

ORIGINAL ARTICLE

Settlement Pattern Analysis of the Neolithic Sites in the Azna Plain, East Central Zagros, Iran

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ABSTRACT

Through several archeological surveys and excavations conducted in the Azna plain about ten prehistoric sites related to the late Neolithic period (from the late 7th and the early 6th millennium B.C.) were discovered. Most of the sites are located at the base of the plain and almost close to the permanent water resources. It seems that the consistency and stability of these rural sites is due to several factors such as internal and cultural elements among which the palaeo-ecological characteristics of the region is underscored. This present study tries to discuss and analyze the transitional process in the Neolithic period of the region with a special reference to the human and environment interactions in the archeological and ecological prospects. Some evidence maintains a rural life process in which economy is based on agriculture and animal husbandry. Also, the analyses of the settlement patterns of the region indicate the importance of the permanent water resources in the formation of settlements in a way that most of these settlements have been closer to the water sources.

Keywords: Azna District, Neolithic Period, Archeology and Environment, Settlement Patterns, Agriculture and Animal Husbandry

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INTRODUCTION

Azna plain located in the eastern part of Central Zagros (fig. 1) and archaeologically it is one of the most important intercultural areas in Iran. This plain which is adjacent to the Central Iranian plateau from one side and the west of the Central Zagros from the other side made always possible the interactions of different cultures during the prehistoric times in Iran. Various excavations and surface survey projects conducted in this area indicated for the Neolithic society's chronological cultural varieties and developments as well as for the subsequent periods of the region. Azna plain during different archaeological periods connected some prehistoric cultures such as Godin, Giyan, Sarab, and Sehgabi of the Central Zagros with the Cheshme Ali and Sialk sequences of the Iranian Central plateau [1]. Although the recent archaeological investigations explored some Neolithic sites of the region but our knowledge about the other archaeological periods of the region is not well established.

One of the most significant issues in the archaeology of the east Central Zagros relates to the intricacies existed in the ancient social and cultural patterns of the area. These include a meticulous regional chronology, environmental changes, population fluctuation, technological specialization, settlement changes, and cultural exchanges.

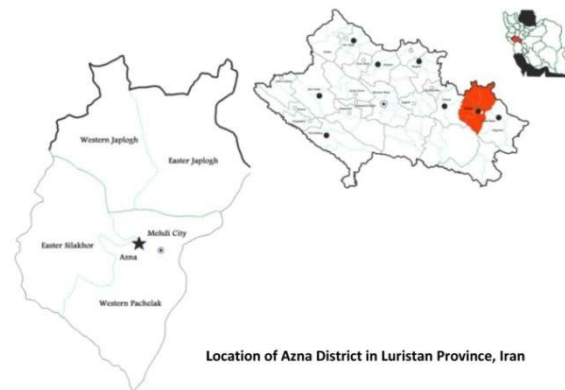


Fig.1- Location of Azna district in *Luristan* province, Iran

Transition from Neolithic to Chalcolithic period in the west central Zagros is characterized by a diagnostic pottery known as *J Ware* and a relative increase in the number of settlements as well as developments in the agricultural irrigation systems [2], whereas *Azna* plain which is located in the eastern part of Zagros has been probably a place for the populations migrated from the Central plateau among which the *Cheshmeh Ali* site remains as an example [3]. It is effective to analyze the settlement patterns of the region in order to understand the way which the natural resources were exploited, how the populations were expanded, how the village societies were stabilized and also the interaction process of these societies were taken place. For solve such problems, an archaeological field investigation including surface survey and excavation project (*Tepe Gala Gap*) was carried out in the study area in 2007-2009 [4 ,1]. Data collected from these fieldworks stored in the GIS maps and necessary manipulations were carried out to analyze the relationships between the Neolithic settlement patterns and the cultural and environmental factors of the region which influenced and formed the Neolithic site distributional patterns.

Village Life and Agriculture

Once there have been balances between the population growth, agricultural production and rural life up to the beginning of the 1960s in the social and traditional life of many villages of the central Iran. These villages surprisingly enjoyed a considerable amount of stabilizing forces in rural population. Hole [5] believes that basic patterns of agriculture and animal husbandry which were the main characteristic of old Iran, up to the twentieth century were established in the early to the late village period (early Chalcolithic to late Chalcolithic). Some basic patterns of these villages such as land exploitation, settlement procedures, agricultural instruments and devices remained more or less invariable up to the land reforming project during 1962-4 [6]. Also, natural resource management in many rural societies and pre-industrial period of the region has always been based on the cultural traditions and as Tome [7] has maintained there has been strong relationships among the physical production, artistic creativity, cultural and technological behaviors and environment.

One of the reasons for population changes in the east of Central Zagros is due to the fluctuations in the climatic conditions. The lower average of precipitation in this area could have increased the rate of drought and consequently a disastrous famine in contrary to the western side which is experienced more rainfall through history. Periodical irregular inconsistencies due to the lower rainfall average resulted in the several droughts and consequently caused enormous population changes and lower population density [8] Recent studies considering the contemporary rural population density show that the number of people in a habitable area is about 100 to 200 persons in ha. According to 1970 census in *Marvdasht* and aerial photographs taken from 98 villages covered an area about 223 ha and contained 25498 persons in overall. Sumner calculated that the density of population in this study area is 114 persons per ha [9]. Although such a modern calculation could not be completely used to estimate the population changes of the area in the ancient times but the relevant studies carried out in the several abandoned villages of the *Azna* plain specifically on the physical characteristics of *Azna* landscape accounted for a comparable amount of population density for the area because the influential factor of population changes seemed to have been stable.

Animal Husbandry and Nomadic Pastoralist

Natural landscape and the climatic conditions are two key elements in conformity of human societies and their environment. Nomads were extended from Arabian Lands (Nefud desert) to the grass steppes of the northern Mesopotamia, Zagros slopes, and the meadow of the Central Asia. Weather condition and the geographical features of the area have restricted the nomadic movements of the immigrants to far or

close regions with some specific types of animals [10]. Study of the nomadic pastoralists in the Iranian highlands is a critical issue in the archaeology of Zagros Iran. The eastern Zagros enjoys the availability of forest less than the western part, but it benefits the large extended grazing land sources making possible a rich pastoralism way of life and developed animal husbandry in this area through history [8].

Unfavorable climate of the area such as the heavy snow in the winters and the dry summers as well as its higher elevations more than 3000 m caused the area less populated than the western Zagros (fig. 2). Analyzing the animal husbandry and its role in the economic and social development of the Neolithic societies has a major place in the Near Eastern archaeology assuming that the mountainous areas of Zagros shared an important role in the beginning of Neolithic especially in the breeding strategy. The animal husbandry seems to be effective as an adaptive strategy if the scattered environmental sources are in short supply [2]. Higher elevated areas protect a system which simply adapts itself to the real changes and lets the population change from one production system to another, a regulation survival policy for people in mountainous areas [11].

While rural animal husbandry is limited, it is assumed it has a crucial responsibility and it accompanies agriculture in an efficient way which is in accordance with cultivating calendar in villages. In the south of the *Azna* plain from a long time ago there have living two *Bakhtiari* tribes in a different way; one is mobile while other preferred sedentary way of life [12]. Development and improvement of nomadic life from the cultural view is justifiable on the grounds of ecology and geography accomplishment between the highlands and plain lands in one side and the persistence on the other side [6]. These two terms indicate the adaptive procedures in exploitation of the environmental resources and social organizations. Making use of grazing land as a renewable source based on a periodical interaction between the highlands and lowlands demonstrates an adaptation between the nomads and their severe environments.

In relation to nomadic persistency, different mechanisms were utilized such as limiting herd to be about fifty sheep or goats for each family or satisfying economical needs with multi-resource nomadism [13]. Generally, two common husbandry methods were used by *Luristan* nomads; a large scale mobile animal husbandry and a limited one which the latter was used by village oriented nomads, both are considered to be the prominent methods in the natural resource exploitation [14].

METHODOLOGY AND SETTLEMENT PATTERNS ANALYSIS

Methodological archeological survey shows its potential in the locational patterns analysis, distribution system of early settlements and providing an overview of the distribution system of archaeological sites in the region. It is also necessary to say that analyzing the historical landscapes without considering the taphonomic processes of the physical environment and archaeological areas is impossible [15]. As Gordon Willey believes main questions in archeological researches are location of the ancient sites and their relationships with the ecology, ethnography tendencies, land exploitation procedure, and settlement patterns realization [16].

One of the other goals in archeological surveys is the knowledge about population changes in the different cultural eras. Population changes and related issues are analyzed with the communication methods, a control in designated area and inconsistencies among the societies based on the obtained data from the archeological analyses. Population density depends on the precise dating and estimation of the depopulated areas. The other considerable issue in the study of population changes which must be taken in account before any estimate is made is to understand and estimate the overall amount of the non-sedentary populations or mobility tribal groups that were seasonally occupying the region. Different scholars estimated population changes based on the population density in the present day villages and cities [17].

The other approach in analyzing settlement patterns is the use of Site Catchment Analysis. In this approach the relationships between archeological sites and their surrounded environs are taken into account with a special reference to recognize the relationship between technology and natural resources located in the economical scope of archeological sites [18]. In this way one of the most important variable is the distance between the sites and resources. Determining site catchment areas is accomplished through providing economical models of the sites based on the identification of specific types of soils as well as a realistic consideration on population power and their technology [16]. Environmental contexts and ecological factors are really important which are able to change ways of land exploitation, sites natural arrangements and their distribution.

Analysis of Settlement patterns in Azna District during Neolithic Period

About 10 sites related to the Neolithic period were discovered by the archaeological investigation in the *Azna* Plain. Most of the archeological mounds are smaller than one ha in extent. Topographically, none of the Neolithic sites has been formed on the margin of the plains or the mountain slopes. Geologically, *Azna*

Neolithic sites in the piedmont areas are located in the considerably higher elevated lands on the deep or semi-deep soil erosions. These patchy plains with an elevation of about 1700 to 2300 m above the sea level were reconstructed from the heavy soils with a mass of lime in the base layers.

The Neolithic sites environs of *Azna* experienced a semi-humid to cold weather with an annual precipitation rainfall of 450 to 854 mm. [19]. 90 % of the Neolithic sites were discovered on the cultivated lands irrigated by the traditional watering systems and the rest are located in the slopes and land with dry farming systems (fig. 3). All sites were located very close to water sources. Considering the abundance of water sources in the southern side of the *Azna* plain, it is remained archaeologically the areas which have been occupied continuously by the inhabitants through different periods of archaeological times. Site density of Neolithic period in the southern *Azna* depends on the different factors mainly one which is related to the ecological advantages. Less than 15% of the prehistoric sites are located about 2 km away from the present villages.

Some of the most important settlements of this period are *Tepe Imamzadeh*, *Barzin Abad*, *Ghala Gap*, *Cheghaveleh*, *Chogha Ghoni*.

Most of the sites of this period are located in the base of the plain with less than 5% slope gradient and because of their proper conditions they were re-occupied by the populations of subsequent periods (fig. 4). Among these sites except *Morad Abad 5* and *Chogha Valeh* which are far away from the water resources, others are all close to rivers or water springs. Two of these sites, *Gala Gap* and *Cham Zaman*, were settled in the margin of the plain and close to rich pastures. *Ghala Gap* is located in a valley between the modern *Azna* and *Boroujerd* cities in an appropriate ecological condition with a many pasture lands and dry farming (Figs. 5 and 6). Site of *Cham Zaman*, although it is located next to the river with an easy access to pasture lands, stayed abandoned up to the Iron Age. *Barzin Abad* shows a close distance to river and there has been life up to the early Chalcolithic period. Another significant site which is located around 100 m away from *Sabar River* is *Chogha Ghoni* indicating a multi layers of archaeological occupations from the different periods.

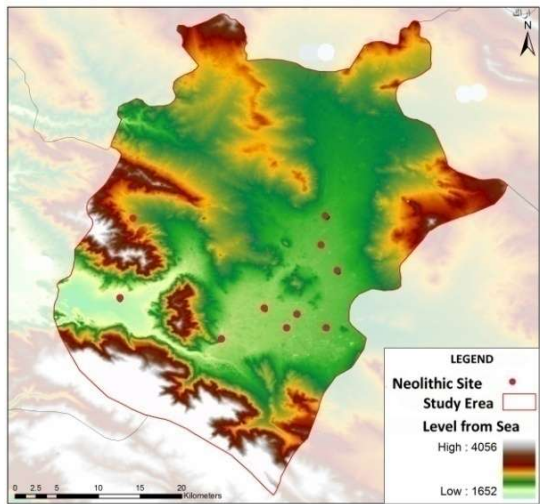


Fig. 2- Topographic map of the study area

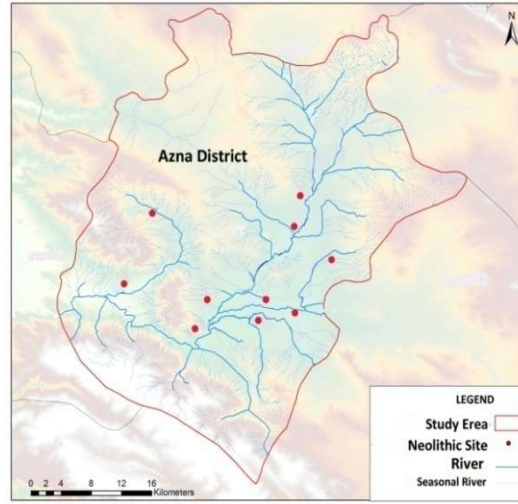


Fig. 3- Distribution of the Azna Neolithic sites in relation to the water sources

Imam Zadeh and *Morad Abad* are the far northern Neolithic sites of *Azna*. Today, *Imam Zadeh* is located 200 meters away from *Rodab River* and it has the highest elevation from the sea level by about 1950 m. This site is really crucial in archeology since from which the well known *Bagh-e No* pottery, painted pottery of Neolithic period in the Central Plateau, such as diagnostic potteries of *Sialk I*: 1-3 and the *Sialk II* pottery of *Cheshmeh Ali* type have been found.

Tepe Chogha valeh today is only one kilometer way from the surface water, so it could be inhabited in the late Neolithic. *Mahmoud Abad* is one of the other sites of the Neolithic which is the lowest among the other site from the sea level. This site is in a better ecological condition because it has enjoyed an average annual rainfall of about 500-700 mm in addition to easy access to water resources ad water springs. Seven sites are located in semi-dry to Mediterranean climate and three of which were in the humid to semi-humid climate.

Considering the settlement size, there is just one site of *Chogha Ghoni* which expanded over about 7 ha while others seems to have been occupied in less than 1 ha. Geographically, *Ghala Gap*, *Cham Zaman*, and *Mahmoud Abad* were distributed in almost about 10 km distant from each other that it is because of the topographic features of the region. The average distance between other Neolithic sites is less than 5 km. Distance between the sites seems to have been logical since every site surrounded by the large peripheral agricultural and pastoral spaces. However they seem to have been clustered into two northern and southern clusters but the southern cluster contained the larger amount of sites (fig. 3).

Excavations of *Tepe Rodkhaney-e Sharqi* demonstrated a five m sediments deposited from Neolithic upwards indicating more rain and various water courses [20]. The isomorphic climatic maps of *Azna* also show to the southern part of *Azna* a temperate climate rather than the north. 50% of the sites in this part are located closer to the rivers and water resources. 40% are located in a distance of one km or more and only 10% percent of these sites showed the closer proximity to a water spring or water currents. It seems that the consistency and persistence of these villages is due to the internal social system, economic independency and cultural dynamism of the Neolithic behaviors which were best developed through the interactions of humans with environments.

Although re-establishing life and social procedures needs further exploration, it is possible to connect some of the marginal sites such as *Cham Zaman* and *Ghala Gap* to those living procedure based on the village life of even semi-nomadic style. On the other hand, most of the sites with easy access to the farms were generally small and their cultural deposits indicated signs of ecological consistency and a long term utilization of sites as sedentary living style. Additionally in studying some abandoning sites such as *Barzin Abad* and *Ghala Gap* there have been traces of green sediments implying for the animal husbandry. As Hole [5] pointed out there is an overlap between sites scattering with *Bagh-e No* Pottery and the geographical distribution of present villagers. This is a living pattern which was common between the sedentary and mobile societies of the *Azna* plain as *Ghala Gap* excavations and zooarchaeological study indicated [21], not only the *Bagh-e No* pottery has been used in *Azna*, but also *Azna* society lived in the way in which cultivation and rural animal husbandry were the basic economy of the *Azna* Neolithic populations.

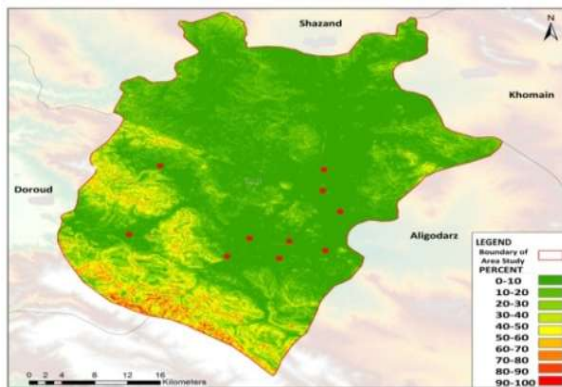


Fig. 4-Distributions of the *Azna* Neolithic sites located on the various slopes of the region



Fig. 5- Tepe *Ghala Gap* a Neolithic site in the *Azna* plain

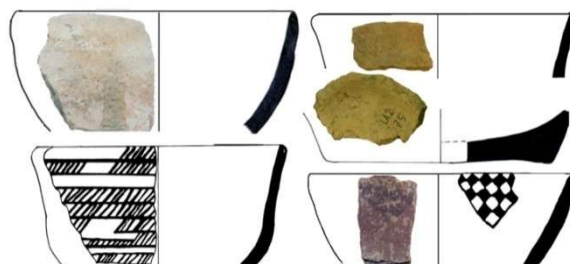


Fig. 6- Diagnostic pottery types of Neolithic Sites in Azna Plain

DISCUSSION AND CONCLUSION

One of the most important elements in the settlement pattern of the *Azna* plain is the influence of surface water courses caused the distribution of the site in the linear format, but in the some areas there have been sites seems to be randomly scattered without settlement policy or exchange systems. In some plains there have been signs of technological changes such as building canals for agricultural purposes, it is expected that there might be a relationship between settlement patterns and these hydraulics [17]. Identifying such irrigation systems in the Neolithic *Azna* needs further study but the physiographic flat pattern of *Azna* plain might permitted the inhabitants to transfer waters to their cultivated lands from the shallow rivers. It seems that living in the small and scattered villages means flexibility against the climatic conditions.

It seems that during the Neolithic period the *Azna* plain had the capacity of accepting the populations of villagers and nomads which we have explored about 10 archaeological sites of them. From out of about 350 km low land plains, 35 km of which were suitable for nomadic life.

The same pattern was seen in the *Mahidasht* Plain where 13 Neolithic sites were found with similar pottery like those found from *Sarab* [22]. In *Mahidasht* as *Azna* there might have been less Neolithic villager sites because the Neolithic tribal groups lived in the higher piedmonts as pastoralists and left from themselves fewer indications [23]. There is a close relationship between settlements and the everlasting water sources and water springs and also good for cultivate lands. This pattern shows that through seven thousand years the dominant economy of the major inhabitants of *Azna* was based on crop cultivation and village animal husbandry. The new discovered sites in *Mahidasht* and *Holailan* are located in the margin of the young alluvium in the base of the valleys or on the conics next to the alluvium. It seems that the density of the population was not that much high to widen the valley of the west central Zagros and inhabit it immediately [24].

New Neolithic groups in *Mahidasht* without specific storage potteries or with thin clay architecture walls show an irregular life style rarely dependent on agriculture [25]. In some immediate surveys of the *Kangavar* plain there is no specific sign of living in the late Neolithic and the extended studies in *Asad Abad*, *Nahavand*, and *Sahneh* led in the same results [24]. From *Shahnabad* phase (early Chalcolithic period of *Kangavar*) two sites were identified in *Kangavar* [26]. McDonald argued that in the more eastern part of the west Central Zagros same as *Kangavar*, there was no interesting point for them from the climatic and ground point of view to utilize the fertile valleys like *Mahidasht* and then started to work on the neighboring valleys.

Settlement patterns of Neolithic in *Malayer* are very similar to *Mahidasht* patterns and all of them are located in the marginal lands of the plain on the alluvial fans and they are not even close to a stream [25]. Unintended evidences show an irregular living in these valleys, even some of the eastern sites are small and located in the margins of the slopes and the evidences show that they had been dependant to hunting and collecting for their basic requirements because they had become abandoned periodically without any specific reason [25].

Howell [27] noticed that he discovered four sites with new Neolithic potteries similar to *Shehnabad*. McDonald has probably attributed these sites to have been used by the nomads -a pattern that has never been seen in *Kangavar*- and he believes as the same as McDonald that, the *Malayer* sites with the height of 1800 m above sea level with the potteries like those from *Shehnabad* (early Chalcolithic period of *Kangavar*) are related to the seasonal nomadism in the highland valleys [5]. It seems that the above mentioned points are not compatible with the evidences found from the excavations of the Neolithic and Chalcolithic phases of *Tepe Ghala Gap* in *Azna*. Although there are some evidences of hunting deer and boar but the societies first subsistence strategy has been basically on the animal husbandry.

The bone assemblages of *Ghala Gap* site contained 80% sheep bones 8% cattle and 1% Horse family bones respectively. Overall most of the bone remains during the early Chalcolithic period. (76%) belonged to herbivorous (small ruminants, sheep likes and cow) and the remains of wild animals like boar and deer were not reported [21]. The pottery of *Ghala Gap* during Neolithic followed the local traditions of Zagros and did not show similarities with other contemporary potteries which are known as *Sarab* and *Guran* [28]. This is a point may due to the regional characteristics of the *Azna* Plain which provided art and technology in a different line.

It seems that the new Neolithic sites specifically those located in the *Karkheh river* basin the tendency has been towards the sedentism and eventually permanent settlement areas [25]. In the *Khoram Abad* valley Hole and Flannery discovered two sites of *Konji* cave and *Ghamari* cave dated back to 5800 to 6000 B.C. The upper layers of these two caves contained some ash layers associated with some domestic goat bones pertained to the beginning of the sixth millennium B.C. [29].

Bagh-e No area with evidence of dry farming is located in the *Khoram Abad* valley and archaeological finds from this site showed that despite the people of the mountainous areas were mainly used animal meats for their existence the *Bagh-e No* occupants were still loyal to the dry farming [29]. But the Zoo archaeological evidences of Neolithic *Ghala Gap* indicated for the peoples of the site an animal husbandry life style [21].

In *Ghala Gap* the limitations of excavated units did not allowed to find direct architectural evidence to make inferences about the residential characteristics of the site but as has been mentioned earlier it seems that the site has been used seasonally according to the domesticated animal bone analysis and pottery finds which were best in accordance with the nomadic life. Hole and Flannery [29] maintained that in the Neolithic period full of water valleys located in the ring of oak forests were not dependent on the watering the crops or even did not feel this need. It seems that the *Azna* inhabitants followed the same process and despite having an animal husbandry strategy they had also limited dry farming cultivation.

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