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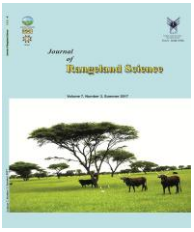

Research and Full Length Article:

Factors Affecting Herders Migration Time to Summer Rangelands (Case Study: Kouhdasht Rangelands, Lorestan Province, Iran)

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Abstract. The main objective of this study was to assess factors affecting early entrance and later exit of herders from summer rangelands. The study population consisted of heads of Nomads in Kouhdasht region, Lorestan province, Iran. According to Cochran formula among 1038 Nomadic families, 310 families were selected with stratified random sampling in 2015. In order to assess validity, expert's opinions were considered and face to face interviews and questionnaires were applied to collect data, and Cronbach's Alpha was used to assess reliability. To determine the factors influencing movement calendar, the factor analysis (principle component analyses) and KMO statistics were used. The variables were ordinated by factor analysis into six factors. Results of Mann-Whitney test indicate that annual herd calving and distance of winter and summer rangelands had a significant effect on livestock entrance and exit date to the summer rangeland. Results of Kruskal-Wallis test showed that herders who had private rangeland and those who had cooperative rangelands leave summer rangelands later and in the right time, respectively. Herders whose main job was ranching had good knowledge about livestock entrance and exit date of rangeland. Results obtained from factor analysis showed that factors of tribes' tendency to use fresh fodder for their livestock, lack of forage in the winter rangelands and increased annoying insects were effective in early migration of nomadic. The livestock weight loss and lack of places in the winter rangelands were effective in early and late exit of livestock from the summer rangeland.

Key words: Early entrance, Exit entrance, Kouhdasht, Summer rangeland, Stakeholders

Introduction

Iranian rangelands cover about for 86.1 million hectares of the country's area. Considering the rangeland area and its fundamental role in sustainable development, there is an urgent need to plan for optimal management of such vital resources (Eskandari *et al.,* 2008). Livestock grazing management is found to be an important subject in management of rangeland ecosystems. The main purpose of grazing management is optimal utilization of range plant in order to achieve optimal efficiency and sustainability of both rangeland ecosystems and livestock production (Bagheri *et al.,* 2007). Nomadic life is a certain type of livelihoods in arid and semi-arid area which is based on herding and utilizing natural rangelands and grasslands. It is estimated that almost 100 to 200 million people throughout the world live in this way (Grahn, 2008). History of nomadic life in Iran returns to about eight thousands years ago (Amanollahi Baharvand, 2013). Since nomadic tribe's subsistence relies on livestock, they are forced to provide the required fodder from pastures and for avoiding heat and harshest cold, they should move season by season between at least two distinct areas. So, that's why Nomadics are so called nomads. By definition, nomadic is a way of life in which humans subsist mainly through animal husbandry searching natural pasture forages and annually migrate from a place to another (Amanollahi Baharvand, 2004). Migration is one of the most fundamental and most important strategies for sustainable use and management of herders' and traditional areas of pasture to overcome climate challenges and to control the grazing season (Scoons, 1995). Neudert (2010) defines nomad migration as a form of social organization and ecological well-being. Jode (2010) believes that main reason for migration is to increase livestock productivity, and more efficient use of water and rangelands. In fact, using this process, in addition to achieving the adequate forage, herders prevent from the rangeland degradation. Nomadic serves as a way of living and livelihoods solution which is compatible with nature. Mehrabi (1990) believes that major nomadic living issues are: spring migration, lack of security while moving and livestock weight loss. Ghanbari (2001) for main issues in the early movement in winter rangelands found out lack of adequate government support in supply of forage, lack of buying surplus livestock at reasonable prices, sharp fluctuations in the livestock price, extreme weather heat, encroachment of non-palatable and toxic plants, animal diseases outbreaks and lack of grazing livestock license in some Nomadic. Shah Mohammad *et al.* (2005) showed that factors such as "hot weather", "lack of sufficient water in rangelands", "pasture degradation", "lack of suitable route", "weakness in governmental support on livestock movement", "common use of pasture", "over-grazing of summer pastures indeed by illegal villagers and other nomads", and "no license in winter rangeland" were the most important factors in an early movement. Ranchers in spite of the implementation and awareness on the damaging effects of early grazing have no choice and may be forced to act on early grazing. From the perspective of the tribes, the most important activities effecting the early migration in Fars Province, Iran were "shortage of fodder and water for livestock, "the water supply in drought years to prevent from the early migration of nomads (Abedi Sarvestani, 2014). Heidari *et al*. (2010) and Mckean and Ostrom (1995) stated that in common use rangelands, management issues begin when each stakeholder tries to make greater use of these resources. Bogale *et al.* (2006) showed that on common areas and farming systems in east Ethiopia, no regulated utilization and land

management in these areas cause the degradation of pastures, more poverty and food shortages. They recognized that lack of sound management method and exploitation right led to irregularities and excessive exploitation of resources. Bajian (1995) in evaluating the best utilization of rural pastures according to stockholders viewpoint in Fars province, Iran believed that the best mode of rangeland utilization is rangeland fragmentation. He believes that separate dedication improves the ownership incentives in strengthening the protection and rehabilitation of rangelands. Supposing population growth and the increasing need for food (red meat), total number of livestock will be increased which impose direct pressure on rangelands. Due to degradation of productive rangeland and also due to lower production per unit area and current carrying capacity of pastures, it is much more impossible to reach livestock and rangeland equilibrium. So, it leads to incorrect exploitation on rangeland (Shamekhi, 2009).

As a result of overgrazing, Iranian rangelands have been degraded under high grazing pressure, lack of considering grazing season, grazing period and number of livestock exceeding range capacity so that the most areas are covered by toxic plants and have changed range conditions to poor and very poor conditions. So, there is an urgent need to consider entrance and exit date of livestock in proportion to grazing capacity of rangelands with a right system for pasture grazing and reasonable time for grazing. Grazing management would ensure the correct rehabilitation of rangelands. The main objective of current research was to determine the factors affecting early entrance and later exit of herders from summer rangelands in Kouhdasht rangelands, Lorestan province, Iran.

Materials and Methods

Study area

Kouhdasht district has an area of 390400 ha in Lorestan province in western Iran with geographical coordinates of 47°33" E and 31°39" N. According to statistics, nomadic rangeland in Lorestan province is about 304000 ha so that grazing capacity accounts for 516800 animal unit. Totally, harvestable forage is 101335 tons. The number of livestock in rangeland is about 300000 animal units and the total number of households headed by nomadic herders in winter rangelands is 1038 family. Average annual precipitation is 405.2 mm and December and January have the highest precipitation among the months (Seidi Shahivandi *et al.*, 2013). Fig. 1 shows district position in Lorestan province (Fig. 1).

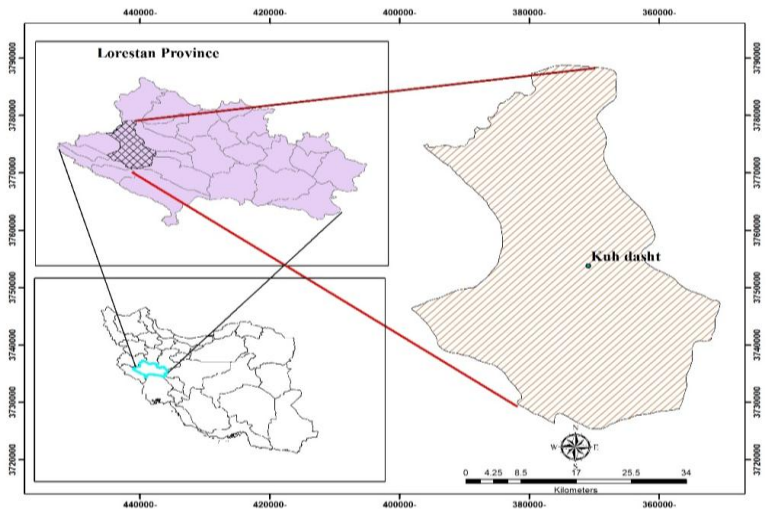

Fig. 1. Map of study area in Iran and Lorestan province

Methodology

This study is a survey research and data collection was completed via interviews and questionnaires. Kuhdasht district has 2200 Nomadics in winter and summer rangelands. There were 1038 nomad families in winter rangeland in 2015. According to Cochran formula (Cochran, 1977) among 1038 Nomadic in summer rangeland of Kuhdasht Rangelands, 310 heads were selected by the stratified random sampling in autumn 2015. In order to ensure validity of data, expert's opinions were used and for data collection, face to face interviews were performed and questionnaires were collected. Cronbach's alpha was used to assess reliability (Cronbach, 1951). Cronbach's alpha reliability coefficient was calculated for 30 questionnaires pre-test as 95%.

Firstly, the descriptive analysis was performed and then, two or more independent variables were compared via Kruskal-Wallis and Mann-Whitney test. To investigate factors influencing migration date, factor analyses via principal component analyses approach and Kaiser-Meyer-Olkin measure (KMO) were used. This analysis was based on autocorrelation between the variables showing in the correlation matrix factor analysis (Zare Chahooki, 2010). The collected data were analyzed in SPSS software.

Results

Tribe demographical parameters as presented in Table 1 showed that 95.5% of households' heads were male and only 4.5% were women. The average age of respondents was 55.5 years and the average family size was 6.52. The average experience duration in livestock herding was 36.2 years. Livestock number was estimated about 135.9 per household. Herders were not in good conditions in terms of education level. 68.1% were illiterate and 28.3% could read and write. Allowable livestock date for entrance to summer pastures is 20th April. Only 16.78% (58 families) of the study participants were entered into summer rangeland in the right time and 83.22% (258 stakeholders) were arrived earlier. Time to exit from summer rangeland was 20th May. 37.42% (116 stakeholders) left rangeland on time and the rest left rangeland later.

Table 1. Demographic parameters of studied tribe

Variables	Mean	SD	Max	Min
Age (years)	55.41	14.26	120.0	24
Education level (years)	1.32	2.59	16.00	0
Household size (persons)	6.52	1.91	12	2
The number of livestock per family	135.9	85.6	520	20
Livestock experience (years)	36.17	15.50	100	2.0
The annual birth rate of 10 head of livestock	12.43	2.60	20	6.0
Herders average annual income (US$ per year)	594.3US$	9.40	480	30
Herders average annual expense (US$ per year)	415.9US$	6.98	380	20
The number of beneficiaries in civic organizations (people)	82.70	35.35	170	35
Number days livestock enters rangeland earlier	25.04	20.70	0.0	75
Number of days livestock exit rangeland later	15.95	14.45	0.0	60

Comparisons of entrance and exit date of livestock to summer rangeland

To survey any relations between the entrance date of livestock to summer rangeland and their socio-economic characteristics, due to non-normal data, the Mann-Whitney and Kruskal-Wallis methods were used.

Mann-Whitney test results (Table 2) showed a significant difference between the timely and early entrance dates in terms of annual birth rate of 10 head livestock and the distance between winter and summer rangelands ($P<0.01$ and

P<0.05), respectively. Due to higher calving, the herders were arrived into the summer rangeland much earlier. Similarly, the more distance between summer and winter rangelands, herders were forced to enter summer rangeland earlier. However, there were no significant differences between the timely and early entrance dates for the age, family size, number of livestock, ranching experience, annual income and expense of nomadic household (Table 2).

The results of Mann-Whitney test for date of departure showed a significant difference between the timely and later departure dates for ranching experience, the distance between summer and winter rangelands, and annual expense of Nomadic (P<0.01). Herders having more experience and having higher annual expense left the summer rangelands later. In contrast, the more distance between summer and winter rangelands, herders are forced to leave the rangeland much earlier than timely exit date. There were no significant differences between the timely and later exit dates for age, family size, number of livestock, annual calving of animals and annual income of herder (Table 2).

Table 2. Comparing entrance and exit date of livestock to summer rangeland and tribes socio-economic status

Entrance/Exit Date of livestock	**Variable**	**Means of ranking**		**U**	**Z**	**sig**
		Timely (n=58)	**Earlier (n=252)**			
Entrance	Age	161.93	154.02	6.93	-6.07	0.321^{ns}
	Family size	145.09	157.90	7.06	-0.99	0.321^{ns}
	Livestock number (per household)	161.48	154.13	7.96	-0.55	0.576^{ns}
	Ranching experience	157.41	155.06	7.19	-0.18	0.556^{ns}
	The annual birth rate of 10 head of livestock	131.52	161.02	5.91	-0.58	0.022**
	Distance of summer and winter rangeland	123.44	162.88	5.44	-3.07	0.002*
	The annual income of herders	166.1	153.06	6.96	-1.02	0.308^{ns}
	The annual expense of herders	163.05	153.76	6.87	-0.18	0.446^{ns}
		Timely (n=116)	Later (n=194)	U	Z	sig
Exit	Age	148.79	159.51	1.04	-1.02	0.308^{ns}
	Family size	157.14	154.52	1.1	-1.25	0.801^{ns}
	Livestock number (per household**)**	146.77	160.72	1.02	-1.32	0.185^{ns}
	Ranching experience	138.86	165.45	9.32	-2.55	0.011**
	The annual birth rate of 10 head of livestock	144.66	161.98	9.99	0.61	0.960 ^{ns}
	Distance of summer and winter rangeland	168.56	147.69	9.73	-2.01	0.044**
	The annual income of herders	146.77	160.72	1.02	-1.32	0.185^{ns}
	The annual expense of herders	143.66	162.58	1.87	-2.55	**0.**006*

*,** and ^{ns}=Significance at 5%, 1%, probably level and non significance, respectively

Results of Kruskal-Wallis test are presented in Table 3. According to date of livestock entrance to summer rangeland, there were no significant relationships between both education level, cooperative rangeland management

and livestock entrance date. But, there was a significant relationship between main herder jobs and entrance date of livestock to summer rangeland (P<0.05); the results indicated that herders who just rely on herding income will enter summer rangeland more earlier (Table 3).

According to the Kruskal-Wallis test, there was no significant relationship between education level and entrance date. But, there was a significant relationship between both cooperative management, stakeholder job and also exit date of livestock from summer rangeland (P<0.05 and P<0.05), respectively. The results realized that cooperative management may exit the summer rangeland much later than that the separated herder. Similarly, herders who had other jobs except herding left the summer rangeland later.

Table 3. Comparing entrance and exit date of livestock to summer rangeland using Kruskal-Wallis method

Variables of entrance date						**X^2**	**sig**
Education	Illiterate	Elementary	Secondary	High school	Academic	4.974	0.29^{ns}
Rank average	154.38	159.70	160.03	145.75	29.50		
Management type	Cooperative	Non-cooperative		Separated		0.457	0.796^{ns}
Rank average	147.73	155.60		158.67			
Main job	herder	Herder-farmer		Herder-other jobs		6.376	0.041^{**}
Rank average	171.14	149.55		161.90			
Variables of Exit date						Chi square	sig
Education	Illiterate	Elementary	Secondary	High school	Academic	2.784	0.595^{ns}
Rank average	153.26	163.90	140.8	174.75	213.50		
Management type	Cooperative	Non-cooperative		Separated		15.635	0.000^{**}
Rank average	171.77	161.61		116.63			
Main job	Herder	Herder-farmer		Herder-other jobs		20.535	0.047^{*}
Rank average	165.40	148.16		174.75			

*,** and ^{ns}=Significance at 5%, 1%, probably level and non significance, respectively

Factor analysis of social, economic and environmental variables

Results obtained from factor analysis using the correlation matrix show that KMO value of all components was higher than 0.05 suggesting reasonable data on factor analysis. The extracted factors were selected based on factor loadings greater than 0.7 after factor varimax rotation. For early entrance, the eigen values and variance percentage for social, economic and environmental factors were extracted (Table 4). The indices of each factor are shown in Table 5.

Results obtained from factor analysis show that factors of lack of stakeholder's motivation to reasonable utilization from rangelands, lack of forage in the winter rangelands and increased annoying insects were effective in the early migration of nomadic. The livestock weight loss and lack of space and place in the winter rangelands were also effective in the exit of livestock from the summer rangeland.

Results of factor analysis in terms of social factors showed the most important factors involving lack of nomad interest in pasture trash forage, lack of health services in summer pastures, lack of herders motivation to reasonable utilization from rangelands, and lack of stakeholders trust to natural resources experts, and degradation about rangelands. The most important economic factors were lack of forage in the winter rangelands and Lack of livestock weight gain in winter rangelands. The most important environmental factors effective in the early migration of nomadic were the increased annoying insects, water scarcity and drought and pesky insects (Table 5).

Table 4. The extracted factors with eigen values and variances percentage for social, economic and environmental factors

Early entrance	Factors	Eigen value	Eigen values percent
Social factors	Factor1	2.517	16.78
	Factor2	1.798	11.98
	Factor3	1.353	9.02
	Factor4	1.168	7.79
	Factor5	1.066	7.10
	Factor6	1.034	6.89
	Total		59.57
Economic factors	Factor1	1.36	34.04
	Factor2	1.002	25.05
	Total		59.05
Environmental factors	Factor1	1.391	34.77
	Factor2	1.027	25.66
	Total		60.43

Table 5. Variables related to each factor and the factor loadings from varimax rotation matrix

Earlier entrance	Factors	Indices	Correlation coefficient
Social factors	1/1	Nomads harassment by villagers and farmers	0.745
	1/1	Lack of stakeholders motivation to reasonable utilization	0.785
	2/1	Lack of sufficient trust to natural resources management	0.724
	2/2	experts	
		The feeling job security by stakeholder	0.706
	3	Degradation of temporary rangelands	0.767
	5	Lack of health services in summer pastures	0.808
	6	Tribes temptation to use fresh fodder for livestock	0.845
		KMO= 0.662 Sig= 0.000	
Economic factors	1	The lack of forage in the winter rangelands	0.955
	2	Lack of livestock weight gain in winter rangelands	0.700
		KMO= 0.569 Sig= 0.000	
Envir. factors	1/1	Water shortage	0.767
	1/2	Successive droughts	0.771
	2	increasing pesky insects	0.892
		KMO= 0.537 Sig= 0.000	

Factors analysis of variables affecting earlier and later exit of summer rangeland

For early and later exit, eigen values and variance percentage are shown in Table 6. The indices of each factor were selected based on factor loadings greater than 0.7 after Varimax rotation method. Results obtained from factor analysis show that the effective factors in the early exit of livestock from summer rangeland were livestock weight loss and water shortages in summer pastures. Also, effective factors in later exit of nomadic are accommodation in winter rangeland and lack of competition (Table 7).

Table 6. The extracted factors with eigen values, the variance percentage that contributed in earlier and later exit

Early and later exit	Factors	Eigen value	Eigen value percent
Early exit	Factor1	1.495	24.92
	Factor2	1.109	18.478
	Factor3	1.024	17.075
	Total	-	60.473
Later exit	Factor1	1.841	30.681
	Factor2	1.095	18.25
	Total	-	48.931

Table 7. Variables related to each factor and the factor loadings after varimax rotation matrix

Early and later exit	factors	Indices	Correlation coefficient
Early exit	1/1	Water shortages in summer pastures	0.806
	1/2	School	0.772
	2	Other herders movement	0.746
	3	Livestock weight loss	0.911
		KMO= 0.553 Sig= 0.000	
Later exit	1	Accommodation in winter rangeland	0.830
	2/1	Inexpensive livestock	0.763
	2/2	Lack of competition	0.781
		KMO= 0.647 Sig= 0.000	

Discussion

Based on the results of factor analysis, the most important social factors were "lack of herder stakeholders motivation to sound utilization", "lack of stakeholders trust to natural resources experts", "degradation about rangelands", "Lack of health services in summer pastures" and "nomads interest in pasture trash forage". As for economic factors, "lack of forage in the winter rangelands" and "no weight gain in livestock in winter rangeland " were more effective in earlier migration of pastoralists as the most important environmental factors were "water scarcity" and "drought and insects". These findings were in agreement with the results of Shah Mohammad *et al.* (2005) who conducted a survey on early entrance of Bakhtiari nomadic tribes to rangeland in Isfahan province and showed that factors such as hot weather and droughts, water shortages in winter pasture, "rangeland destruction", Lack of government services on migration routes, and nuisance driven by the villagers and nomads are the most important factors in the early migration; also, Abedi Sarvestani (2014) in Fars province showed that the main causes of early movement are lack of fodder and water for livestock" and the required water supply in drought years. These results confirm findings of Ghanbari (2001) who stated that factors affecting the early movement from winter rangeland are "lack of state support in financing the purchase of forage", "government failure to buy surplus livestock at reasonable prices", extreme heat and the influx of non-palatable and poisonous plants, animal disease outbreaks" and no grazing license. Factors including "the lack of space and place in the winter rangeland, lack of competitors affect the early exit and water scarcity in summer rangelands, movement of other herders, and livestock weight loss are the factors affecting later movement from summer pastures. To the best of our knowledge, such factors have not been mentioned in another study. Based on the results, the more annual calving's of ten livestock, induces earlier enter to summer rangelands. As well, in case of more distance between both upland and lowland rangelands, nomadic tries to move earlier and reach to summer rangelands to use fresh forage for their livestock. The findings of this study showed that individuals with high experience do exit summer rangelands later. Because younger herders compete with them, they enter earlier and use more fodder for feeding their livestock and that's why older herders enter and exit rangeland later and comply their old habits and license dates. There was a significant relationship between livestock exit date from summer rangeland and distance between summer and winter rangelands. The most distance between summer and winter rangelands, the herders try to exit winter rangelands earlier. There was no research on this subject so far and merits much more investigation. When herder's income increases, they exit earlier from

rangeland and vice versa. Cooperative herders exit summer rangeland earlier. Comparing average exit summer dates from rangeland has shown that herders who have cooperative and communal rangelands exit rangeland later and those with private one exit rangeland timely. This is in agreement with the results of Farahanifard and Sedeghi (2006), and Papliyazdi and Labaf Khaniki (2000). The study showed that the main causes of early migration of nomadic herders are "water shortages", "lack of forage in the winter rangelands" and "livestock weight loss". These support findings of Abedi Sarvestani (2014) showing that the most important factor on early movements of nomads is"water shortages" followed by "forage shortage". So, in order to solve early movement, there is an urgent need to water demand met by some sustainable methods. At the same time, given the environmental importance of rangeland and biodiversity in sustainable development, it is better to provide cheaper forage for livestock in drought years. This in turns prolongs time of entrance to rangeland. Bakhshandeh Nosrat (1994) showed that rangeland only meets 45% of livestock demands and the rest is related to manual forage which accounts for 85% of herding cost.

Given the insect outbreaks in rangeland, it is recommend to encourage people for household hygiene, awareness and training of health centers, keeping the livestock away from black-clad, and finally, spraying insecticides. Results suggest that herders with common management exit the rangelands later than those with a private rangeland. As in private one, since herders have ownership, they try to exit on time and the most important suggestion is to divide common rangelands or establish the cooperation. The findings showed that the majority of the studied tribes are illiterate or semi-literate. This fact is indicative of fundamental issues between nomads. Some studies showed that while keeping this issue in mind for organizing nomad movement, strategies to reduce illiteracy among tribes should be taken into account.

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عوامل مؤثر بر زمان کوچ دامداران (مطالعه موردی: شهرستان کوهدشت، استان لرستان)

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چکیده. هدف تحقیق حاضر بررسی عوامل مؤثر بر زمان ورود و خروج زود هنگام و دیرهنگام دامداران در مراتع ییلاقی است. جامعه آماری پژوهش را سرپرستان خانوار عشایر شهرستان کوهدشت، استان لرستان تشکیل داده، با بهره‌گیری از فرمول کوکران، از میان ۱۰۳۸ خانوار عشایر مناطق ییلاقی شهرستان کوهدشت، ۳۱۰ سرپرست خانوار به روش نمونه‌گیری تصادفی طبقه‌بندی شده در پاییز ۱۳۹۴ انتخاب شدند. برای سنجش روایی از نظرات اساتید استفاده شد و اطلاعات مورد نیاز پژوهش با انجام مصاحبه حضوری و از طریق پرسشنامه‌ها جمع‌آوری شد. برای سنجش پایایی از آلفای کرونباخ استفاده شد. برای بررسی عوامل موثر بر زمان کوچ از روش تحلیل عاملی و محاسبه ضریب (KMO) استفاده شده است. براساس روش تحلیل عاملی، متغیرهای مورد مطالعه در ۶ عامل گروه‌بندی شدند. نتایج حاصل از آزمون من‌ویتنی نشان داد بین زمان ورود دام به مراتع ییلاقی با زایش سالانه گله و با فاصله بین مراتع ییلاقی و قشلاقی رابطه معنی‌داری وجود داشت و زمان خروج دام در مراتع ییلاقی با فاصله بین مراتع ییلاقی و قشلاقی نیز ارتباط معنی‌داری وجود داشت. همچنین بین زمان خروج دام از مراتع ییلاقی با سابقه دامداری و متوسط هزینه سالانه دامداران ارتباط معنی‌داری وجود داشت. نتایج آزمون کروسکال والیس بیانگر آن است که دامدارانی که مراتع حریم دارند دیرتر و آنانی که مراتع تعاونی دارند به موقع از مراتع ییلاقی خارج می‌شوند. نتایج تحلیل عاملی نشان داد که مهمترین شاخص‌ها در ورود زود هنگام دامداران به مراتع تابستانی تمایل به استفاده از علوفه تازه، کمبود علوفه در مراتع قشلاقی و زیاد شدن حشرات مزاحم می‌باشند. در مقابل، کاهش وزن دام و کمبود جا و مکان در قشلاق در ورود زود هنگام و خروج دیر هنگام دامداران از مراتع تابستانی موثر بودند.

کلمات کلیدی: ورود زود هنگام، خروج زود هنگام، شهرستان کوهدشت، مراتع ییلاقی، بهره برداران