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The Past and Present: A Correlation Analysis between Environmental Factors of the Neolithic and Chalcolithic Sites in the Bakhtiari Highlands with an Ethnoarchaeological Approach

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Abstract

Laran district, located at the southern basin of the Zayandeh Roud River, has been an eligible location for human settlements throughout historic/prehistoric periods due to its geographical conditions and significant environmental potential. This part of the Zagros Mountains is one of the foremost regions between the Central Plateau and Khuzestan Province thus with its environment plays a crucial role in forming, maintaining, or destroying archaeological sites. This research is descriptive-analytical that studies 27 Neolithic and Chalcolithic sites identified through the archaeological survey analysis accomplish in the Laran district in 2010. Arc GIS was used to facilitate the understanding of spatial patterns through environmental factors. This software combines the existing distances and the data related to environmental conditions with the locations of the sites then offers the results in the form of numbers. Pearson's Correlation analysis was used to examine the relations between archaeological sites and environmental factors. Existing or lack of correlation among archaeological sites depends on the human's relationship with their environment which generates a particular kind of perspective. In the present study, the extent of archaeological sites serves as the dependent variable and environmental conditions such as distance from water resources and access routes, the vegetation, the aspect and the degree of slopes, and above sea level (elevation) are independent variables. Additionally, archaeological studies using the same analytical method were accomplished in 61 campsites in the district and the results resembled Neolithic and chalcolithic sites of the Laran district. The results show that settlements in the Laran district are rarely dependent upon environmental factors, which means that the mentioned settlements, similar to present campsites, were used on a seasonal, temporary basis.

Keywords: Laran District, Bakhtiari Highlands, Environmental Factors, Neolithic and Chalcolithic, Pearson Correlation.

Article Type: Research Article

Introduction

Laran County is located on the southern side of the Zayandeh Roud basin and its distributaries. This district is among the unknown areas in Iran with almost no archaeological study records. Considering the slight acquaintance to the district, an intensive survey was carried out in the Laran District which the main purposes were to identify and record all the evidence of human activities in the area through history to define an archaeological map of the district, and to compose a relative chronological framework based on cultural materials. The next step was to study the setting for the settlement, to understand both intra-regional and extra-regional relations among archaeological settlements using environmental resources. No

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doubt offering an accurate image of such processes requires survey analyses. In terms of archaeology and cultural ecology, it gives rise to numerous questions and uncertainties since the Laran district has not been comprehensively studied. For instance, despite the harsh environmental conditions and impassable areas, which factors in the creation or continuation of Neolithic and Chalcolithic settlements in Laran County were effective? Which one of these environmental factors has more influence compared to the others? The present article intends to study the influence of environmental factors on the establishment of Neolithic and Chalcolithic sites in the Laran District, using an analytical-descriptive method. Studying archaeological sites, examining and analyzing material culture, and investigating the role of the environmental factors in forming and establishing archaeological sites along with exploring settlement patterns through understanding the changes in the district, can enhance our understanding of people's habitat selection and their interaction with their surroundings as well as qualitative and quantitative changes in settlement patterns and, finally, intra-regional demographic changes.

Materials and Methods

One of the most important goals in performing field studies in archaeology is to study the methods of interaction between human societies and the environment they live in. Hence in Spatial analyses, the correlation between settlements and environmental characteristics such as mean sea level, distance from the nearest rivers and roads, slope, vegetation, aspect of the slope, and other factors are studied (Clarke 1977: 119). Thus, archaeology employs ecology to study methods of human interaction with nature. Cultural ecology is the study of eco or biome which consists of how living creatures occupy the land and how they interact with each other. Accordingly, environmental studies include knowing the circumstances of existence and interaction between living creatures and the environment, or the science concerns itself with the relations between living creatures and their environment (Sutton & Anderson 2010: 3). In other words, ecology is the study of the relationship between different life forms with their natural environment. Studying the effects of the environment on human beings was common, especially from the 1950s to the 1970s when Julian Steward established the foundations for the theory of cultural ecology. He established this theory in the 1930s (Pálsson 2004: 64; Sutton and Anderson 2010: 21).

Cultural ecology studies how the environment affects human beings and how human beings affect the environment. Cultural ecology is focused on beliefs and cultural measures that help human societies to adapt to the environment and instruct them on how to use the ecosystem in their lives (Kottak 2009: 373). In other words, cultural ecology studies human life, limitations, and environmental and social obstacles (Shakouei 2011: 232). The main purpose of these studies is the relationship between culture and environment or between humans and the earth. The vision as a set of spatial, biological, and social networks concerning earth is considered as an ecological skin or limb (Shemirani *et al.* 2010: 80). Cultural ecology is the way to obtain the bigger picture of how humans adapt to their environment, co-exist, and how they change it.

Thus, to measure the effect of environmental factors in forming settlements, we used the correlation coefficient. The environmental factors were considered as independent variables and the area of the sites was taken to be the dependent variable. To better understand the spatial patterns of sites with environmental factors, I used Arc GIS software. This software provided the present distances and data which were the results of environmental conditions combined with spatial conditions of sites in the form of numbers for the researchers. Then the correlation analyses of archaeological sites concerning their environmental conditions were conducted via SPSS and Pearson correlation analysis. The correlation or lack of correlation of archaeological sites depends on the relationship of humans with the environment which offers a specific kind of perspective. In assessing the correlation, when both variables are in relative and interval scales, then Pearson product-moment correlation is used. Pearson correlation coefficient, which is also called the Pearson product-moment correlation or zero correlation coefficient was introduced in 1895 by Sir Karl Pearson. This coefficient is used to assess two relative and interval scales with a value between -1 and +1. In the condition the sum is positive, it means the changes happen in both scales in the same aspect. In other words, if the number of one scale increases so does the number of other scales, and vice versa. But if

the amount of r is negative it shows that the scales move toward opposite aspects. On the other hand, if the sum that we get for the correlation coefficient is zero then it means there is no relation between the two scales. If there is exactly +1, it shows a complete positive correlation and if it is -1 it shows a complete negative correlation. The reason we chose this analytical method was this hypothesis which claims that environmental factors and human behavior have a relative uniformity.

Geographical Settings of Laran District

The area of Laran District is 516.28 square kilometers and is located 25 kilometers from north to northwest of Shahrekord. This region is surrounded by Isfahan province at the north, Kuhrang town at the northwest, Farsan town at the west, and Ben and Shahrekord at the eastern borders (Figure 1). Since it is located in the mountain ranges of Zagros, it has the characteristics of a high-altitude area, therefore it is exposed to wet winds of the Mediterranean systems and it causes them to ascend and precipitate. Thus, it enjoys a good amount of rainfall. Most topographic characteristics of this region consist of high mountains, deep valleys, and small plains between mountains. Rainfall in the region is often influenced by Mediterranean Climate currents and mostly low-pressure systems that enter the region from the west and southwest and affect the region from autumn to the end of spring. In this region, the heights and foothills on the path of western wet winds receive more rainfall and have more dense vegetation (Jafari 1989: 20).

Due to the height of this region and the extended periods of cold, vegetation mostly consists of pastures and Astragalus. Numerous mountain peaks and heights plus considerable snow supplies have created many springs and rivers which not only provide the province with adequate water supplies but also serve as the vital water resource for Isfahan and Khuzestan provinces (Nakhaei *et al* 2011: 62). The lowest altitude in the region is 2036 meters above sea level in Zayandeh Roud and southwestern Karoun Basin. Overall, from a natural perspective, this region consists of several mountain peaks with an altitude of more than 3000 meters, along with deep valleys and hills in which animal husbandry, herding is thriving but both dry and irrigated farming are less common. This region located at the end of the route of Bakhtiari nomads is one of their summer camps (Minorsky 1945: 76; Alizadeh 1988: 27). The people of this region mostly do farming and herding to earn a living besides migration. Despite the existence of advanced mechanized farming tools, farming is still done in traditional ways. People use these methods due to the absence of flat farming land, low fertility of the soil, and permanent river beds being lower than the lands surrounding them.

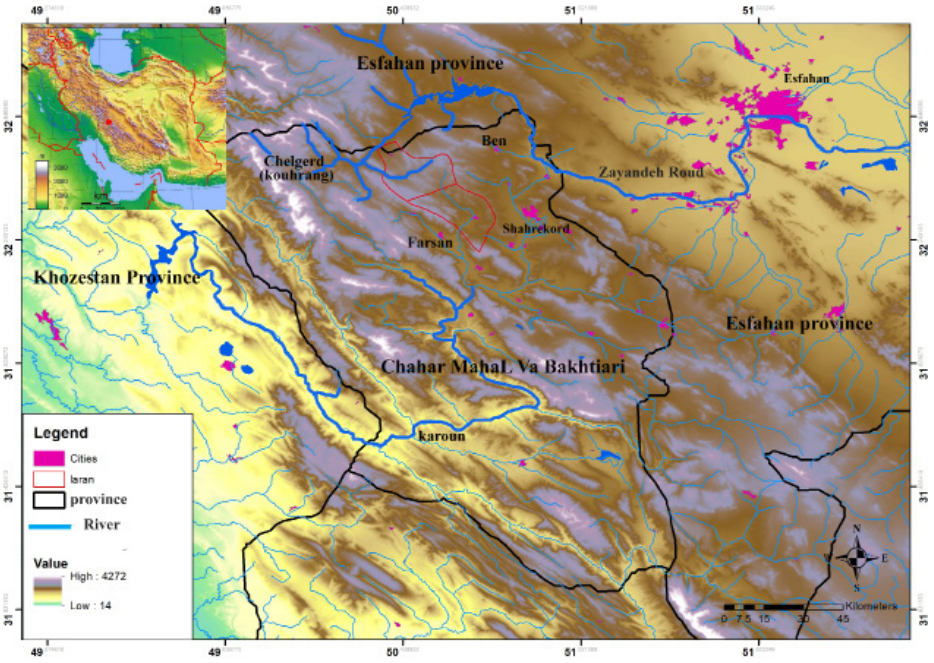


Figure. 1: *Location of Laran County*

Research Background

Even with the great environmental potential, Laran District has not been studied systematically by an archaeologist so far. Seemingly, sounding at Tape Eskandari of Hafshejan _located in the South of Shahrekord County_, by Jahangir Yasi in 1968 are the oldest archaeological investigations of the region which there are no reports on that (Norouzi 2009: 161). In the same year, a delegation was dispatched by the archaeological administration center to excavate and examine the sites around Shahrekord County. The delegation visited Tape Kouganak in Shahrekord-Daran borders and carries out sounding there. Since they found only a few prehistoric and Islamic potteries, they decided that Tape Kouganak did not contain any layers and it does not justify archaeological recording (Kosari 1968: 9). The most serious archaeological studies of Chahar Mahal and Bakhtiari Province were carried out in certain regions of Lordegan by Allen Zagarell in 1974. The studies were continued, by Allen Zagarell and a delegation of German archaeologists under the supervision of Professor Hans Nissen in 1975. A short-term investigation was carried out in Qale Geli, Lordegan in 1977 and 78, (Nissen and Zagarell 1975: 91). These activities continued after the 1979 Revolution. The Laran region was examined and systematically surveyed under the supervision of Ali Asghar Norouzi for 30 days in 2010 for the first time. As a result, 210 ancient sites were found from Neolithic to contemporary times (Norouzi 2010: 1295). This study examines 27 Neolithic and Chalcolithic sites (Figure 2) and 61 campsites of contemporary nomad Pastoralists.

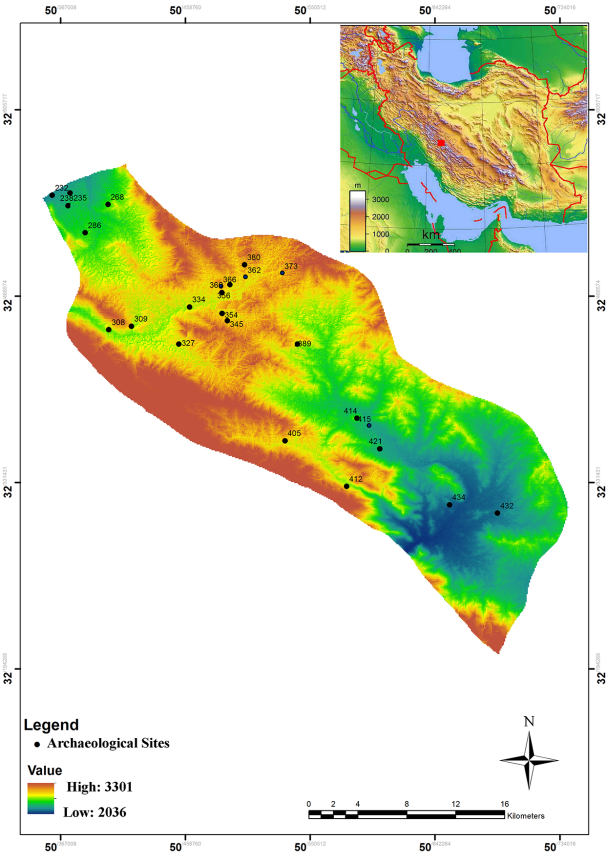


Figure. 2: *Neolithic and Chalcolithic sites of Laran County*

The Correlation Between Neolithic and Chalcolithic Sites and Environmental Factors

To achieve the goals of the study, we have no choice but to determine a specific criterion for measuring the influence of environmental factors on the formation of settlements. For this purpose, the specific measurable data concerning the sites and the environmental resources were collected, and the influence of the factors mentioned earlier was determined using SPSS, statistical analysis, and correlation coefficient (Figure 3). Environmental factors were considered as independent variables and the area of the sites was considered as the dependent variable. In the correlation coefficient, the correlation among the variables was taken to be between +1 and -1. The closer a variable is to 1, the greater its correlation will be and the closer it is to zero, the less its correlation. Using the Pearson correlation coefficient, the relationship between each environmental factor and the sites was examined, and then the environmental factors that influenced the formation and preservation of the sites were described and analyzed.

The Correlation Between the Areas of Laran Sites and Distance From Permanent Water Resources

Water is one of the most important factors for the formation of settlements in Iran (Kiyani Haftlang 2003: 89). The northern part of Laran is located in the Zayandeh Roud basin while the southern part is located in the Karun basin. A network of streams, rivers, and springs has provided enough water for the district. The distance between the archaeological site and permanent water resources ranges from 50 to 1757 meters. Pearson correlation coefficient is +0.267 (Figure 3) which is close to zero and shows the low correlation between the archaeological sites and distance from permanent water resources as

Correlations

		Scale	Distance from Rod (meter)	Distance from River (meter)	elevate	slope	slope Direction	landuse
Scale	Pearson Correlation	1	-.024	.267	-.510**	.022	-.124	.225
	Sig. (2-tailed)		.905	.179	.007	.914	.539	.259
	N	27	27	27	27	27	27	27
Distance from Rod (meter)	Pearson Correlation	-.024	1	.285	.398*	.535**	-.326	-.151
	Sig. (2-tailed)	.905		.150	.040	.004	.097	.451
	N	27	27	27	27	27	27	27
Distance from River (meter)	Pearson Correlation	.267	.285	1	-.060	.142	-.226	-.031
	Sig. (2-tailed)	.179	.150		.765	.478	.257	.880
	N	27	27	27	27	27	27	27
elevate	Pearson Correlation	-.510**	.398*	-.060	1	.271	.026	-.414*
	Sig. (2-tailed)	.007	.040	.765		.171	.896	.032
	N	27	27	27	27	27	27	27
slope	Pearson Correlation	.022	.535**	.142	.271	1	-.180	-.180
	Sig. (2-tailed)	.914	.004	.478	.171		.368	.369
	N	27	27	27	27	27	27	27
slope Direction	Pearson Correlation	-.124	-.326	-.226	.026	-.180	1	.170
	Sig. (2-tailed)	.539	.097	.257	.896	.368		.395
	N	27	27	27	27	27	27	27
landuse	Pearson Correlation	.225	-.151	-.031	-.414*	-.180	.170	1
	Sig. (2-tailed)	.259	.451	.880	.032	.369	.395	
	N	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure. 3: *Correlation of Environmental factors with Neolithic and Chalcolithic sites of Laran County*

a contributing factor. Nonetheless, it is a positive figure and indicates a very low correlation between area and distance from water resources. That is to say, as we move farther from the water resources, we must expect to have sites with smaller areas. This correlation, however, is merely true by 17%. As we know, the longitudinal profile of a river with a regular slope is toward the head of the river and concave, it becomes wider as we move toward the bottom of the river. The bed of the river is at a greater depth near the source of the river. the depth decreases as the river flows down and it becomes parallel with the land surrounding it which can be caused by the higher speed from the flow at high altitudes. Therefore, taking water from the upper parts of the river is more difficult and the inhabitants of such regions resort to other sources of water (Sarikhani *et al* 2016: 113). Other sources include springs and seasonal streams or watercourses that can be found in all the valleys throughout the region. Observations showed that next to almost every archaeological site, a permanent or seasonal spring or stream can be found. It is safe to say that in this region, lots of seasonal or permanent springs can be found at the foot of mountains, hills, and knolls which serve as the centers around therefore some of the new regional villages such as Katak, Aghbolagh, and Fath Abad have been formed. There is no permanent source of water around many of these villages. It seems that, due to the humid weather and consequently frequent rains and abundant groundwater reservoirs, people have been under no obligation to live close to rivers. Hence, at certain distances from permanent water reservoirs, there are sites with various areas (Bahrami Nia *et al* 2013).

The Correlation Between the Area of Laran Sites and Above Sea Level (Elevation)

As one of the important factors influential upon the climate and the ecosystem, the sea level creates high or low thermal pressure points in warm or cold regions and influences other characteristics of the ecosystems such as rainfall and animal-plant ecosystem (Mokarram and Sathyamoorthy 2015: 2; Saeedi Goraghani *et al* 2014: 247).

Analysis of Pearson correlation coefficient of the area of sites concerning the mean sea level equals -0.510 (Figure 3) which shows a direct, inverse, and significant correlation at a level lower than 0.05. In

other words, as the mean is the more increases the sea level, the area of the sites is decreases. Mean sea level (elevation) determines the topography of the region and is a contributing factor in creating different climatic regimes and lifestyles. This factor, along with the slope degree on which the site is formed, can define the economic nature of nomadic or sedentary communities. Altitude is a restrictive factor for the spatial aspect of the settlements so that, the number of settlements decreases in altitudes above 2000 meters, except for nomadic sites (Seidaei and Norouzi 2010: 65); villages and sedentary sites are mostly formed in lands with slight slopes. Despite the proximity to water supplies, mountain slopes are not appropriate spots for occupation. considering their natural and environmental conditions, they are not suitable for sedentariness. Today, villages are rarely formed in such regions (Farokh Nia 2016: 160). Mountainous elevated regions are divided into three groups according to their altitude: the first group includes altitudes with more than 2000 meters which have intensive slopes, severe erosion, and deep ravines which have poor and rich pastures; the second group includes altitudes from 1800 to 2000 meters that are located in highlands between deep gorges and even lands; finally, the third group which contains altitudes of less than 1800 meters in which population and agricultural activities are concentrated (Tajbakhsh and Balmaki 2014). According to this division, sites in Laran District are situated at 2153 to 2574 meters above sea level. Settlements in such altitudes can only be intermittent and seasonal.

The Correlation Between the Area of Sites and Distance From Main Access Routes

Roads and natural passageways are of utmost importance in settlement pattern research. Roads make economic, social, and cultural communication possible and facilitate interaction among various societies. On the one hand, it shows the environmental determinant that develops obstacles, then again, it reflects the efforts of human beings for overcoming that determinant (Khosrow Zadeh and Habibi 2015). The extent of Laran sites is between 750 to 9100 m2. The sites are situated from 10 to 2348 meters away from access routes. Pearson correlation coefficient is -0.024 (Figure 3) which is close to zero, inverse, and weak, which shows the lack of correlation between the two factors. In other words, the sites are situated at various distances from main access routes.

Every year, Bakhtiari nomads enter the district from Khuzestan Province, Kuhrang, and Farsan and use passageways that have long been used by people (Khazeni 2010: 77). They use routes that have been created through the years for travel and head toward their abodes. Due to difficulties posed by the environment and the limited ways that facilitate passage through deep valleys and their surrounding mountains, many of the old passageways are being used at present. Consequently, it can be said that for past people, communicating paths weren't of great importance and secondary paths such as routes played more noticeable roles. Observations showed that there are dirt roads at the bottom of most valleys that are still in use as roundabout ways that connect regions and these are used more than the main passageways. Today, the nomads enter their summer quarters and reach their abodes using such secondary paths at the bottom of the valleys. The nomad's abode is not close to communicating paths and many of them live in outlying valleys far from main access routes. Most of the local people use such roundabout paths for moving to and from their villages.

The Correlation Between the Site Areas and the Sites Location's Slope

The slope is another factor that plays an important role in the distribution of human settlements. Analysis of topography and its role in the distribution of rural settlements is useless without taking into account the slope. Today, the slope maps are so important that specialists have no choice but to use them in their projects. Considering the important role played by slope in agriculture and construction, using it as a factor besides other characteristics can help the examination of the area under study. Also, the slope is one of the most important factors in determining the shape of the earth (Sarikhani *et al* 2016: 108). Establishing settlements on slight slopes facing sunlight plays an important role in forming the settlements, sustaining the population, and using the land. Not taking into account these factors alongside altitude, on the other hand, makes it impossible to understand the distribution of settlements through different ages (Bahrami Nia *et al* 2013: 26). The slope degree of the place where archaeological sites are formed is an important factor that influences the site due to its economic nature. Pearson correlation coefficient

between the areas of Laran sites and the slope degree of the position of the site is +0.022 (Figure 3). This figure is close to zero and indicates the lack of correlation between the area of sites and the slope degree, and is open to interpretation at a 9% level. A possible reason is that most of the sites are seasonal and the slope degree of the ground on which they are located is not important. This phenomenon occurs today as well; regional nomads and ranchers set up tents and settle at any spot they see fit. Thence most of their settlements are at the foot of hills and mountains, bottom of valleys, and among hills and slopes (Roustaei 2015: 35). It could be a consequence of them occupying each region for only a short time; as a result, they must choose spots that are protected from wild animals and strong winds (Hole 2004: 112). Also, slopes that are lower than 15% are the most suited for agriculture. On condition that environmental and other conditions are fit, agricultural products improve in terms of both quality and quantity. Such regions are also suitable for making gardens (Motarjem and Balmaki 2009). In general, grounds with steep slopes are not suitable for agriculture. Steep slopes serve well as pastures, meadows, jungles, and mountainous grasslands (Farhoodi 1991: 83). Therefore, choosing lands with steep slopes is an indication of temporary settlement.

The Correlation Between the Extent of Laran Sites and Slope Aspect

Geography and climatology divide the aspects of the slope into eight groups: north, northeast, east, southeast, south, southwest, west, and northwest. The aspects are ranked from 1 to 8 respectively based on the extent to which they catch the sunlight. The Pearson correlation coefficient between the area of the Laran district and the aspect of the sites is -0.124 (Figure 3). It is close to zero and shows a lack of correlation between the area of the sites and the slope aspect.

The slope aspect determines the amount of sunlight that the earth receives which can determine, in its turn, the temperature, quality of the soil, and the amount of water that the soil receives (Sarshogh *et al* 2013: 78). This is one of the reasons for the variety in vegetation on different slopes. The temperature varies noticeably in three slopes, which include those on which the sun shines directly, those which receive a little sunlight, and those which receive no sunlight. Therefore, slopes that face the sun are suited in cold climates while slopes that are in the shadow are better for settlement in hot climates. In this region, the downward slopes are the most important while the upward slopes are the least important. Westward and eastward slopes are less important than the southward slopes and are mainly used in spring and autumn. Because the region has a cold climate, the sites are expected to be found on slopes with direct sunlight more abundantly, similar to most of today's villages in the Laran district (that is to say, the southward slopes). The findings, however, refute this hypothesis and show that Laran sites are located on varying slopes. It means that the sites have either been deserted for a very long time or were only used in certain seasons. In summer, nomads living in the county usually choose northward slopes for settlement. This is because they will be protected from direct sunlight. Close to moving to their summer quarters or at the time of migration when the weather starts to become colder, they choose southern and eastern slopes t to enjoy the most sunlight possible (Bahrami Nia *et al* 2013: 27). Therefore, it seems that using slopes in various aspects manifests that the settlement is temporary and is occupied during the warmer seasons. Thus, the aspect of the slope is not important.

The Correlation Between the Extent of Laran Sites and the Vegetation

The vegetation in any region is one of the studied factors in the typology of different regions and plays an important role in the diet, lifestyle, and business of the people. (Khosrowzadeh and Habibi 2015). The density and fertility of vegetation are directly related to the rainfall, sea level, type of soil, and slope degree. The type of the land and the vegetation in any region are divided into different groups according to the soil potential, slope degree, and the use that they are put to. As discussed in part two, the region is high and mountainous with calcareous soil. In regions with a high altitude, the depth of the soil is low therefore it's not suitable for agriculture. The vegetation in this region is divided into 13 types that are coded from 1 to 13 as follows: fields with perfect soil for irrigated lands; low potential for seasonal pastures; common arid lands with low potential for turning into pastures; common lands used for dry farming; rich pasture lands; low to medium potential for pastures; high potential for irrigated farming; high potential for turning into pastures and low potential for dry farming; in case

enough water supplies are available, the medium potential for irrigated farming; low potential for seasonal grazing and building stones and potential for building and construction. Generally, the regional vegetation is suitable for pastoral use and has been divided into different categories, from low to high potential. The Pearson correlation coefficient shows that the correlation between Laran sites and the vegetation is +0.259 (Figure 3) which indicated a low correlation between these two. Nonetheless, the correlation between them is direct, which means that fields with denser vegetation have wider sites. This low correlation is open to interpretation by 25%. This is apparent as all the sites in the Laran district are below one hectare and are situated in regions where the vegetation is pastoral. The only region with dense vegetation is the bank of Zayandeh Roud which has the largest site (one hectare) in the region. Lands in this region can be irrigated. Therefore, regions with a high altitude and pastoral vegetation cannot contain large sites.

Ethnoarchaeology: A Model for Interpretation

In modern archaeology, archaeologists observe traditional societies around them to interpret cultural processes through recreating ancient behaviors. For about three decades, there has been a consensus that in terms of epistemology, allegory plays an important role in archaeological interpretations (see Binford 1978; Hodder 1982; Kramer 1979; Trigger 1989). Such studies, which are called Ethnoarchaeology, started in the 1960s and have been most frequently used in processual archaeology (see Binford 1962; Watson *et al* 1971; David and Kramer 2001: 6). The main purpose of this theory is to recreate ancient behaviors and understand the past through observing today's traditional societies. Ethnoarchaeology plays an intermediary role between ethnography and archaeological materials (Horn 1994; Ogundele 2005). In general, Ethnoarchaeology makes use of ethnographic tools and archaeological perspective to make up for the shortcomings in each of them through resorting to the capabilities of the other (Papoli Yazdi and Garagian 2005). Ethnoarchaeology aims to provide ethnographic data (that are directly related to the interpretation of archaeological material) and explain them to create models for archaeology (Lynne Costin 2000).

Assessment of the Nomadic Pastoralism Camps

To assess the settlement system, we recorded 61 camps in the region (Figure 4 to 6). Similar to the analysis of the correlation of Neolithic and chalcolithic sites with environmental factors, the correlation between these modern campsites and environmental factors was studied. To measure the influence of environmental factors on the formation of nomadic settlements, specific measurable data were collected about sites and natural resources and correlation coefficient analysis was used.



Figure. 4: *A nomadic pastoralist camp in Laran County*



Figure. 5: *Another abandoned nomadic pastoralist camp in Laran County*



Figure. 6: *A nomadic pastoralist camp in Laran County*

Environmental factors served as independent variables while the area of nomadic camps was considered dependent variables. The findings revealed that nomadic campsites are not dependent upon environmental factors (see Figure 7).

Nomads of the Laran County are people of the Haft Lang clan of the Bakhtiari tribe and include Harouni, Aghakhani, Rezaei, Behdarvand, Kahid, and other Bakhtiari clans. Also, some Qashqai tribespeople (who originally live in Fars province)

Correlations

		Scale	Distance from Rod (meter)	Distance from River (meter)	elevate	slope	slope Direction	landuse
Scale	Pearson Correlation	1	-.024	.267	-.510**	.022	-.124	.225
	Sig. (2-tailed)		.905	.179	.007	.914	.539	.259
	N	27	27	27	27	27	27	27
Distance from Rod (meter)	Pearson Correlation	-.024	1	.285	.398*	.535**	-.326	-.151
	Sig. (2-tailed)	.905		.150	.040	.004	.097	.451
	N	27	27	27	27	27	27	27
Distance from River (meter)	Pearson Correlation	.267	.285	1	-.060	.142	-.226	-.031
	Sig. (2-tailed)	.179	.150		.765	.478	.257	.880
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	N	27	27	27	27	27	27	27
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	N	27	27	27	27	27	27	27
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	Sig. (2-tailed)	.539	.097	.257	.896	.368		.395
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landuse	Pearson Correlation	.225	-.151	-.031	-.414*	-.180	.170	1
	Sig. (2-tailed)	.259	.451	.880	.032	.369	.395	
	N	27	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Figure. 7: *Correlation between today's camps and environmental factors*

The district is located in a mountainous region in the southwest of the Zagros Mountains. Similar to other parts of the Zagros Mountains, it extends from the northwest to the southeast and consists of parallel valleys. In terms of geomorphology, the region consists of high mountains and deep, alluvial valleys. High rocky mountains, deep valleys, and extremely small plains between mountains make up the general topography of the region. This shows that the Zagros has new formations with a substrate consisting mostly of calcareous stones. Since the bedrock of this region is calcareous, the soil produced through the erosion of such stones is shallow calcareous soil that is not applicable for agriculture. This imposes some sort of limitation upon the population living in the region. Apart from a relatively high topography, this region has a cold and dry climate in autumn and winter and a mild climate in summer. Considering the climate and the high rainfall in various seasons, it is evident that the climate of the region is dry and cold.

are found in the region, most of them live in the village of Marghmalek. Laran district, situated between Khuzestan and Isfahan, is part of the summer quarters of the Bakhtiari tribespeople (Minorsky 1945). These nomads migrate twice through the year. In spring, from the middle of April to the end of May, they move from tropical zones (in cities of Khuzestan province) to the Kuhrang, Laran, and the foothills of the northern Zagros. They use the same path to return to their home from the end of September to the middle of November (Garthwaite 1972). Every tribe enters its summer quarters and settles in the best spot which is reserved for the tribe head or Khan. After a few days, every family leaves for its pastures or campsites. These campsites are usually situated close to one another. Each campsite has up to 15 Tents (Bohouns). The tents are far from each other, usually by 1 kilometer or more, depending on the size of each pasture. In long-distance migration, in which pastures are larger, tents are farther from one another (Nik

Kholgh and Nouri 2010: 57).

There are many nomadic pastoralist campsites in the Laran District, 61 of which have been identified and recorded. The position of each campsite, along with its environmental features (such as archaeological sites), has been analyzed using SPSS. The results, which resembled those of Neolithic and chalcolithic sites, are as follows:

The Correlation Between the Area of Nomadic Pastoralism Camps and the Sea Level

The Pearson correlation coefficient of the area of nomadic camps with sea level as a factor is -0.824 (Figure 7) which shows a direct, inverse, and significant correlation. That is to say, the more the mean sea level is, the less the sites of nomadic camps will become (Figure 8). As was discussed, altitude is a limiting factor for the spatial aspect of settlements, so the number of settlements decreases in altitudes of more than 2000 meters, with nomadic pastoralism regions being the only exceptions.

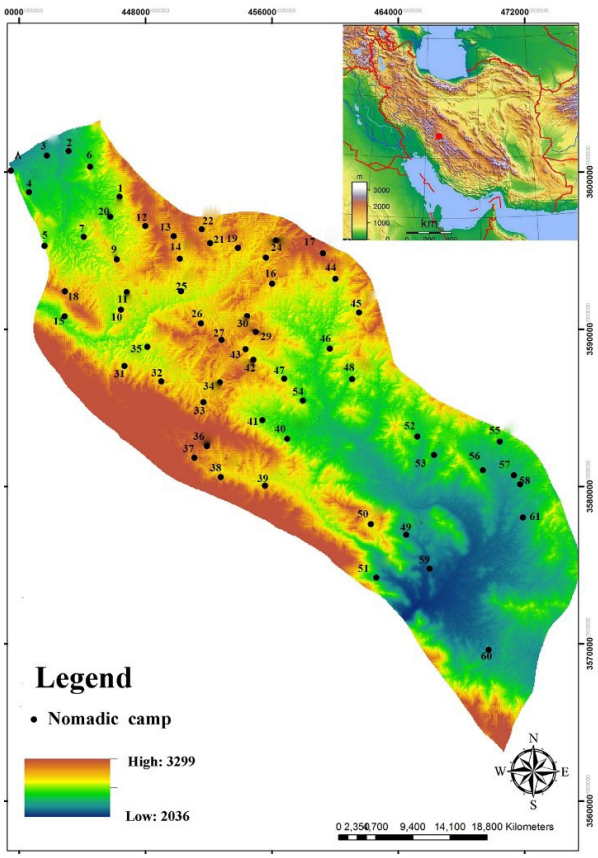


Figure. 8: *The position of Nomadic pastoralism camps with above sea level.*

Foothills of mountains, despite being close to water supplies, are not suitable spots for the formation of settlements. This is because their natural and environmental conditions are not appropriate for sedentariness, just as modern-day villages are rarely formed in such areas (Farokh Nia 2016). For this reason, intermittent camps are found in this region, because they can be inhabited only in a few months during the year.

The Correlation Between the Area of Nomadic Pastoralist Camps and Distance From Access Routes

Nomadic pastoralism camps have areas from 600 to 1400 m2 and are situated from 118 to 3428 meters away from access routes. The Pearson correlation coefficient is -0.213 (Figure 7), which is close to zero, inverse, and weak and is an indication of the correlation absence between the two factors. In other words, sites are located at different distances from the access routes. Every year, Bakhtiari tribespeople enter the region from Khuzestan province, moving through Kuhrang and Farsan, at the beginning of spring, usually in May. These are the paths that have been used by people from ancient times. At present, nomads enter the region through their routes that have been created for years for their transportation and travel towards their abode. Due to difficulties posed by nature and the few available alternatives for transportation (paths through valleys and regional mountains), many of the paths used at present are the same that were used in past. One of the reasons could be that for ancient people, access routes were not of great importance, and secondary paths such as routes played more noticeable roles.

The Correlation Between the Area of Nomadic Pastoralism and Distance From Permanent Water Resources

Because rivers and streams are abundant in the area there are enough water supplies. The distance of nomadic pastoralism camps from permanent water resources ranges from 29 to 3238 meters, the Pearson's correlation coefficient shows 0.089 (Figure. 7) which means a low and negative correlation between nomadic camps and distance from water resources. It means that the more we get away from the water sources, we should expect the area of the camps to be smaller, but this is not

always true. Observations showed that almost any nomadic camp is close to a permanent or seasonal river or seasonal watercourse. We can say that in this region, there are many seasonal and permanent rivers and streams neighboring each other close to foothills and hillsides. Despite the humid weather and abundance of rainfall and underground resources, it seems that it's not necessary to live near permanent rivers and in different distances from permanent water resources, there are sites with different areas (Bahraminia *et al* 2014).

The Correlation Between the Areas of Nomadic Pastoralism Camps and the Slope Degree

The Pearson's correlation coefficient for the area of nomadic camps and slope degree is -0.160 (Figure 7). This figure is close to zero and means there's no correlation between areas and the slope degree of the hills where the sites are located. Perhaps one of the reasons is that most of these camps are seasonal and the residents on them are indifferent about the slope degree.

The Correlation Between the Area of Nomadic Pastoralism and the Slope Aspect

The Pearson's correlation coefficient between the size of nomadic camp areas and the aspect of slopes where the sites lie is +/237 (Figure 7). The figure, which shows a direct but minor correlation between the camp areas and the slope aspect, demonstrates that the aspect is not important to the people because they change their campsite once or twice during summer.

The Correlation Between the Areas of Nomadic Pastoralism Camps and Vegetation

The Pearson's correlation coefficient shows that the correlation between the area of nomadic camps and vegetation is -/165 (Figure 7). This means that the correlation between vegetation and the areas is not very significant and in fact, is weak. This is quite clear because all nomadic camps are at places where most of the vegetation consists of grasslands or agricultural land. There is thick vegetation only in the outskirts of Zayandeh Roud and just those lands are irrigable. So, one should not expect major nomadic camps in heights with grasslands.

The low correlation between the archaeological sites of Laran with several environmental factors indicates that sites of Laran have not been hugely dependent on environmental factors; we can see this in the results of the Pearson's correlation coefficient. Figure 9 shows the correlation of the Neolithic and Chalcolithic sites of Laran with environmental factors that have had the most impact on making them. Sea level has a direct and inverse correlation with the size of the site in these factors. But it seems we should put this factor alongside the rest of the factors such as seasonal resources and vegetation which are not as important as height so that we can reach a logical interpretation. It looks like vegetation, water resources, and sea level have a direct and mutual correlation with each other (Abdi and Arefi 2005: 404). Seasonal rainfall is much more common in heights than in plains and as a result, water resources flow in the form of rivers and small streams create dense vegetation. It also relies upon the type of the soil, its depth, and the climate as well. These three factors have turned this region into an important spot for human communities. The nature

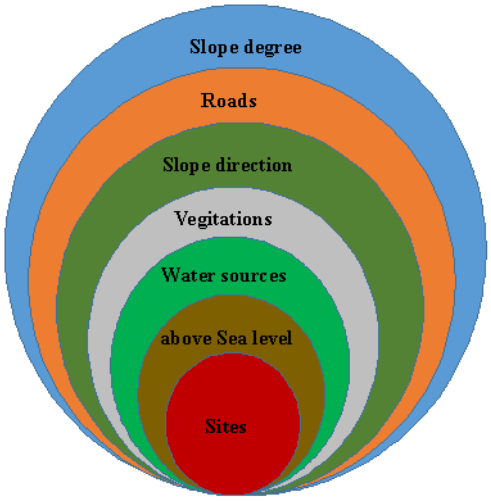


Figure. 9: *The effect of environmental factors on the importance of creating sites using Pearson correlation analysis*

of Laran communities and their limited dependence upon environmental factors must be studied at length, but mean sea level, seasonal water resources, and grassland vegetation are the most important factors. The same issues were studied concerning nomadic camps and yielded similar results. The low dependency of Neolithic and Chalcolithic sites on permanent water resources and other factors such as slope degree and access routes indicate that these sites are seasonal. Therefore, access to permanent water resources has been of less importance to them and the seasonal water resources were more

important instead. On the other hand, dependency on the sea level, seasonal resources, and vegetation of Laran is relatively good. Nevertheless, we should study the nature of such communities and conclude why altitude, vegetation, and seasonal resources are more important to them. The geography of the Zagros Mountains and lack of agricultural lands, rich grasslands, and thick forests has turned that region into a good place for nomadic residence. Therefore, constant migration and moving and animal husbandry as the prominent economic endeavor are the foundations of a nomadic lifestyle. Livestock and grasslands are the main pillars of its existence (Moshiri 2008: 32). Alizadeh states that these communities probably have a livelihood based on small dry agriculture, hunting, and animal husbandry (Alizadeh 2010; 2013: 47) or generally they are mobile rancher-farmers (Alizadeh 2008: 23). In fact, due to the nomadic pastoralism life, economic growth and diversity are limited, nomads try to make use of all the natural resources around them (Alizadeh 2008: 25; Cribb 1991: 374). This is notable considering the placement of regions in comparison with the sea level and different slope degrees along with proximity to seasonal water resources. As mentioned earlier, 5 to 10 degrees of the slopes are the best for establishing human settlements (Anabestani 2011: 182) and placement of regions on different slope aspects and degrees indicates that the settlements are short-term and seasonal and usually are occupied by nomads and ranchers (see Hole 2009). In archaeology, these sites are called slope sites (Zagarell 1989; Potts 2014:17). Altitudes higher than 2000 meters, unfit places like steep slopes and rocky lands (Potts 2014: 25), high mountains, and hillsides all indicate seasonal and temporary settlements (Heydari Dastenaei 2013: 43). High altitudes are not very suitable for permanent settlement. It is noteworthy that the valleys and plains in the mountains of Zagros, especially those in the region, become very cold in winter, so it is unlikely that the few archaeological sites have been inhabited all year long (Zargell 1982: 60-61); so considering the geographical and environmental conditions in high regions, the nomads of these regions had to have a specific migratory pattern in summer and autumn, especially in case of vertical migration. It is logical to assume that such characteristics have remained more or less the same from the beginning of nomadic life.

In reconstructing the environmental conditions of this region, from ancient times until today, it seems that the climate is the same because the experiments carried out on the vegetation of Qale Rostam (see Zagarell 1982: 55) and other regions of Zagros, all indicate that severe climate changes have not been existent since the 5th millennium BCE accordingly, it can be assumed that this region has had pasture vegetation for animal husbandry since ancient times. Due to the access problems, unfavorable conditions for plant growth, shortage of rich soil and land, and severe slopes, mountain heights have been considered less desirable for permanent settlement. These mountainous regions can only serve as sources of food for livestock and are mostly used by nomadic pastoralists and ranchers (Rahnemaei 2014: 125). Hence the landscape and the mountain environment of Laran along with its cold climate has imposed a lot of limitations on people's lives and has caused them, from ancient times, to adapt their lifestyles to the cold and rough winters and mild summers and engage in limited farming and animal husbandry. In addition to this community, there is another group of people who have used migration to adapt their lifestyles to the environment and cope with the nature and rough climate of the region (Khazei 2010: 79). Therefore, we can imagine these people adapting their lifestyles to the climate of the region.

Conclusion

One of the purposes of the settlement pattern studies is the analyzing information such as the location of each site in the environment, including the distance of sites from permanent water resources, the distance of sites from main access routes, slope aspect, slope degree, and vegetation. In other words, it seeks answers to the questions that this study has been based on. With these questions, the raw data gathered by the researchers were analyzed using SPSS and the Pearson correlation coefficient. The results showed that the archaeological sites of Neolithic and Chalcolithic sites in the Laran have little dependence on environmental factors like slope degree, aspect of the slope, and distance from access routes. Factors such as mean sea level, distance from seasonal water resources, and vegetation have had a more impactful role in comparison with other factors. This correlation showed that the topography, seasonal water resources, and vegetation that have

a direct correlation with each other, attract human populations and have caused continuity of life in this region. Also, the formation of the settlements in this region has been influenced by the topography and the region's climate. As mentioned before, above sea level, pastoral vegetation, different kinds of calcareous soil, lack of rich soil suitable for farming, and the cold climate of the region have turned it into an unfavorable spot for settlement. Considering the climate, ecology, and the low correlation of environmental factors, it is evident that this area has had only inhabitants during some parts of the year and these settlements have been temporary and seasonal. Hence the communities that have a low dependency on environmental factors should be considered primitive communities with a nomadic/ rancher nature. Another aspect is that nomads don't depend on specific places or environmental factors like farmers; because they can change the way they earn a livelihood if any environmental, financial, and social changes or crises come up and they can keep the possibility of changing their lifestyles open (Alizadeh 2008: 30). Because the basis of the financial system in a nomadic lifestyle consists of humans on the one hand and livestock and pastures on the other, it can be argued from a general point of view that the distribution of nomad settlements in the region is caused by different factors, three of which are most important. The first and most important factor is the livestock and the herding; the second factor is the geography and topography and the third is the human factor. Concerning this issue, Zagarell says "Migration is a kind of adaptation with several elements that are caused by the balance of financial, environmental, political and military factors; any change in any of these factors can upset the balance of the pattern of choosing places for settlement" (Zagarell 1975: 135). Therefore, in a nomadic lifestyle, livestock enjoys a very high status, which is why Frank Hole believes that nomads are comfortable and can settle their camps in places where their livestock have enough grass to eat and are secure (Hole 1979: 293-294).

It can be concluded that nomads settle in places where: 1) the slope degree is appropriate (Beck 2003: 293-294). Usually, in these areas, underground resources surface, and streams are formed. 2) In these areas the soil is shallow which is why sedentary people don't claim these lands 3) The region nomads live in are usually confined spaces and are hard to reach. 4) Due to the altitude and rainfall, such regions have very rich pastures that cannot be used by sedentary people (Abdi *et al* 2002). Considering what we said it can be imagined that sites in Laran are all seasonal and the pattern for settlements is similar to the pattern of seasonal and temporary settlements of nomads today. This is because several archaeological sites have been discovered to the spots where nomadic camps exist.

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References

Abdi, K.; G. Nokandeh; A. Azadi; F. Biglari; S. Heydari; D.Farmani; A. Rezaii & M. Mashkour. 2002. Tuwah Khoshkeh: A Middle Chalcolithic pastoralist camp-site in the Islamabad Plain, West Central Zagros Mountains. *Iran* 40: 43-74.

Abdi, N. & Hassan Arefi. 2005. Using Multivariate Canonical Correspondence Analysis Method (CCA) for managing seed collection from natural resources areas. *Iranian Journal of Rangelands and Forests Plant Breeding and Genetic Research* 12: 393-417.

Alizadeh, A. 1988. Socio-Economic Complexity in Southwestern Iran during the Fifth and Fourth Millennia BCE: The Evidence from Tall-e Bakun A, *Journal of the British Institute of Persian Studies,* Vol. 26: 17-34.

Alizadeh, A. 2003. *Excavation at Preshstoric Mound of Chogha Banut, Khuzestan, Iran.* The Oriental Institute of the University of Chicago and the Iranian cultural Heritage and Tourism organization.

Alizadeh, A. 2008. *The formation of the tribal and rule of Elam. Shahrekord: Cultural Heritage*, Handicrafts and Tourism Organization of Chaharmahal va Bakhtiari Province.

Alizadeh, A. 2010. The Rise of the Highland Elamite State in Southwestern Iran. *Current Anthropology* 51 (3) 353-383.

Alizadeh, A. 2013. Adoptive and complementary livelihoods: Agricultural and nomadic Pastoralism in southwestern Iran. *Iran Archaeological Journal* 3: 41-73.

Anabestani, A A. 2011. the Role of Natural Factors in Stability of Rural Settlements (Case Study: Sabzevar Country). Geography and Environmental Planning 40 (4): 89-104.

Bahraminia. M.; A. Khosrowzadeh & M. E. Esmaeili Jelodar. 2014. Analysis of the Role of Environmental Factors in the Spatial Distribution of the Neolithic and Chalcolithic Sites of Ardal County, Chaharmahal VA Bakhtiari Province. *Journal of Archaeological Studies* 5: 21-37.

Beck, L. 2003. Qashqai Nomad Pastoralists and their use of land, in Naomi miller and Kamyar Abdi (Eds) *Yeki Bud Yeki Nabud, essay on the Archaeology of Iran in Honor of William Sumner.* Los Angeles: University of California, 83-97.

Binford, L. 1962. Archaeology as Anthropology. *American Antiquity* 28: 17– 25.

Binford, L. 1978. *Nunamiut Ethnoarchaeology,* New York: Academic Press.

Clarke, D. 1977. *Spatial analysis in archaeology*, (new studies in archaeology). Cambridge: Cambridge University Press.

Cribb, R. 1991. Mobile Villager: the Structure and Organization of Nomadic Pastoral Campsites in the Near East, in Gamble and Boismier (Eds). *Ethno archaeological Approach to Mobile Campsites Michigan*. Ann Arbor, 371-394.

David, N. & C. Kramer. 2001. *Ethno-archaeology in Action.* Cambridge: published by the Cambridge University Press.

Farhoodi, R. 1991. Atlas of Iran Slope and Its Outcomes, *Journal of Geographical Research* 27: 93-75.

Farokhnia, S. 2016. Spatial Analysis and Predictive Modelling Applied to the Archaeological Sites of Bastam Plain, Northeast of Iran. *Journal of Archaeological Studies* 8: 151-170.

Garthwaite, G. 1972. The Bakhtiyari Khans, the Government of Iran, and the British, 1846-1915. *International Journal of Middle East Studies* 3(1): 24-44.

Heydari Dastenaei, M. 2013. An overview of the Chalcolithic period in the northwest of Iran and suggestions for the expansion of the Dalma tradition, *Payame Bastan Shenas* 19:37-50.

Heydari Dastenaei, M. 2017. the effect of environmental factors on the Prehistoric sites in the southern Zayandeh- Rud by using the Pearson correlation. *Journal of Iran Pre-Islamic Archaeological Essays* 2 (1): 1 -14.

Heydari Dastenaei, M; M. Mortazavi; R. Shirazi; & M. Khosravi. 2017. Interaction between Humans and Environment: Spatial Environmental Analysis of Neolithic to Bronze Age sites of Laran County, Chahar Mahal and Bakhtiari Province. *Journal of Archaeological Studies*, 9(1): 75 -92.

Hodder, I. 1982. *Symbols in Action: Ethnoarchaeological Studies of Material Culture*. Cambridge: Cambridge University Press.

Hole, F. 1979. Rediscovering the past in the present: Ethnoarchaeology. in Carol Krame(ed). Luristan Iran. *In Ethnoarchaeology.* New York: Columbia University Press, 192-218.

Hole, F. 2004. Campsites of the seasonally mobile in western Iran, In. K. von Folsach, H. Thrane & I. Thuesen (Eds.). *from hand axe to Khan: essays presented to Peder Mortensen on the occasion of his 70th birthday.* Aarhus: Aarhus University Press, 105-123.

Hole, F.2009. Pastoral Mobility as an Adaptation. In Jeffrey Szuchman(Ed). *Nomad, Tribe, and the State. The Ancient near East,* University of Chicago, 261-284.

Horne, L. 1994. *Village Spaces: Settlement and Society in Northern Iran*, Washington D.C: Smithsonian Institution Press.

Jafari, A. 1989. *Gita Shenasi: Iran Mountain.* Tehran: Institute of Geography and Cartography.

Khazeni, A. 2010. *Tribes and empire on the margins of nineteenth-century Iran.* Washington: University Of Washington Press.

Kiyāni Haftlang. K. 2003. *A survey on the geography of Iran,* Tehran: Center for International-Cultural Studies.

Khosrowzadeh, A. & H. Habibi. 2015. Stying the Sassanid Settlement Pattern of Farsan in Termontane Plain Chahar Mahal and Bakhtiyari Province. *Pazhoheshhaye Bastan Shenasi Iran* 5: 99-118.

Kasari, Y. 1958. *Third Report of the survey of Isfahan and Chaharmahal va Bakhtiari.* Archeology and

Cultural Organization. Code 258 (not published).

Kottak, C. 2009. Cultural Anthropology: Appreciating Cultural Diversity. 14th Edition. New York: McGraw- Hill.

Kramer, C. 1979. An Archaeology view of a Contemporary Kurdish Village: Domestic Architecture, Household Size and Wealth. In Carol Kramer (Ed.).*Ethnoarchaeology -Implications of Ethnography for Archaeology.* New York: Columbia University, 139-163.

Lynne Costin, C. 2000. The Use of Ethnoarchaeology for the Archaeological Study of Ceramic Production. *Journal of Archaeological Method and Theory* 7(4): 377-402.

Minorsky, V. F. 1945. The Tribes of Western Iran, *the Journal of the Royal Anthropological Institute of Great Britain and Ireland* 75(1/2): 73-80.

Mokarram, M. & D. Sathyamoorthy. 2015. Modeling the relationship between elevation, aspect and spatial distribution of vegetation in the Darab Mountain, Iran using remote sensing data. *Modeling Earth Systems and Environment* (1)1:30.

Moshiri, S. R. 2008. *The geography of nomads*. Tehran: Samt.

Motarjem. A.& B. Balmaki. 2009. Survey of Parthian Sites in Northern Hillsides of Alvand's Mountains (Hamedan). *Journal of Archaeological Studies* 1: 135-153.

Nakhaei, M; F. Mosaee; A. Ramezani & A. Vahab. 2011. Quality assessment of Karun River and its branches in Chaharmahal va Bakhtiari province. *Iran Geological Quarterly* 5 (20): 59-79.

Nik Kholgh, A. A. & A. Nouri, A. 2010. *Theme of the Nomadic Sociology of Iran.* Tehran: Chapakhsh.

Nissen, H. & A. Zagarell. 1975. Expedition to the Zagros Mountains. *Proceeding of the IVth Annual Symposium of Archaeological Research in Iran*. Tehran. 159-89.

Norūzi, A. A. 2009. Archeological Studies on Northern Karūn Basin (Chahārmahāl-o-Bakhtiyārī Province). *Journal of Archaeological Studies* 1: 161-175.

Nowroozi, A. A. 2010. *Preliminary report on the survey of the Laran County*, Chaharmahal va Bakhtiari province. Archives of the Cultural Heritage, Handicrafts and Tourism Organization of Chaharmahal and Bakhtiari Province (not published).

Norouzi, A. A, & M. Heydari Dastenaei. 2018. Preliminary Results of the Archaeological survey on the southern Zayandeh Rood Basin, Laran County, *Chahar Mahal and Bakhtiari Province Journal of Archaeological Studies,* Volume:10(1): 207 -226.

Ogundele, S. O. 2005. Ethnoarchaeology of Domestic Space and Spatial Behaviour among the Tiv and Ungwai of Central Nigeria, *African Archaeological Review* 22(1): 25-54.

Pálsson, G. 2004. Human—environmental relations Orientalism, paternalism and communalism. In Philippe Descola and Gísli Pálsson (Eds). *Nature and Society.* London: Taylor & Francis e-Library, 63-81.

Papoli Yazdi, L. & O. Garajian. 2005. The role of Ethnoarchaeology in theoretical progress of archaeology. *Baastan Shenasi* 1:20-27.

Potts, D. 2014. *Nomadism in Iran: From Antiquity to the Modern Era.* Oxford: Oxford University.

Rahnemaei, M, T. 2014. *Iran, its Natural and Environmental Power.* Tehran: Mahmkah.

Roustaei, K. 2015. A Morphological Typology of the Ancient Sites in Kouhrang Area. *Pazhoheshhaye Bastan Shenasi Ira*n 5:27-46.

Saeedi Goraghani, H.; S.M. Solaimani; N. Azizi; A. Azareh & S. Heshmati. 2014. Investigation of Changes in Rangeland Vegetation Regarding Different Slopes, Elevation and Geographical Aspects (Case Study: Yazi Rangeland, Noor County, Iran). *Journal of Rangeland* 4: 246-255.

Sarikhani, Majid; M. Heidarian & S. Parseh. 2016. Analying the Sassanian Settlement Pattern of Sonqor-o Kolyaie Plain, *Pazhohesh Haye Bastan Shenasi Iran* 6:101-120.

Sarshogh, M.; M.H. Salehi & H.A. Beigi. 2013. The effect of slope aspect and position on soils particle size distribution in Chelgerd region, Chaharmahal-va-Bakhtiari province. *Journal of Water and Soil Conservation* 19(3): 77-96.

Seidaei, S. & A. Norozei. 2010. Analysis on Spatial Distribution Patterns of Rural Settlements in Charmahal & Bakhtiyari Province. *Geography*

and Development Iranian Journal 8(18):135-158.

Shakouei, H. 2011. *New Thoughts in the Philosophy of Geography: Environmental Philosophy and Geography Schools*. Tehran: Geographical Institute and Cartography.

Shemirani, M.; M.J. Mahdavi Nezhad & E. Alavi Zadeh. 2010. Ecological Park: Natural-Cultural Ecology. *Armanshahr Journal* 2: 78-89.

Sutton, M. & E. Anderson. 2010. *Introduction to Cultural Ecology,* United Kingdom: Rowman Altamira Press.

Tajbakhsh, R. & B. Balmaki. 2014. Analyzing Settlement Patterns and Catchment Areas of the Chalcolithic Sites around the Alvand Mountain in Relation to the Regional and Inter-Regional Similarities. *Journal of Archaeological Studies* 6: 1-20.

Trigger, B. 1989. *History of Archaeological Thought.* Cambridge: Cambridge University Press.

Watson, P, J.; S. A. Leblanc & C. L. Redman. 1971. *Explanation in Archaeology: An Explicitly Scientific Approach*. New York and London: Columbia University Press.

Zagarell, A. 1975. Nomad and settled in the Bakhtiari Mountains. *Sociologus* 25: 127-138.

Zagarell, A. 1982. *The Prehistory of the Northeast Bahtiari Mountains, Iran: The Rise of Highland Way of Life.* Beihefte Zum Tubinger Atlas des Vordern Orients. Riehe B, No 42. Weisbaden.

Zagarell, A. 1989. Pastoralism and the early state in Greater Mesopotamia. in Lamberg-Karlovsky(ed). *Archaeological thought in America.* Cambridge: Cambridge University Press, 280-301.