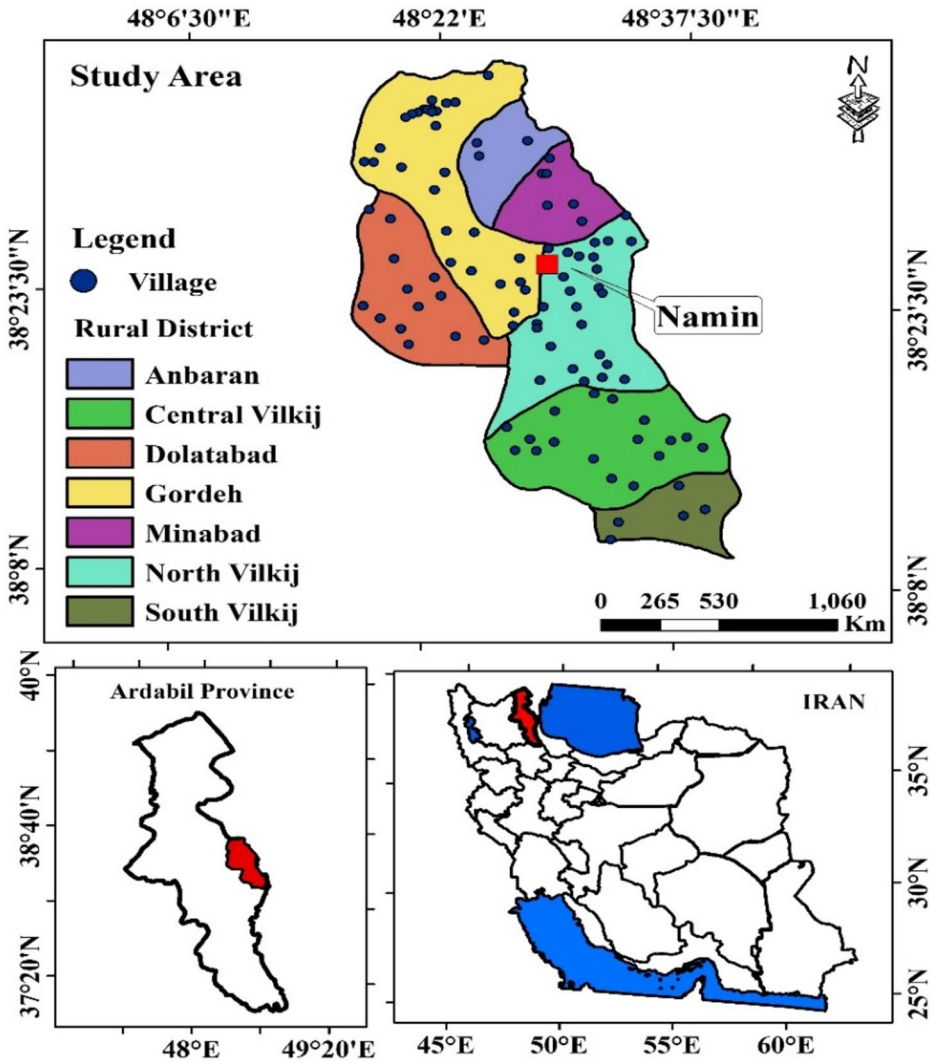

Figure 1. Location of the study area, Ardabil province of Iran. (The processing and creation of maps were conducted by the researchers using ArcGIS version 10.1[21].

Additionally, some residents of the cities surrounding this area own summer homes and spend their time in these regions seasonally, drawn by the pleasant climate and stunning natural landscapes of the ecosystems.

Data collection

The current study was conducted in 2021 and focused on pastoralists residing in the villages of the Namin region. The Namin region comprises seven rural districts, and for this research, a specific number of villages were selected from each district based on their size and geographical coverage. Then, 2 villages in South Vilkij (villages of Saghezchi and Hor), 4 villages in Central Vilkij (Gharetapeh, Sooha, Marni and Aladizgeh), 3 villages in North Vilkij (Goleloo, Kalehsar and Khanghah Olia), 2 villages in Minabad (Minabad and Jid), 3 villages in Gordeh (Gordeh, Oranj and Khoshabad), one village in Anbaran district (village of Anbaran) and 2 villages in Dolatabad district (Ali Bolaghi and Saghesloo) as statistics community were selected. Some characteristics of the target villages are presented in Table 1. In the selection of villages, we took into account the distribution and distance between the sample villages.

Considering that our aim was to evaluate the factors influencing the decline of traditional livestock husbandry among the pastoralists in the region, we present some characteristics of livestock husbandry in the studied villages in Table 2. This table includes information such as the total number of animals in each village, the number of livestock allowed based on the exploitation license, the number of ranchers, and the area of rangelands in each village (General Administration of Natural Resources and Watershed Management of Ardabil Province, Iran). As rangelands in Iran are state-owned rather than privately owned, the Natural Resources and Watershed Management Organization determines the time of exploitation, the number of animals allowed per unit area, and the number of ranchers in each area, issuing licenses to the ranchers. Although some villages did not have official and valid data, we selected them as target villages due to their significance in terms of animal husbandry.

Rural districts	Village	Household	Population	Percent of community*	Number of samples
South Vilkij	Saghezchi	83	272	1.80	8
	Hor	955	3248	21.48	10
Central Vilkij	Gharetapeh	166	556	3.68	10
	Sooha	582	1958	12.95	12
	Marni	273	929	6.14	10
	Aladizgeh	442	1850	12.23	10
North Vilkij	Goleloo	155	527	3.48	10
	Kalesar	295	932	6.16	10
	Khanghah Olia	48	130	0.86	5
Gordeh	Gordeh	101	285	1.88	8
	Oranj	69	221	1.46	6
	Khoshabad	17	388	2.57	3
Dolatabad	Alibolaghi	114	378	2.50	10
	Saghesloo	158	624	4.13	5
Anbaran	Anbaran	312	932	6.16	4
Minabad	Jid	211	754	4.99	10
	Minabad	320	1139	7.53	11
Sum		4301	15,123	100	142

Table 1. Personal qualities of the respondents. *Percent of community: that is, the population of each target village is a percentage of the total population of the studied villages.

Rural districts	Village	Total number of livestock (based on livestock unit*)	Total number of livestock licensed (based on livestock unit*)	Number of ranchers	Rangeland Area (ha)
South Vilkij	Saghezchi	3612	756	88	963.5
	Hor	4359	1275	67	1300
Central Vilkij	Gharetapeh	1608	220	61	220
	Sooha	1791	243	257	200
	Marni	4446	198	231	198
	Aladizgeh	No data	No data	No data	No data
North Vilkij	Goleloo	16,294	360	77	215.47
	Kalesar	21,572	371	234	371.6
	Khanghah Olia	7614	302	68	302
Gordeh	Gordeh	434	434	17	434
	Oranj	393	63	95	127.1
	Khoshabad	1010	108	34	216.27
Dolatabad	Alibolaghi	No data	No data	No data	No data
	Saghesloo	No data	No data	No data	No data
Anbaran	Anbaran	No data	No data	No data	No data
Minabad	Jid	6628	2327	230	1939.6
	Minabad	1025	1181	54	1180.84

Table 2. Some features of traditional livestock husbandry in the region. *Livestock unit: livestock unit in Iran is a live sheep weighing 50 kg. In order to manage the rangelands and calculate the grazing capacity, they convert different livestock into livestock units. For example, one indigenous cow is equal to 5 livestock units. Or a native goat is equal to 0.4 livestock units.

It is important to note that in most regions of Iran, including the study area in this research, the number of livestock in the rangelands exceeds the total number of livestock licensed for exploitation. This discrepancy can be attributed to several factors. One of the primary reasons is that exploitation licenses in Iran are often outdated, leading to a mismatch between the number of livestock in the rangeland and the number of livestock licensed. Additionally, family members who inherit livestock farming operations after the death of their father may fail to renew their exploitation licenses. Consequently, if, for instance, four family members are now involved in livestock farming instead of the father, the number of their livestock may be approximately four times greater than that of their father's. It is worth noting that in recent years, the Natural Resources and Watershed Management Organization-Iran has taken steps to update exploitation licenses for the use of rangelands.

The research method was descriptive-analytical, and the data collection tool was a questionnaire. The questionnaire was developed by the researchers after reviewing existing literature and assessing local conditions. The questionnaires included descriptive characteristics of the village, its residents, as well as 14 economic criteria, 18 social criteria, and 10 ecological criteria. The questionnaire design focused on three primary criteria: economic, social, and ecological criteria. Then, aspects or factors were identified for each main criterion. To determine the relevant factors for the study area, various sources such as books, international papers, field surveys, and initial interviews with local and government experts were consulted. In the initial section of the questionnaire, the researchers investigated the descriptive attributes of the communities under study. The findings are detailed in Tables 1, 2, 3, 4. In the next part of the questionnaire, questions (factors) related to the main research criteria were designed in a five-point Likert scale format.

The validity of the questions was confirmed through content validation and by consulting with the local community, as well as utilizing the opinions and suggestions of relevant specialists and experts. To ensure that the designed questionnaire was suitable for the local, economic, ecological, and social conditions of the studied area, it was carefully designed and adjusted to fully cover the subject and variables required for the research. Cronbach's alpha coefficient was used to assess the reliability of the questionnaire, and the alpha values for economic, social, and ecological criteria were 0.73, 0.55, and 0.76, respectively. The closer the value of this coefficient is to one, the stronger the internal correlation between the questions in the questionnaire, indicating greater homogeneity.

To determine the number of questionnaires, approximately 5–10% of the households in each village (preferably the head of the household) were selected as the sample size[23–25], and then the proportion of each village was determined. Therefore, the number of questionnaires varied among different villages. To conduct sampling in each village, rancher households were distinguished from non- rancher households. In some cases, certain individuals within rancher households declined to participate in the research interviews and were therefore excluded from the study population. Then, sampling of rancher households was done randomly. Since some of the indigenous individuals were not literate, the researchers verbally explained the research to the ranchers and conducted interviews with them on the overall topic. Additionally, the researchers assisted them in completing the questionnaires. In other words, the researchers completed the questionnaires based on the pastoralists' answers to each question.

Statistics such as frequency, mean, standard deviation were used to extract the characteristics of the statistical population. Moreover, Friedman's non-parametric test was used to rank the most important factors affecting

	Class	Frequency	Frequency percentage	Mean
Age	20–30	10	7	52.57
	31–40	23	16.2	
	41–50	34	23.9	
	> 50	75	52.8	
Literacy	Illiterate	40	28.2	–
	Elementary school	35	24.6	
	Guidance school	41	28.9	
	High school	23	16.2	
	Academic literacy	3	2.1	

Table 3. Some personal qualities of the respondents (n = 142).

	Village	Mean (USD)	Total Mean (USD)	Standard deviation
Average annual income of agriculture	South Vilkij	282.33	656.33	8.23
	Central Vilkij	488.00		
	North Vilkij	934.67		
	Gordeh	745.00		
	Dolatabad	133.33		
	Anbaran	33.33		
	Minabad	488.00		
Average annual income of livestock husbandry	South Vilkij	291.67	788.33	5.56
	Central Vilkij	654.67		
	North Vilkij	1114.67		
	Gordeh	133.33		
	Dolatabad	777.67		
	Anbaran	50.00		
	Minabad	718.16		

Table 4. Average annual income of ranchers in agriculture and livestock husbandry.

the downturn of traditional livestock husbandry within each main criterion. The Friedman test is a procedure used to analyze variance by ranks, specifically observed rank scores or rank scores obtained by ordering ordinal or numerical outcomes. The procedure involves ranking each row (or block) together, then considering the values of ranks by columns. It is employed when one is not willing to make strong distributional assumptions. A popular application is to use this test to identify treatment effects of k different treatments in a randomized complete block design[26].

Then, based on the results of this test, the factors of each main criterion were prioritized according to their mean ranks to determine the most significant factor influencing DTLH. Additionally, Friedman's test was employed to prioritize the economic, social, and ecological criteria impacting DTLH in the study area. In order to check which criterion (economic, social and ecological) had a greater impact on the DTLH, we calculated the average of the factors within each main criterion, and then used Friedman's test to rank the three main criteria based on their impact.

In this research, given that the data collection tool was a questionnaire and the responses of the stakeholders were recorded using the Likert scale, the data is on an ordinal level, necessitating the use of non-parametric tests in this research. Spearman's correlation coefficient was used to check the correlation between the personal qualities of the respondents and economic, social and ecological criteria affecting the DTLH.

Ethics approval and consent to participate

All experimental protocols were approved by the Review Board of the Department of Range and Watershed Management, Faculty of Agriculture and Natural Resources, University of Mohaghegh Ardabili, Iran. All methods and analyses were conducted in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants who assisted us in completing the questionnaire and providing data for this research.

Results

The results of the analysis of the respondents according to age and literacy are presented in Table 3. The results indicates that 7% of the respondents with the lowest frequency, fall within the age group of 21–30 years, while the age group of over 50 years has the highest frequency, accounting for 52.8%. Furthermore, the results demonstrate that 2.1% of the respondents, with the lowest frequency, possess a university education, while 28.9% of the respondents, with the highest frequency, have middle school degree.

Besides engaging in livestock husbandry, the community under study also possesses agricultural lands. Table 4 displays the results of the average income in both the agriculture and livestock sectors. The findings indicate that the average annual income in the agricultural sector amounts to 656.33 USD, while in the livestock sector, it is 788.33 USD.

The results of prioritizing the economic, social and ecological factors affecting the downturn of traditional livestock husbandry, as determined by the Friedman test, are presented in Tables 5, 6, 7 and 8. The findings from Friedman's test indicate significant differences ($p < 0.01$) in the importance and ranking of economic, social and ecological factors (Table 5).

Table 6 reveals that the most crucial economic criteria are as follows: "The high cost of providing inputs and fodder required for livestock (E4)" (with a mean rank of 11.12), "more economic opportunities and access to well-paying employment opportunities in the city (E1)" (with a mean rank of 10.60), and "low profit from livestock farming in the rangeland (E12)" (with a mean rank of 8.99). It should be noted that while other economic criteria also play a role in the downturn of traditional livestock husbandry, their impact is less significant compared to criteria E4, E1, and E12.

According to the results in Table 7, the most important social criteria contributing to the downturn of traditional livestock husbandry were "uncertainty regarding the future well-being of children and the social and economic situation in the village (S11)" (mean rank = 14.12), "motivation for academic and career development in urban areas (S14)" (mean rank = 14.10), and "Access to specialized and professional training opportunities in cities (S13)" (mean rank = 13.80).

Based on the findings presented in Table 8, the most important ecological criteria impacting the downturn of traditional livestock husbandry were "drought" (mean rank = 7.96) and "non-implementation of range management plans and grazing permits (ECO9)" (mean rank = 6.07).

In order to check which criteria (economic, social and ecological) had a greater impact on the DTLH, we calculated the average of the factors within each main criterion, and then used Friedman's test to rank the three main criteria based on their impact. There were significant differences observed in the economic, social and ecological criteria that contributed to the DTLH (Table 9). The mean rank results indicated that the ecological criteria had the highest impact on the DTLH, followed by social and economic criteria, with values of 2.95 (41.1%), 2.03 (34.6%), and 1.02 (24.29%), respectively (Fig. 2). It is important to note that the average values of the

Criteria	N	Chi-Square	df	p
Economic	142	1049.58	13	0.000
Social	142	1549.06	17	0.000
Ecological	142	536.87	9	0.000

Table 5. The results of Friedman's test for check the significance of the difference of factors affecting the downturn of traditional livestock husbandry.

Indicator	Mean rank	Rank
The high cost of providing inputs and fodder required for livestock (E4)	11.12	1
More economic opportunities and access to well-paying employment opportunities in the city (E1)	10.60	2
Low profit from livestock farming in the rangeland (E12)	8.99	3
Lack of suitable economic conditions and lack of job opportunities in the village (E13)	8.84	4
The absence of government support and limited access to credit facilities (E6)	8.69	5
The livestock market experiences frequent fluctuations (E2)	7.81	6
Lack of a structured market for selling dairy products (E3)	7.74	7
The absence of transformation and packaging industries for agricultural and livestock products (E7)	6.88	8
The absence of drought insurance (E8)	6.30	9
Poor financial resources of villagers to buy livestock efficiently (E14)	5.58	10
Lack of investment and entrepreneurship opportunities and job creation in rangeland and villages (E9)	5.56	11
Lack of agricultural land and rangeland (E11)	4.01	12
Inequality of city and village facilities and welfare and subsistence services (E10)	2.24	13
Low profit from multiple use from rangelands such as beekeeping, exploiting medicinal and industrial plants (E5)	2.21	14

Table 6. Prioritization of economic factors affecting the downturn of traditional livestock husbandry based on Friedman's test.

Indicator	Mean rank	Rank
Uncertainty regarding the future well-being of children and the social and economic situation in the village (S11)	14.12	1
Motivation for academic and career development in urban areas (S14)	14.10	2
Access to specialized and professional training opportunities in cities (S13)	13.80	3
High risk associated with livestock farming in the rangelands (S4)	12.49	4
Absence of economic, social, and legal organizations such as cooperatives to facilitate cooperative work in the rangelands (S5)	12.34	5
Inadequate government laws and policies for monitoring rangelands (S7)	11.16	6
Lack of interest among the younger generation to continue and expand agricultural and animal husbandry activities (S1)	8.60	7
Insufficient supervision by natural resources experts to ensure compliance with livestock numbers and grazing permits (S8)	7.12	8
Migration and departure of young labor from villages (S17)	6.64	9
Lack of recreational, sports, health, service, and treatment facilities in rural areas (S10)	6.36	10
Incompatibility of traditional rural society and animal husbandry practices with the preferences of young people (S12)	6.24	11
Common ownership of the rangeland leading to a lack of sufficient authority for its management (S6)	6.13	12
Lack of coordination among pastoralists for implementing pastoral plans (S2)	6.09	13
Low participation by pastoralists in rangelands restoration projects (S9)	5.21	14
Misleading advertisements in mass media promoting a prosperous urban lifestyle (S3)	5.60	15
Dissatisfaction with housing conditions, as well as inadequate water, electricity, and gas services in villages (S15)	4.00	16
Rural families' inclination towards an urban lifestyle and the prevalence of consumerism instead of a focus on rural production culture (S18)	2.85	17
Prejudice against preserving cultural traditions such as clothing styles or speech patterns (S16)	2.64	18

Table 7. Prioritization of social factors affecting the downturn of traditional livestock husbandry based on Friedman's test.

economic, social, and ecological criteria have been presented in the text. To enhance a more efficient comparison of the influence of these three criteria on the DTLH, the Fig. 2 is depicted in percentages (The spider plot in Excel can be naturally shown as a percentage of average).

The correlations between certain personal qualities of the respondents and the economic, social, and ecological criteria were found to be significant in contributing to the downturn of traditional livestock husbandry (Table 10). Notably, age and literacy, husbandry income and agriculture income, as well as total income and economic factors showed significant correlations. Additionally, agriculture income and total income, total income and economic factors, economic factors and social factors, as well as ecological factors, and social factors and ecological factors also exhibited significant correlations.

Discussion

In Iran, livestock husbandry is basically dependent on rangeland ecosystems. Understanding the ecological factors that shape the ecosystem's structure, as well as considering the economic and social factors that impact stakeholders, can provide valuable insights into the state of livestock husbandry.

Indicator	Mean rank	Rank
Drought (ECO1)	7.96	1
Non-implementation of range management plans and grazing permits (ECO9)	6.07	2
Vulnerability to livestock diseases and insufficient familiarity of the villagers with the achievements of livestock science and animal health (ECO10)	4.68	3
Lack of suitable sources of drinking water for livestock (springs, rivers, etc.) (ECO8)	4.58	4
The low quality of water in the rangelands for livestock (ECO7)	4.57	5
Improper distribution of water bodies in the rangelands for livestock (ECO6)	4.56	6
Destruction of vegetation of rangelands (ECO2)	4.15	7
Decreasing the quality of pasture plant fodder due to excessive grazing and the increase of invasive and non-palatable species (ECO4)	3.68	8
Soil erosion or increased sensitivity of pasture soil to erosion (ECO3)	3.67	9
Flood (ECO5)	2.82	10

Table 8. Prioritization of ecological factors affecting the downturn of traditional livestock husbandry based on Friedman's test.

Indicator	Chi-square value	df	Mean rank	Rank	p
Economic	264.521	2	1.02	3	0.000
Social			2.03	2	
Ecological			2.95	1	

Table 9. The differences between the economic, social and ecological criteria affecting the downturn of traditional livestock husbandry.

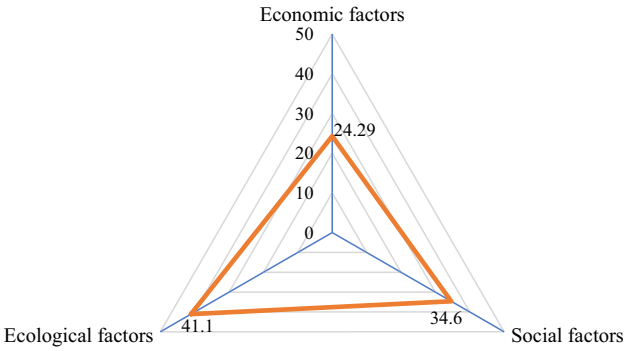

Figure 2. Comparison of the impact of economic, social and ecological criteria on the downturn of traditional livestock husbandry. The graph is drawn based on the mean rank's percentage.

Personal quality	Age	Literacy	Husbandry income	Agriculture income	Total income	Economic factors	Social factors	Ecological factors
Age	1							
Literacy	− 0.67**	1						
Husbandry income	-0.07^{ns}	0.11^{ns}	1					
Agriculture income	-0.02^{ns}	0.15^{ns}	0.53**	1				
Total income	-0.06^{ns}	0.15^{ns}	0.90**	0.83**	1			
Economic factors	0.02^{ns}	0.05^{ns}	0.26**	-0.07^{ns}	0.21*	1		
Social factors	0.02^{ns}	0.01^{ns}	-0.08^{ns}	-0.08^{ns}	-0.1^{ns}	0.42**	1	
Ecological factors	-0.67^{ns}	0.08^{ns}	-0.06^{ns}	-0.08^{ns}	-0.09^{ns}	0.18*	0.38**	1

Table 10. Correlation between the personal qualities of the respondents and economic, social and ecological criteria affecting the downturn of traditional livestock husbandry. Significant correlations are shown by: *p = 0.05; **p = 0.01.

Role of economic factors on the downturn of traditional livestock husbandry

The results revealed that the most crucial economic criteria affecting the downturn of traditional livestock husbandry were "the high cost of providing inputs and fodder required for livestock" (mean rank of 11.12), "more economic opportunities and access to well-paying employment opportunities in the city" (mean rank of 10.60), and "low profit from livestock farming in the rangeland" (mean rank of 8.99). Traditional livestock husbandry in Iran relies on summer rangelands during spring, summer, and part of autumn. However, in the colder seasons such as autumn and winter, the livestock are kept in pens and fed with fodder. Some nomads also utilize winter rangelands in addition to manual feeding of livestock during the winter season. In the past 5 years, due to inflation and the devaluation of the national currency in Iran, it has become increasingly challenging and expensive to provide the necessary fodder for livestock farmers during the seasons when the animals are kept in pens and manually fed (from mid-autumn to early spring). Alongside the cost of acquiring livestock fodder, there has also been a significant increase in the cost of obtaining necessary veterinary medicine for livestock. This is consistent with the findings of Mirjalili et al.[6], who highlighted the lower productivity of traditional livestock farming compared to other occupations as an economic factor contributing to its stagnation. The recent droughts and reduced rainfall in the Iran have resulted in a scarcity of fodder in the rangelands, necessitating manual feeding of livestock for most of the year. Additionally, ranchers are required to purchase drinking water for their livestock, leading to significant expenses. Consequently, the income generated from animal husbandry is much lower than the associated costs, making it less profitable compared to other businesses. Moreover, Hosseinzad and Rashid Ghalam[27] emphasized the impact of exchange rates (dollar), particularly the fluctuating prices of imported inputs such as livestock and poultry consumption inputs, on the overall price of the final product.

More economic and job opportunities, as well as the diversity of jobs in cities, have caused young people to migrate from rural areas to cities and even other countries. In big cities, due to the different lifestyles of urban and rural communities and the majority of the population in cities, young people find better opportunities to generate income and therefore less interested in livestock farming in villages. This, among other conditions, can be effective in the downturn of traditional livestock husbandry. Bayat et al.[15] stated that rural–urban migration and the departure of labor from villages, along the weak financial capacity of villagers to buy high-yielding livestock, drought and lack of fodder in rangelands have caused the stagnation of the traditional livestock economy in the Malayer region of Iran. Moreover, Moameri et al.[18] found that the lack of interest among youth in continuing and expanding agricultural and livestock activities, along with greater economic opportunities and access to higher-paying jobs in urban areas, have been significant factors driving rural–urban migration. The inequality of urban and rural facilities and welfare and livelihood services also play a role in this migration. Mirjalili et al.[6] noted that the migration of young people from the village reduces population growth and sometimes depopulation of rural areas and reduces the young labor force in the villages. This migration also causes a change in the age-sex pyramid of the active rural population, resulting in a decreased demand for traditional livestock farming and land management jobs.

Due to the rising prices of livestock inputs and fodder, many ranchers are unable to meet the financial demands of their livestock. Additionally, the migration of young workers from rural areas has further exacerbated this issue. As a result, many ranchers are forced to reduce the number of their livestock, leading to decreased profits. In traditional livestock farming in Iran, a shepherd is required to graze the livestock in the rangeland or care for them in pens. Whether there are 100 or 10 heads of livestock, one shepherd is needed. Therefore, if the number of livestock decreases, ranchers must hire a shepherd, increasing their expenses. To reduce costs, some ranchers with a small number of livestock mix their animals and hire a single shepherd during the spring and summer seasons when the livestock are in the rangeland. The costs of labor and shepherd wages, as highlighted by Baghestani Meybodi[28], also contribute to the overall cost of animal husbandry and contribute to its stagnation. Mofidi[29] further explains that the main costs of traditional animal husbandry in the Sahand region of Tabriz, Iran include animal feed, labor and shepherding, medicine and veterinary expenses, as well as the rental of rangelands during the early spring season and grazing on rural agricultural and garden fields until mid-autumn.

Role of social factors on the downturn of traditional livestock husbandry

According to the results, the most important social criteria contributing to the downturn of traditional livestock husbandry were "uncertainty regarding the future well-being of children and the social and economic situation in the village" (mean rank = 14.12), "motivation for academic and career development in urban areas" (mean rank = 14.10), and "access to specialized and professional training opportunities in cities" (mean rank = 13.80). Due to various problems, the population of many rural areas of Iran, including the area studied in this research, has decreased. As a result, the amenities in these areas are inadequate, causing concern among residents about the social and economic future of their children. Consequently, they strive to send their children to larger cities that offer better educational opportunities at schools and universities. Furthermore, once their children complete their education, they seek employment in urban areas and do not return to their villages. However, it is important to note that some ranchers are unable to send their children to cities for education due to financial constraints. These individuals typically engage in animal husbandry and agriculture after completing their elementary education in rural schools. Broki Milan and Eynali[30], Moameri et al.[18] and Zhang et al.[31] reported the main factors driving rural-to-urban migration include the lack of suitable job opportunities, the absence of processing and packaging industries for agricultural and livestock products, inequality in facilities and welfare services between cities and villages, the absence of a suitable platform for young people to get married, dissatisfaction with housing conditions and essential services (such as water, electricity, and gas) in rural areas, inadequate management of waste materials and sewage.

Role of ecological factors on the downturn of traditional livestock husbandry

The findings indicated the most crucial ecological indicators impacting the downturn of traditional livestock husbandry were "drought" (mean rank = 7.96) and "non-implementation of range management plans and grazing permits" (mean rank = 6.07). The global phenomenon of climate change has led to droughts in various parts of the world, including Iran. This has had a significant impact on the vegetation of rangelands, resulting in a decrease in fodder available for livestock. In the specific area studied for this research, consecutive droughts over the past decade have caused a decline in fodder production. Consequently, livestock production and the income of ranchers have also decreased[32]. In some cases, livestock farmers have been compelled to sell their livestock due to the scarcity of fodder in rangelands and the rising prices of dry feed such as alfalfa and barley during winter and autumn seasons. Moreover, the lack of implementation or monitoring of range management projects by Iran's Natural Resources and Watershed Management Organization has resulted in neglecting grazing capacity in rangelands and causing ecosystem destruction. Due to the high cost associated with manual livestock feeding, ranchers release their livestock into rangelands before they are adequately prepared (in terms of soil and plant readiness) and keep them there longer than necessary. This practice, along with repeated grazing on palatable plants and overgrazing, leads to uprooting many plants at the beginning of the growing season. Additionally, at the end of the growing season, plants are not given an opportunity to store sufficient carbohydrates for subsequent growth periods. Consequently, both vegetation and rangeland soil suffer from significant damage[16,33,34]. As a result of these problems, traditional livestock farming stagnates. In various studies, the effects of climate change and drought on the destruction of the ecosystem and as a result the stagnation of traditional animal husbandry have been pointed out[6,29,35–38]. These researchers have reported that drought is a significant factor contributing to the decline of traditional livestock farming. In any given year, the vegetation on rangelands is either regenerating itself or being destroyed due to the influence of drought. While rangeland improvement is a long-term process, drought causes long-lasting effects. The most effective approach to managing drought is preparation in the years leading up to it. In this situation, there are two possible solutions: firstly, purchasing fodder and manually feeding the animals until the drought subsides; secondly, reducing the number of animals. However, due to financial constraints, ranchers often lack the means to buy fodder and feed their livestock by hand, forcing them to sell their animals in order to avoid losses resulting from livestock deaths. This factor stands as one of the primary reasons for the stagnation of traditional livestock farming.

Conclusion

The most important source of income for pastoralists is livestock husbandry in rangelands, making them heavily dependent on these areas. However, ecological factors such as drought and lack of precipitation have led to a significant decline in vegetation and forage within the rangelands in recent years. These droughts, along with the rising cost of fodder required by livestock, force ranchers to sell some of their livestock at a reduced price. As a result, these ecological challenges, along with related economic and social issues, have ultimately led to a decrease in income for livestock farmers. This situation has resulted in the income from livestock production being much lower than the costs incurred, leading to negative net profits for farmers. Finally, the outcome of these conditions led to an increase in welfare problems and the DTLH. Moreover, in recent years, there has been a noticeable rise in residential land prices across various regions of Iran, including the area under examination in this study. This trend has led to a shift in land usage from rangelands, forests, and agricultural lands to residential properties and have prompted local people to sell rural lands to non-indigenous individuals. On the other hands, economic challenges in rural communities, traditional livestock husbandry difficulties, waning interest among the younger generation to pursue livestock husbandry, and the allure of better job opportunities in urban areas are prompting some young people to migrate to cities. Furthermore, the favorable climate and beautiful natural landscapes in the research area have spurred the growth of tourism and ecotourism. While this development has bolstered the local economy, it may also diminish interest in livestock husbandry in the region in the long run.

One solution that can be suggested to prevent DTLH is the establishment of livestock cooperatives in rural areas, which can enhance ranchers financial and technical capabilities. Additionally, providing low-interest loans or free fodder by government organizations to ranchers can help sustain their livelihoods and prevent the DTLH to some extent during drought periods. Furthermore, enhancing welfare, recreational, and educational facilities in rural areas, as well as incorporating new technologies in traditional livestock husbandry practices, can make the profession more appealing and prevent stagnation.

One limitation of the current study was that some local individuals did not disclose their financial information transparently to avoid tax issues. Moreover, there were cases where native people were reluctant to provide accurate data for various reasons, necessitating the completion of additional questionnaires to obtain more precise information. During the completion of questionnaires and interviews with ranchers, a challenge arose as they were eager to share their diverse issues, often deviating from the research topic. Researchers needed to pay attention these concerns to build trust with the ranchers, resulting in time being spent on unrelated matters. Despite this time consumption, satisfactory results were typically achieved through questionnaire completion.

Data availability

All data generated or analysed during this study are included in this published article.

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Author contributions
All authors contributed to the study conception and design. M. Moameri and M. Lotfi original researcher, introduction, methodologist, statistical analyst, writing- review and editing; A. Ghorbani methodologist, statistical analyst; Y. Ghasemi Aryan, assistant researcher, writing-review and editing. All authors read and approved the final manuscript.

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