

Traditional House Elements in the Sahara 'Ksour' Northern Algeria

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Abstract:

The ksour of The Algerian Northern Sahara are distinguished by the diversity of their traditional architecture and their specific local building material and their special construction techniques. The people who built them made use of what was available to them bearing in mind the specificity of the desert region, especially the traditional residential architecture, which is at the center of human beings stability. Architects attached the greatest importance to the respect for privacy of the population through different architectural elements, but the geographical and historical diversity of the northern desert of Algeria had affected variably the traditional architecture in all over that region, in terms of general planning and functional coordination within the 'ksar. Through this study, we will try to know the most important elements in the traditional house units in the ksour of the northern Algerian Sahara, focusing on three different regions: Al-Saoura in the west, the 'Mzab valley in the center and the Rig valley in the east.

Keywords: ksour; north of the Sahara; traditional house; traditional architecture; Elements.

ملخص:

تتميز قصور شمال الصحراء الجزائرية بتنوع عمارتها التقليدية وبمواد وتقنيات بناء محلية، أبدع من قام بتشيدتها في استغلال ما توفر لديه مراعيًا خصوصية المنطقة الصحراوية. خاصة العمارة السكنية التقليدية التي تعد محور العلاقة بين الإنسان واستقراره. لذلك كان من الواجب توفير العناصر الأساسية لتلبية حاجياته داخل الوحدة السكنية، حيث أولى المعماري الأهمية البالغة لاحترام خصوصية الساكنة من خلال هذه العناصر المعمارية، إلا أن التنوع الجغرافي والتاريخي لشمال الصحراء الجزائرية أثر بأشكال متنوعة على ما أنتجه الإنسان بالمنطقة من عمارة تقليدية، هذا من ناحية التخطيط العام والتناسق الوظيفي داخل القصر، أما عن الوحدة السكنية التقليدية سنحاول من خلال هذه الدراسة المعنونة ب عناصر المسكن التقليدي في القصور شمال الصحراء الجزائرية، معرفة أهم عناصر المسكن التقليدي بقصور شمال الصحراء الجزائرية، مركزين على ثلاث أقاليم هي الساورا بالغرب و وادي مزاب بالوسط و وادي ريغ شرقا.

الكلمات المفتاحية: القصر؛ شمال الصحراء؛ المسكن التقليدي، العمارة التقليدية، العناصر.

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1- Introduction

The cultural heritage, whether material or immaterial, left by the desert man, suggests a great desire to exploit the natural elements that were available to him in order to meet his requirements and needs to survive within that rude natural environment. This desire grew up in proportion with his determination, toughness and ability to adapt, which led him to build up a civilization that denotes such a sort of presence and awareness expressed by the architectural heritage and the integrated urban fabric that nature Had also contributed to select the quality and the nature of its features, especially in the Saharan Ksour, where secrets continue to stir the curiosity of researchers since the beginning of the twentieth century, particularly the occidental researchers who are still fascinated by the local engineering creativity.

The reason for architectural works in the Sahara is functional as well as lucrative. Different references trace back this theory to the beginning of the twentieth century. Nevertheless, its intellectual roots Go futher back in time. **Louis Sousou Levan** was the first to establish the basic principle of Function (The form follows the function)(Nada Al-Hallak,2013:538). The form must be the natural result of function, and this is exactly what characterizes the Ksour of the Algerian Sahara on the principle bases of filling the void.

In this regard, **Pierre Robert Baduel** (Sociologist) mentions that " *throughout history, man did not control his constructional environment by the architect, but quite the opposite. The process of control was through individual or collective construction, and this led the individual to draw his architectural values from the record of civilized values imposed to him by history.*" (Pierre Robert Baduel .1986:232).

1.1- Research problem and objectives:

The traditional dwelling in the 'ksour of the Algerian desert is the most important architectural unit expressing the urban thought of its constructors despite the distance, the geographical and cultural differences between the ksour of the northern desert in Algeria and the period of their construction. Nevertheless, many researchers refer them to the same architectural style with the same archaeological characteristics. In this regard, we will try through this study to highlight the most important architectural and archaeological features of the traditional dwelling in this region by relying on some field studies of a group of researchers.

In the present study, we will consider the following elements:

1. The concept of Saharan ksar.
2. The Algerian Saharan ksour.
3. The architectural archetypes in the Saharan ksour.
4. The traditional dwelling in the Saharan ksour.
5. The traditional dwelling in the 'Mزاب Valley.

6. The traditional dwelling in the north of the Saoura.
7. The traditional dwelling in the Rig Valley.

1.2- The concept of Saharan ksar:

'*ksar* (pl. *Ksour*) in Arabic is the house. Literally, it means short. It was called so because the sanctuary of woman is short. The *ksar* is bigger than the houses. It is generally used to designate a Castle or a fortress, but also to refer to some fortified Saharan constructions with specific urban style restricted to some given areas generally adjacent to oases. (The Great Encyclopedic Dictionary, 1984: 7905).

The word is pronounced "*Gsar*". It is a phonic alteration of the Arabic root *qasr* which designates what is short or limited. That is to say, a limited space to which only a certain category of social groups has access. It is a confined and reserved space limited to the use of some people. (Mousaoui A, 1994: 370).

Technically, the term was used to denote a populated or an abandoned agglomeration that has become a group of historical buildings and monuments (Comment No. 01). It is a fortified city by its own geographical location or by oases and is often surrounded by fences. It is the destination of choice for the nomads and even for the city dwellers searching for pasture for their flocks. (Colomieu victor, 1862:162)

The Saharan *ksar* also designates a group of agglomerated people with common interests, both in peacetime, to carry out educational, ideological, social and commercial activities, and in wartime to take shelter when enemies attack them. In other words, the Saharan *ksour* are urban structures for a groups of people that meet their homogeneous and interrelated requirements in blood, belief and culture (Mohamed Akab, 2007:20-21). The agglomerated people are not necessarily from the same clan, but they are gathered around basic materials, to perform a common civilizational mission and to deepen their mutual understanding. The pragmatic basis for this agglomeration shapes the morphology of the *ksar* in the way that this constructional mass does always extend horizontally with a tied relationship with the oasis and the availability of water resources.

The *ksar* is usually surrounded by a rampart (*SUUR*). This fortification is one of the main characteristics of the *ksar* and its various components. It ensures the protection and defense of the inhabited space, and at the same time, it serves to distinguish the sacred space from the secular one.

1.3- The Algerian Saharan ksour:

The concept of *ksar* in Algeria, *AGHRAM* in the local dialect, does not differ from the foregoing definition. Consequently, the word does not mean the known residence of the prince or of the king, but it rather means life in the city or such a life of stability.

Nomads who live in the Sahara do often call the residents of the Ksar 'Ksouri', which means "The city dwellers" and it is still commonly used in the Algerian Sahara dialect.

The southern ksour are often surrounded by a mountain range commonly called the 'ksour mountains. In Algeria, the ksour extension goes from the region of Fiqiq in the west to the east, through the cities of al-Baydh, Ghardaia and Ouargla. with variant heights, each mountain has its own name. Also called the Saharan Atlas Mountains, this chain forms a barrier between the steppe and the great desert.

The historians diverged about the construction's dates of the ksour in the south of Algeria. This discrepancy led to a large number of opinions. The historian **Martan**, for example, classifies the southern ksour into three types, highlighting that the ksour of the northern Algerian Sahara belong to those that were built in the beginning of the seventh century AD. (Qadda labtar,2017:24)

Mean while, Ibn Khaldoun (1332-1406) says that: "the first ksour were probably built from the 1st and 2nd century BC. They undoubtedly constitute the progressive extension of the Saharan Atlas phenomenon of sedentarization of the Berber nomads." (Ibn Khaldoun A,UD:178) (Djebbar khadidja el-bahdja,2018:39-40).

There are several organizational schemes of "The Ksourian space". The most decisive ones are those related to what we called "the mythico-ritual" scheme. The technological and rational schemes are secondary. It seems today that it is time to stop seeing in the ksour only a "spontaneous architecture " without any rules or models. We need a new vision, where "tradition" does not necessarily rhyme with "archaism" or "backwardness". These human settlements seen as the product of spontaneity have become, in fact, synonymous to the rigorous planning that prove more complexity than the current or modern planning, in the sense that it takes into account not only the rational but also and above all the irrational: the spiritual

1.4- The architectural archetypes in the Saharan ksour:

From the historical point of view, the origins of the town planning and the architecture of the Saharan ksour can be divided into two classes, according to the date of their construction: those built before the advent of Islam to the region, of which the structure has changed after Islam, and those built in latest periods.

1.4.1- The local architecture before Islam:

It is an ancient architecture drawn mainly from the local tribes in two types:

A) At the beginning, their architecture was mainly brick-based buildings without a precise scheme.

B) The second type consists of stone buildings that are constructed in high points, surrounded by walls with very winding and narrow alleys, such as the ksar of Lahmar in the north of Bechar, and the ksar Minea in Ghardaia.

1.4.2- The Islamic architecture:

The Islamic architecture refers to the ksour that depend in their layout on the planning of the Islamic city, which is represented by the presence of religious constructions such as mosques and the Quranic schools “Zawiya”, and which is characterized by the regularity of its shape, like the architecture of almost all the scattered ksour in the south of Algeria, especially in the northern Sahara.

1.5- The traditional dwelling in the Saharan ksour.

Researchers diverge about the most accurate appellation of the Saharan **Dwelling**. In their literature we find: dwelling; home; residence and house. The latter is mostly used in Arabic instead of dwelling. It is used to describe a housing unit inside the ksar as well as the dwellings of the Sahara. Allah says: **“and your Lord inspired to the bees:” *Take for yourself among the mountains, houses, and among the trees and [in] that which they construct***” (Surat Al-Nahl verse 68)

In the Quran the term ‘Home’ is wider than ‘House’: **“And Allah has made for you from your home’s a place of rest and made for you from the hides of the animals tents which you find light on your day of travel and your day of encampment; and from their wool, fur and hair is furnishing and enjoyment for a time”** (Surat Al-Nahl verse 80)

Another interchangeable word with ‘House’ is: **ad-dār**. In singular form the word designates the living space. But in addition to the meaning of "house" or "built area", the word dār means "territory": Dār **al-`ahd**, “territory of the pact”, dār **al-harb**, “territory of war”, dār **al-imān** “territory of faith”, dār **al-islām**, “territory of Islam”, and many other denominations, which clearly show that before designating a house, the word dār designates a delimited and appropriate space, over which the undisputed authority of a leader or group is exercised. It is therefore a space over which power is exercised, the authority of which is recognized. While inhabiting it refers to habitat. As-sakan in Arabic, from which derives the term sakīna "serenity". Sukūn is the opposite of movement. Sakana means "he lost his restlessness (harakātuḥu)", or "calmed down after taking action". The main function, therefore, of the house is to provide rest and serenity, to remove the being from the hustle and bustle and noise surrounding it. (Mustapha Ameur Djeradi, 2012: t36-37)

The House in general refers to a civilized dwelling of stone, brick, wood, fabric, leather, wool, or animal hair. The Arab houses took several names that differed according to the material of their construction and their structural elements and facilities.

As for the source of house planning, there are different opinions. Some researchers refer to the Greeks, the Romans, or to other ancient civilizations, but with Islam the house and housing developed and became very special in terms of living style, structure, and decoration.

The Dwelling in the Saharan ksour consists of a group of facilities, the most important of which are; the rooms, storerooms, **kunif** (Water Closet), and the roof. The house may be constituted of two or more floors, depending on the specificity of each region. As for its organization, it is subject to the principle of IHTISSAB applied by Al **muhtasib** (A sort of urban police).

2- Method:

Through this study; We will try to rely on the method of direct description of the selected samples, by means of field inspection or with the help of previous studies, prepared by archaeologists, as we will come back to later, and then try to extract the common architectural scheme between the dwellings of the ksour in the north of the Algerian Sahara, By dividing the northern Sahara into three regions, as previously mentioned in the study summary.

2.1- The Traditional Dwelling in the M'zab Valley:

The M'zab or Mzab, (Mozabite Aghlan), is a natural region of the northern Sahara in the province of Ghardaïa in Algeria (Figure 01). It is located 600 km south of Algiers. The valley of Mzab (comment n° 02) consists of a group of five ancient cities called the **ksour** of the Mzab valley, which are spread throughout the region with a distinct architectural style, and are all classified by UNESCO as world heritage. In this valley, the dwelling is the second important element in the Mozabite architecture after the mosque. Its architecture with its different elements is obviously subject to Islamic traditions.

Due to the number of similarities between the Ksour, we will try to explain in general and without detail, the characteristics of the traditional Mzab dwelling on the basis of the study of Maarouf Belhadj and Djoudi Mohamed as well as my own findings and observations in the field.

2.1.1- Dwelling planning:

The traditional dwelling of the Mzab valley consists of a ground floor, a first floor and a roof (Maarouf Belhadj, Djoudi Mohamed, 2012:72-75). Some houses may include a basement as vestibule. The average height of the dwelling does not exceed 7.50m (OPVM, UD: 08). Most of them are of rectangular shape (Kermida Mokhtar, 2001: 06), while some others have an irregular pattern and shape following the nature of the ground, which is characterized by a rocky structure.

The Mزاب housing is mostly characterized by the presence of the entrance provided with a door made of palm wood beams in one of its corners, as is the case in almost all the North African residences (Van Der Meerschen Michel, 1987: 77). The door is also provided with a traditional lock with a fovea that was commonly used in the Sahara.

The main entrance is connected to the shed, a separating space between two different spaces that Islam sought to keep apart for the sake of family privacy especially females intimacy. It is a type of refracted entrances locally called **Imi** (Jean-Loïc Le Quellec, 2006 : 82). After the shed comes the hallway entrance which is a space allowing to move into the core of the house, which is usually exploited to grind grains like wheat in a molar installed in one of the corners. (Marcel Mercier, 1932: 248-251)

From the shed, we move directly to the core of the house, “**AMESS NTEDAR**” or through a porch “**TAHEDJA**” in some dwellings. It is the principal space in the dwelling regarding its shape, scales and the structure of the different spaces inside it. It is almost completely covered except the open window like a vent hole that connects the ground floor to the first floor to provide sunlight and renewed air (Youssef bin Bakir Al-Hajj Said, 1992: 88). Its roof carries out beams in the middle and in parallel with the corners of the vent hole, but in some cases the beams are replaced by two or three columns.

All around the center of the house is distributed the kitchen (picture n° 01), and a room designated to receive the female guests, as well as a number of rooms reserved for the owners. But the first thing that attracts attention in terms of location and size after exceeding the shed, is that room called “**Tizifri**” reserved for the reception of the female guests. It is isolated in a way that allows women to meet (André Ravéreau, 1981 :124), and characterized by a wide entrance (Youssef bin Bakir Al-Hajj Said, 1992: 88).

The courtyard is surrounded by three rooms or, in very rare cases, by four rooms. A number of niches adorn the walls to replace the wooden furniture and cabinets. Before the door of the room there is a small threshold. Sometimes the level of the rooms is higher than the floor level of the core of the house.

The rooms in general are characterized by a low level of ceiling, so that the field of vision when sitting down on the ground in the western rooms is equal to the amount of field of vision when sitting down on a chair (Jean-Loïc Le Quellec, 2006: 82). The family members occupy these rooms (**lebiout**) especially in the first floor, following their status and their individual position within the family. The grand parents or the older persons occupy a room in this floor, taking into account their critical age, while the grooms lodge a room in the upper floor (Mohamed Triki, Khaled Bouzid, 1989: 99). The kitchen is provided with a number of niches and shelves to put cooking utensils and lighting (Yves Bonete, 1959: 64).

The toilet (WC) in Saharan architecture is called: **Al-Kunif** (comment n° 03), and is locally called "**Ajmeir**". It is usually located at the back of the center of the house (Kermida Mokhtar, 2001: 28). It is adjacent to the outside wall of the house where the waste tank is easy to empty. Usually, there is a space adjacent to the laundry called *Bit al-Saboun* but the two are kept apart, and there is no door but rather a fabric curtain, because its architectural design hides it from the outside.

We moving up to the first floor through a stairway (picture n° 02), the shape of which varies from one residence to another. It is located in one of the corners at the center of the house, where the covered area does not exceed half the surface of the ground floor, and the covered part includes facilities such as those on the ground floor all around the **shubak**. In some cases, we may find a reception room for men, called locally in the Mozabite dialect "**Aliyi**". The whole is preceded by a corridor carried out on arches and pillars locally called "**Icomar**" (comment n° 04).

The rooms in this floor are distributed around a large open courtyard (Guy Bisson, Archive OPVM:3) called "**tighar- ghart**". In some cases, there are more than three bedrooms occupied by the married children (Kermida Mokhtar, 2001: 40). Each Mozabite dwelling must include in the first floor a store room called in Mzab "**Bakho**" or "**Takhbit**".

This floor is also provided with **Al-Kunif** (WC) and a laundry on the same vertical projection with its equivalent in the ground floor in order to facilitate the collection of waste and waste water. Their presence in the two floors is due to the parallel use of both of them.

The residence is crowned with a surface called locally "**Tamnait**" (OPVM, UD:08). It is mainly constituted of an area of roofs for the covered facilities of the first floor. Their different levels vary following the ground on which the dwellings were erected. In the traditional dwelling, this surface is generally void of any construction except in some cases, where some sides are assigned to build some open rooms for sleeping in the summer, in addition to a small space for storing firewood, or in some other cases a small space is reserved for raising chickens. The whole surface is surrounded by a sort of walling of a height ranging between 0.80m and 2.20m at most (Kermida Mokhtar, 2001: 41) in parallel with the street and the neighborhood for the sake of privacy (Maarouf Belhadj, Djoudi Mohamed, 2012: 72-75). (see figure n° 02)

2.1.2- Building materials:

Due to the nature of the climate in the Wadi Mzab region, which is characterized by a significant change in temperature, the inhabitants of the region were forced to use and exploit the local building materials available in nature to meet their requirements of durability and insulation without neglecting the aesthetic aspect.

Stone is one of the basic materials in building houses in the Mزاب valley, because it is widely available in the large number of stone-quarries scattered on the banks of the valley. The local stone is calcareous and of different sizes (Zaaba Omar, 2016: 104), it is used in rough form in the construction of walls and pillars, while the flat stones are used to close the openings or to tile the surface of the roof.

Tibchemt is another widely used building material in the Mزاب valley. It is a sort of reddish gypsum material available in many quarries spread all over the banks of the Mزاب valley. The local inhabitants call this original stone: **kedam** or **hjarelkef**. It is cooked in special ovens fed with dry Saharan plants placed through an opening in a round dome. The burning process lasts about 24 hours, during which the stone blocks turn into fragmented pieces (Djouidi Mohamed, 2014: 138). It is used as a support and in roofing with palm tree parts and leaves provided by the oases in the area. The lime and soil are mixed with gravel and are also used to build some levels of the residence.

2.1.3- Building techniques:

The most important techniques used in traditional house construction in the region are the mixing and the alternation between a group of building material type, while for the roofing several types of techniques had been used, especially for vaults in order to distribute the weight evenly with the walls. As for coating, the main used material is the **tibchemt** mortar and sand or the lime mortar appropriate for sealing holes and spaces between the formless stones in order to give the walls an equal form.

2.2- The traditional dwelling in the north of the Saoura:

The Saoura is a valley in the southwestern Algeria (figure n° 01). It is formed by the Oued Saoura river shaped by the confluence of Oued Guir and Oued Zouzfana at Igli (Merzougui Touhami and others, 2013). The architecture is diversified in the south west Algerian ksour, particularly in the northern region of the Saoura (comment n° 05) which is characterized by the diversity of the architectural monuments resulting from the great cultural diversity in the region, in addition to the urban influences and exchanges with the neighboring areas. This region borders the path of the most important historical trade routes.

2.2.1- Housing scheme:

Before we reach the door of the dwelling, we pass through a shed or a refractory portico (picture n°03), with a length of 1.5 to 2 meters. Without any decorations or openings except in the dwellings of two floors, which are very few in the region, the frontage of the dwellings is simple, reflecting the simplicity of its constructor. As for the current condition of these housing units, they are degraded and it is very rare to find a complete house with all its parts.

We enter the residence through doors made of palm trees wood (picture N°. 04). The door is provided with a traditional lock that was commonly used in the Sahara, and which depends on the principle of the fovea that consists of a group of nails on a moving wooden key that conforms to the holes engraved on the moving section where other moving nails installed inside the fixed section of the lock are pushed. The immovable part is made entirely of palm trees wood and is locally called **Taglabt**.

Immediately after the entrance, we find a dug area called **Matmoura**. Right behind it is the courtyard (**Asoaris** or **Taserit**), at the center of which there is a square support system of a length of 0.80 m. Through the yard we can access other parts, namely the rooms called **Lebiout** and the guest room that is quite separated from the other rooms. (see figure n°03).

the cooking place is often in one of the corners of the courtyard, where a traditional oven (**Kosha**) is topped by a chimney to the highest part of the dwelling (picture No. 05). The green palm tree leaves are used to cover a part of the oven to prevent insects and small animals from entering it.

All of the dwellings are provided with a WC (**al Kunuf**) (picture n° 06) that consist of two parts. The lower part or the hole called **Adaye**, and the upper part called **Anj**, where the accumulated waste and ash are used as fertilizers for the oasis gardens. There is only one Kunuf in the house except in some cases of large homes.

Most of the houses consist of a ground floor and a roof, which is an open space at the top of the house, accessible through a staircase and a ladder in the corner of the house occupying the total area. Some of its areas are used for storage, hanging out the washing or for poultry raising. The surface is surrounded on its four sides by a wall that does not exceed half a meter (0.50 meters). The roof is used to sleep during hot summer nights, while women use it to dry clothes and grains during the day. As for children, especially girls, it is the ideal place to play their favorite games.

We get to the roof through a stairway, in the middle of which there is a break area just above the wood store. This space is open outwards through a small opening.

Most of the walls of the residences of the ksour in the north of the Saoura region contain niches that form a kind of decoration.

Under the walls we find places of rest called locally **Aldakat**, used also for another purpose and role, which is to ensure the lower side consistency of the wall. According to some sheikhs (old persons) from the region, it was also used during summer for sleeping (Picture No. 07).

What characterizes some houses in the area is the presence of wells inside them, often located in one of the corners in the courtyard side. Some wells are built for crucial

public needs. The average depth of the well is 10 meters. An integrated system made of goat's hair ropes is used to extract water from the wells by means of pulley called **khattara**, and a bucket made of wood or goatskin.

2.2.2- Building materials:

The habitations located in the ksour of the region are distinguished by the use of various building materials in line with the widespread technologies at that time. The selection process of those materials obeyed to a several factors, among which is the availability and the suitability of natural and climatic conditions. These materials were each used according to the category of constructors, though there is no large difference between them due proximity of periods of their construction.

The houses were built with large sized bricks, locally made from clay and sand. Of a rectangular form in general, their sizes range from 0.10m to 0.15m in thickness, 0.20m in width and 0.40m in length. The clay is mainly used to build the exterior walls that are locally called **al- hautt**. Their thickness often varies between 0.40 and 0.60 m. As for their foundations, they do not exceed one meter of height, and they are mostly built of medium-sized stones, linked by clay mortar.

The advantages of using bricks in construction include (see: Labtar Qadda, 2019:63-80):

- The regularity frontage shape due to the size regularity of the brick itself.
- The easiness of transporting bricks to the construction site as it is of small size and low weight.
- The easiness of laying bricks.
- Good adhesion of the brick to the clay mortar.
- Resistance of the bricks to weather factors, in addition to being an acoustic insulator.

Stones of all kinds and natural shapes have been used without polishing, whether at foundation level or on walls. They are joined with linking materials like the clay, or by a prepared mixture of sand and lime and some organic or mineral fixings.

2.2.3- Building techniques:

By observing the structures of the ksour houses in this region, the construction techniques used can be limited to tile and header construction technique, and underlay construction technique. If the building material is bricks, the choice of these two techniques is based on the quality and dimensions of the brick molds and the area of the building, and their use requires to make the wall thicker enough to support the weight of the structures, due to the absence of solid welding materials and the non-use of internal fasteners as in modern architecture using iron or steel structures (metal reinforcement),

while the irregular construction techniques are consistent with the use of stone as main construction material .

The walls are covered in a simple manner either with clay or with lime or with a mixture of them that is most often affixed by hand and leveled on the walls. This technique conforms to the construction stages in all the ksour of the Algerian Sahara.

What we have observed in the field, is that the first level of most of the houses is low in height and their roofing rarely exceeds 2.40m from the inside. The internal surface of the rooms in the house is often square with an average size of 3.2 x 3.3 meters, which is most likely due to the weakness of the building materials in terms of durability as it does not support weight at great heights. Besides, it cannot stand over a distance greater than 3.50 m.

2.2.4- Roofing and Supporting Systems:

The habitation supporting system depends on pillars built of bricks or stones and limestone mortar, which are sometimes crowned by various arches (Picture N° 08). As for the roofing, the used materials are mainly palm trees, cane and oleander if available (Picture N° 09). The size of the spaces inside the house is controlled by the roof made of palm tree trunks.

2.3- The traditional dwelling in the Righ Valley.

The Oued Righ (also spelled Oued Rir, Oued Rirh, Wadi Righ) is a region of the northeastern Algerian Sahara. It includes a number of oases, the principal center of which is Touggourt. Some of these oases population speak Oued Righ Berber (comment n° 06). In defining the general description of the scheme of the traditional dwelling in the valley of Righ, we relied upon field visits, and some previous studies carried out by researchers in the archaeological field, the most important of which is Arezki Boukhanouf, though the habitation was not at the center of these studies.

2.3.1- The dwelling scheme:

The traditional habitation in this area consists of several spaces, mainly:

- The principal entrances, which are often covered and lead to a guest room dedicated to preserving the privacy of the dwellers.
- The inner shed leading directly to the courtyard or the central courtyard around which the rooms are organized.
- The guest room: an almost rectangular room used to receive guests, and usually situated after the entrance, it has a direct connection with the shed.
- The Stable: a covered area used for raising animals owned by the dwellers.

- The yard: an isolated area, usually rectangular, having several functions including preparing food, meeting, washing, etc. and it is also a place for children to play. Besides its social function, it has an ergonomic function of lighting, ventilation, and adjusting temperatures in the dwelling area.
- Al-Sabat: it is the covered part of the courtyard.
- The store room is usually with the perimeter of the courtyard and used to store provisions and agricultural products, especially dates.
- The kitchen: area for cooking that contains a stove setting.
- The rooms: are distributed on the different floors in the case of multi floors dwelling. Often rectangular and consistent with the size of the wood used for roofing as shown in the picture below.
- The roof: is an area dedicated to the different daily and seasonal tasks of the inhabitants.).(see figure n°04).

2.3.2- Building materials and techniques:

The variety building materials used in the dwelling units in the region which are from bricks, mud bricks and stones, affected significantly the height and thickness of the walls, so the ways of building them varied, where we find in some cases the combination of more than one technique and material in order to improve the durability of the building or to achieve an aesthetic goal, as shown in figure n° 05.

Among the used techniques are:

Stairs construction technique: its local name is "**Drouge**". It connects the ground floor to the upper floor. We find it mostly unidirectional, in which the trunks of the palm trees form the oblique level that is covered with mortar and upon which the stairs are built with bricks. Its width ranges between 80 and 90 cm.

- The arches technique: arches are formed by means of a group of green palm sticks that are attached to both ends of the wall and the pillar, so that it is based on two pieces of wood, then the bricks are compacted then fixed with mortar. After it dries, the bond and palm tree sticks are removed.
- Roofing techniques: for roofing the dwellings of the region, the used materials are: palm wood, palm trunks, fronds, mud soils, sand and tibchemt. This is accomplished in the form of either rectangular or hemispheric domes, or as flat surfaces.

The role of domes is to reduce temperature, especially in summer, as the hot air inside the rooms rises up to the ceiling while the cold air remains down. It has got another role of preventing the accumulation of sand carried by the wind. Some domes

are provided with openings covered with glass pieces allowing light to get inside the building. It also acts as a sound insulator.

The domes technique reduces the use of wood for roofing, and the structure is more rigid and supports the weight and is less vulnerable to the external forces influence. In flat roofing, palm trunks and leaves are used and covered with a mixture of soil and then with a layer of tibchemt.

3- Results and Conclusion:

On the basis of the foregoing data, we conclude that all the dwellings of the Saharan ksour in the north of the Algerian Sahara share the same characteristics and the same structural and architectural elements and are similar to the rest of the dwellings in the north of Algeria. Depending on the dweller, his social status, and his physical ability, the common denominator between all the dwellings is the open area, in addition to the rectangular shape that extends longitudinally towards the interior as well as the absence of decorations.

The design of the dwelling reflects the customs and traditions of the people of the region. It provides for them psychological comfort and protection from the external factors thanks to the regular fabric and the local building materials. Hence, it is a representation of simplicity in design, unity in appearance and harmony between areas swiveling around the central area or core of the house called *wast ed dar*.

All the houses follow the same plan, namely the interior courtyard, which is always square in shape, accessible through a shed. This courtyard is also very functional depending on the circumstances. It may act as a stable for animals or as a temporary storage place. Around the courtyard are arranged the different **byut** (rooms). These adjacent rooms spread out on the ground floor and rarely upstairs, are lighted and ventilated through this courtyard.

The **bayt** (plural **byût**) is the basic cell, usually of 4 meters deep and about 2 meters in height and width. The collocation of these **byut** and their superposition gives from the outside the impression of a high wall, compact and without opening, similar to the ramparts of a fortified establishment. One of these byut serves as a kitchen. It is generally without a roof to allow the evacuation of fumes resulting from the wood fire used for cooking.

We may confirm that most of the habitations contain more than three rooms in each floor, and the roof is considered as a necessary area to take advantage of the dwelling space for the different daily tasks and activities, due to its small area that sometimes does not exceed 50 square meters.

The construction of the habitation took into account the Saharan climate, by occupying a limited area of one hundred square meters at most, where the ground floor

doesn't communicate with the outside world except through a horizontal opening, in order to provide good thermal insulation.

The habitations in the Saharan ksour differ in terms of their construction periods. However, they all belong to the same architectural style, which is not out of the general context of what is known in terms of building. In addition to the geometry of the volumetric cover of the architectural element according to a special view that makes it aesthetically able to produce, resist and maneuver, as well as to gather between several properties, in order to serve and delight man.

As for the building materials and techniques, they are almost the same, their differences lie in the geological variation of the region between the construction sites i.e., the chemical composition of the same building material is different from one area to another, as well as their appellations and usage at the different levels of the construction.

4- Comments:

- **Comment n° 01.** A historical building means everything left from the past ages such as the ancient cities and their ruins, quarters and markets. These monuments and ruins constitute an important aspect of the cultural heritage, which is considered as a link between the nation and its past. Besides its importance and usefulness at the political, cultural and scientific levels, it is a source of pride and glory of the nation. The current definition of the historical building is based on the Venice Charter of 1964, especially in section 1, which states that the concept of the historical building includes not only one architectural work, but also the urban or rural location that reveals evidences of a given civilization, an important development, or a specific historical event. This does not apply only to the valuable artworks, but also to the modest ancient works that have acquired a cultural significance over time.

- **Comment n° 02.** Among those who referred to this tribe was the historian Yahya Ibn Khaldoun in his text "Bughyat ar-rouad", where he mentioned: "... Berber nomads who dwelt in the Sahara looking for pasture from Sejelmassa to Zab... " see: Yahya Ibn Khaldoun, "Bughyat ar-rouad" mentioning the kings from Bani Abdul-Wad, presented and investigated by Dr. Abdel Hamid Hajiyat National Library, Algeria 1980, part 1, p. 186.

- **Comment n° 03.** It is a square or rectangular hole used as a collector of excreta and waste. Its is surrounded by stones and roofed with palm trunks and small stones.

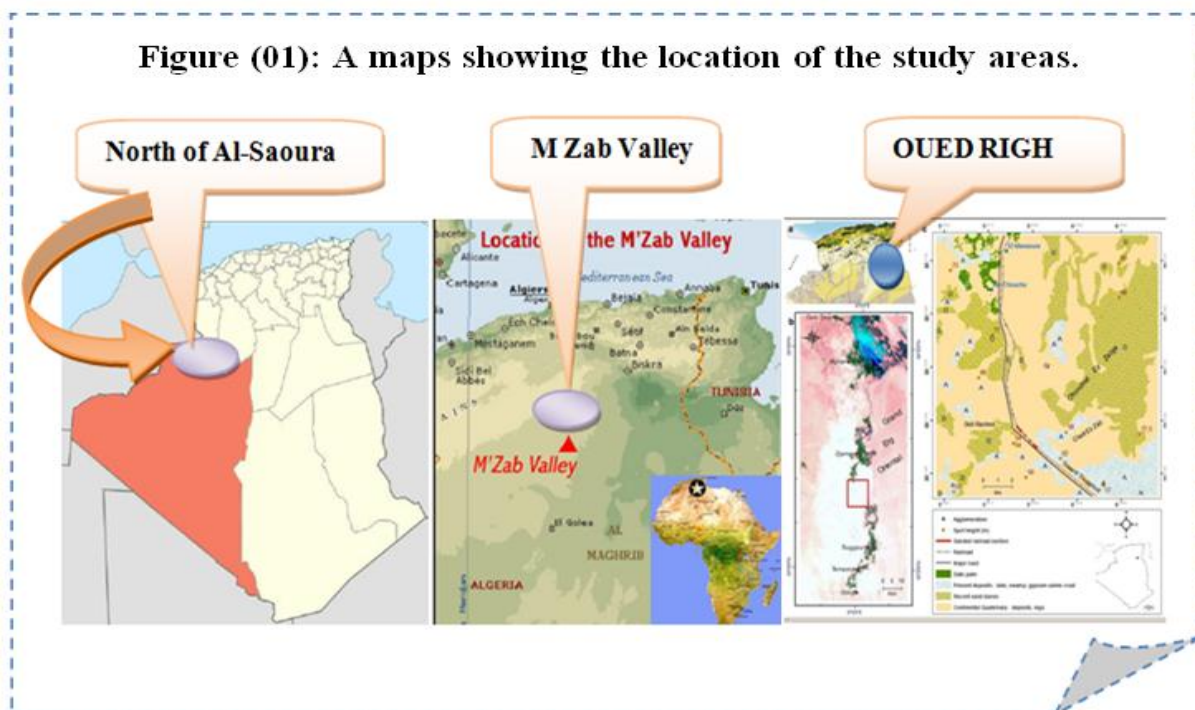
- **Comment n° 04.** "Icomar" is a roofed part carried on a line of arches and columns, so that is to be open to the roof, i.e., the uncover courtyard, called the terraght. Its number ranges from one to two galleries, and at times it reaches three corridors oriented to the southwest and southeast to exploit the sun rays in the winter the sunrise to the sunset. This orientation allows the largest amount of sunlight to get in the ground floor through

a window in the middle of the house, where the most activities like weaving and cooking in the second kitchen. The equipment varies from one dwelling to another, but it is accommodated with less accuracy than its counterpart in the rest of the Maghreb in cities.

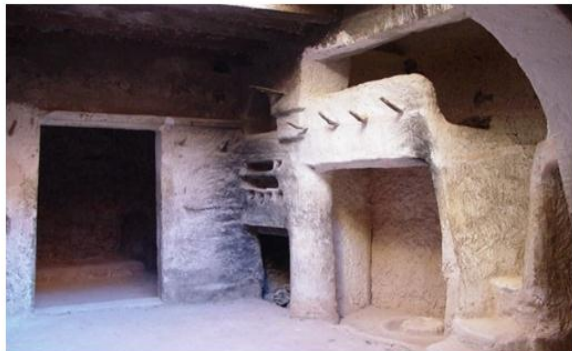
- **Comment n° 05.** The Saoura is the southwestern region of Algeria in the provinces of Bechar, Tindouf and Adrar. In the current administrative division, this region comprises 20 districts and 51 municipalities, the most important of which are Beshar Tindouf, Adrar, Timimoun, Bani Abbas, Taghith. The name of the region is derived from the name of the valley that penetrates it from the north to the south called Wadi Saoura.

- **Comment n° 06.** The Rig valley region is located in a rectangular depression, starting from the head of the valley at the top of the city of Mugheer and exactly in the village of Ain al-Safra in the municipality of Umm al-Zawr the province of El Oued at the Shatt of Malghigh in the north. It extends along in a rectangular shape about 160 km south to the village of Quq in the municipality of Omar. In many writings of the Arab and non Arab historians, such as the Yakout Al Hamwi, this region was called (The Little Zab) in his dictionary Al-Buldan. Ibn Khaldoun A called it The Land or the country of Rig. It was him who determined the origin of its population.

5- Appendix of the pictures and Figures:



Picture N° (01): the kitchen in the dormitory.

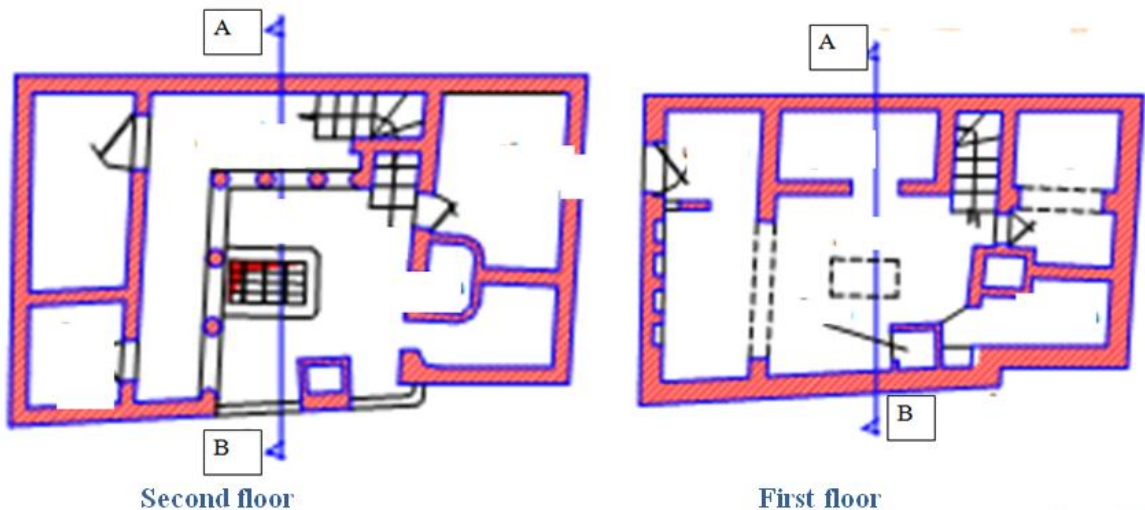


Picture N° (02): the stairs in the Mozabite house



The Source: <https://atamzab.blogspot.com/https://atamzab.blogspot.com/>

Figure (02): Sample of a traditional house in Mzab



The Source: (MAAROUF Bel-Hadj, DJOUDI Mohamed, 2012).

Picture N° (03): The covered shed.



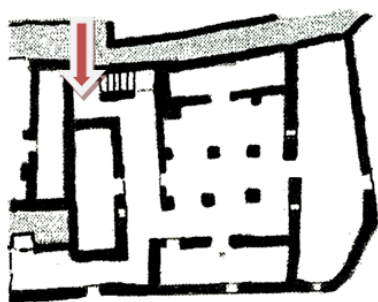
(Authors picture)

Picture N° (04): Entrances and doors.

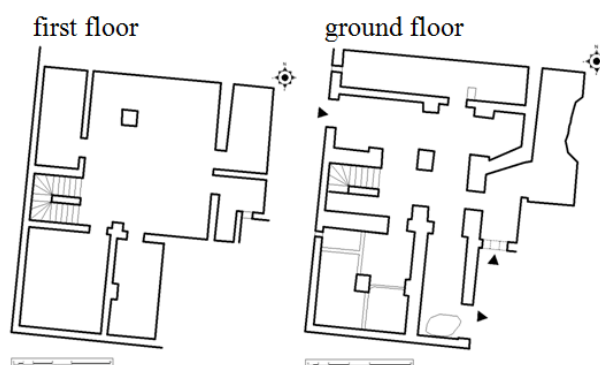


(Authors picture)

Figure N° (03): Housing plan sample in the north of the Saoura.

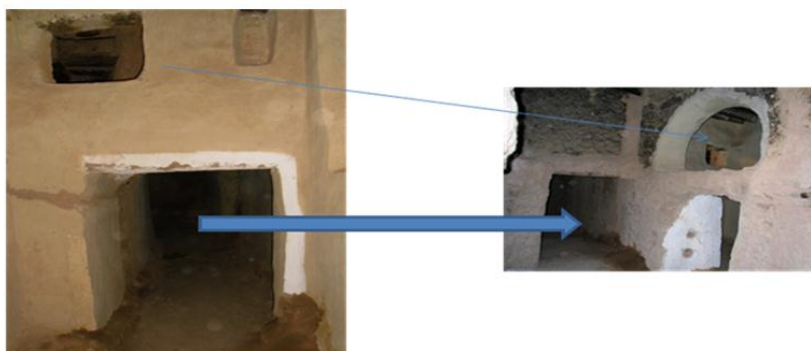


The Source: CHIAB Smail, 2005.



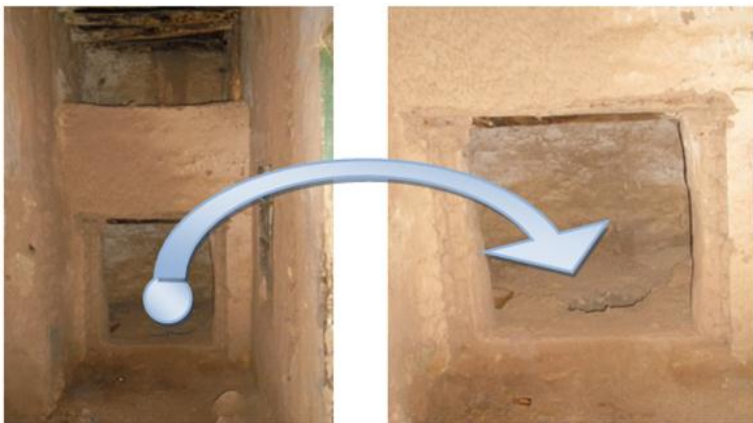
The source: A field graduation report for masters students 2019/2020, in archeology, conservation and restoration Tlemcen.

Picture No. 05: the traditional oven (kosha).



(Author's picture)

Picture N° (06): Toilets or kunuf.



(Author's picture)

Picture N° (07): Niches, Stairs, and Aldakat.



(Author's picture)

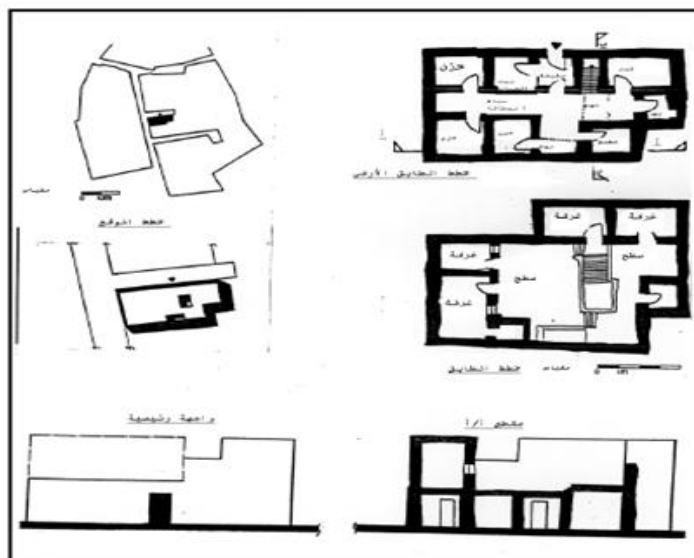
Picture N° (08): Supporting system.



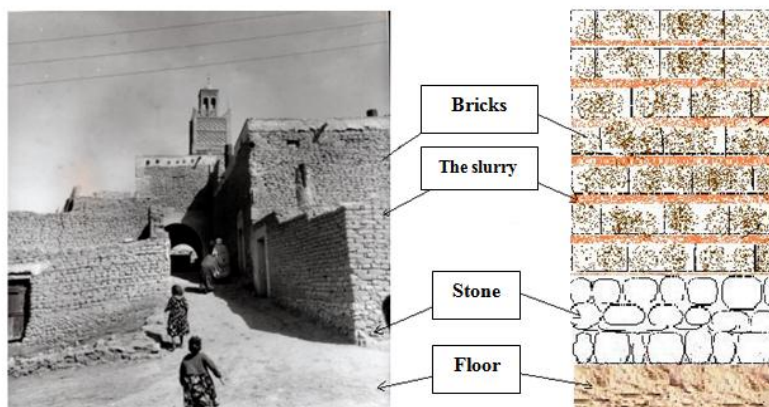
Picture N° (09): the roofing system.



(Author's picture)

Figure N° (04): Sample of the dwelling scheme in the Rig Valley

The Source: Boukhanouf Arezki, 2012.

**Figure N° (05): Building materials and techniques
In the traditional dwelling in the Rig Valley**

Source: Boukhanouf Arezki, 2012.

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