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Characteristics of Rural Architectural Housing Typologies in Doukkala area, Morocco

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Abstract
Doukkala, located in central Morocco, features diverse rural architecture shaped by nine tribes according to local resources and traditions. This article explores the transition from traditional to modern housing, highlighting differences in form, construction methods, materials, and functions, as well as challenges faced by rural dwellings. It also examines state efforts to preserve and valorize traditional housing as cultural heritage. The study applies a descriptive and historical approach, combining field research, scientific literature, and terrain observation using ArcGIS and satellite imagery to analyze rural housing typologies in the Doukkala region.

Keywords
Doukkala, Architecture, Rural housing, Tazota housing, urban transformation.

Izvleček
Značilnosti tipologij podeželske arhitekture na območju Doukkala v Maroku
Doukkala, regija v osrednjem Maroku, je znana po raznoliki podeželski arhitekturi, ki so jo oblikovala plemena glede na dosegljivost lokalnih virov in tradicijo. Prispevek raziskuje prehod od tradicionalnih k sodobnim oblikam bivališč ter izpostavlja razlike v obliki, gradbenih metodah, materialih in funkcijah, pa tudi izzive, s katerimi se soočajo podeželska naselja. Obravnava tudi prizadevanja države za ohranitev in ovrednotenje tradicionalnih bivališč kot kulturne dediščine. Študija uporablja opisni in zgodovinski pristop ter združuje terensko raziskovanje, pregled znanstvene literature in opazovanje terena s pomočjo programske opreme ArcGIS in satelitskih posnetkov za analizo tipologij podeželskih bivališč v regiji Doukkala.

Ključne besede
Doukkala, arhitektura, podeželska bivališča, bivališča tipa Tazota, urbane spremembe

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1 Introduction

The local population has interacted with the natural environment of Doukkala area according to the adequate conditions, as it has built various architectural rural housing beginning with nomadic housing like the Noala and the Tazota housing. These housing typologies constitute a material heritage. The local population has built and created various architectural rural housing drawing on cement, iron and bricks. It has adopted the container housing according to the economic and social conditions.

The architectural rural housing has become a principal element of the capital material. Doukkala is well known by the diversity of architectural housing typologies according the geometric and material methods of construction. Doukkala is characterized by ancient traditional housing such as the Noala, the Toufri, and the Tazota. However, it is also characterised by modern housing built with bricks, iron, and cement.

This study focuses on characteristics of rural architectural housing typologies in the area of Doukkala due to the shortage of studies on rural housing. That is, the topic under study is being addressed only by one study that is entitled as " Endangered building cultures in Morocco: the case of Tazota in Doukkala region" by the researchers Samia Nakkouch and Mohamed Filali (2025). However, the study did not tackle all typologies of architectural rural housing in Doukkala area. In other words, the subject has not received important studies regarding types, characteristics, and function of housing across Doukkala. Our study can be considered as a fundamental foundation for local researchers who are interested in rural housing.

1.2 Research problem and objectives of the study

Doukkala area is located in the center of morocco. Doukkala is characterized by semi-arid climate and is known by agricultural irrigation drawing on Oum Errabia valley. In Bour subsistence agriculture depends on precipitation while the agricultural in general depends on wells. The local population has interacted with the local environment of Doukkala and has created various architectural rural housing typologies that differ according the geometry, function, materials, and economic and social status. The purpose of this study is to describe typologies of traditional and modern rural housing built by the populations of Doukkala and factors for the transition towards modern housing. It also investigates the reason behind the abandonment of traditional rural housing. Moreover, this study aims to find out the procedures of the state and the local population in preserving the heritage of traditional housing in the context of the sustainable development.

To investigate the topic, the study will take fundamental and secondary questions. The main question of this research is "what are the architectural rural housing typologies and the factors behind the shift from traditional to modern housing in the area of Doukkala?" whereas the secondary questions go as follows:

- What are the characteristics of the common architectural rural housing typologies in the Doukkala area?
- What are the factors behind the transition from traditional to modern housing in the rural areas of Doukkala?
- What are the procedures taken by the state to preserve and valorise traditional housing for tourist’s attraction?

- What are the constraints the architectural rural housing is facing in Doukkala area?
- What is the nature of the constraints that the rural areas are facing? Are they structural, legal, or socio-economic?

2 Methodology

- Using the descriptive approach to describe architectural rural housing typologies in terms of forms, geometry, materials, function and classification of both the traditional and modern housing.

- Using the historical approach to study the traditional housing in terms of the history of construction and use by the people of Doukkala. This approach was used to study the factors which lead to the shift from traditional to modern housing in the area of Doukkala.

- Field research is a fundamental element of data collection to be adopted in our study. That is, it was necessary to contact the local population to identify the various architectural rural housing based on the geometric and materials of building. This paper absolutely draws on scientific articles indicating several types of rural houses in Doukkala.

- This paper directly draws on observing the rural housing forms. This terrain observation has been an opportunity to pick up pictures presenting the rural housing forms building by the local population. In order to produce thematic carts, the software Arc Gis 10.8 is used to process Google Earth imagery.

3 Results

3.1 Study area

Doukkala area is located in the center of Morocco. It is characterized by a semi-arid climate as it is penetrated by seasonal valleys taking its crucial source from the Rehamna plateau Doukkala is divided into four distinct spatial units when talking about development: Oulja part is exploited with intensive agricultural irrigation relying on wells. The Sahel part is exploited in agricultural pastoralism. The plain part is exploited in irrigated agriculture drawing on Oum Errabia valley (El aoud, 2024). The part of south-eastern margins is exploited in Bour subsistence agriculture depending on precipitation. Doukkala area is inhabited by nine tribes. Doukkala is characterized by a semi-arid climate and irregular precipitation at a rate of 266 mm according to 36 years climate series (1980/1981 a 2015/2016) (El aoud, 2024).

Doukkala has got seasonal valleys taking its source from the Rehamna plateau: The Aouja, Souani, and Bouchane, etc. Doukkala is an area that belongs to Casablanca-Settat region according the territorial division of 2015 (Figure 1).

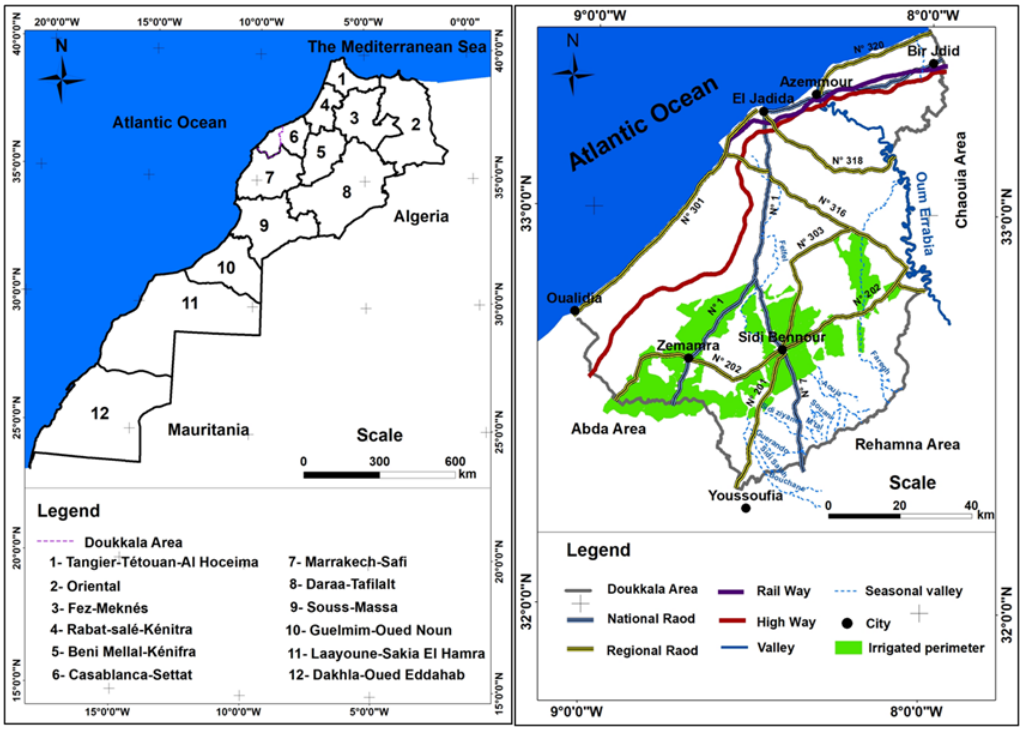

Figure 1: Doukkala as an Area in Region of Casablanca-Settat.
Source:Personal work based on Google Earth imagery, 2024 using Arc Gis 10.8 software.

Doukkala extents to11289 km2 approximately. Doukkala is divided into two provinces: El Jadida and Sidi Bennour. Doukkala is inhabited by1.366.297 million inhabitants (R.G.P.H, 2024) and nine tribes: The Aounate, Ouled Bouzerara, Ouled Amrane, Ouled Amour, Ouled Bouaziz, Ouled Frej, The Haouzia, Chtouka, and the Chiadma (Bellaire, 1932). The tribe is a homogeneous societal unit; it is characterized by interaction at the economic, social, cultural, political and organization level. The tribe is a group of people belonging to a tribal alliance or ancestor. It consists of several clans and douars; the tribe is settled in specific geographical and unified by specific regales.

The douar (Dresch, 2018) is a distinctive residential community in rural of the Doukkala area (Figure 2). The douar is the smallest administrative unit within the territorial community or province and remains under the control of The Mkadam (is a representative of the local authorities whose function is to collect information's in the Douar or Douars s/he is being assigned).

Figure 2: The Douar is a Residential Compound "Ouled Boubkar Douar as a Model".
Source:Field work, 2024.

3.2 Definition of rural architectural, housing, and rural housing

Rural architectural is the spatial and function response to local needs, especially productive and residential, closely conditioned by the agricultural context. Thus rural housing is developed in a habitable environment conditioned to the geographical context and cultural roots, being the building itself an architectural component for the transformation of the territory. The inhabitant himself generally builds his rural dwelling to live in the countryside and engage in agricultural activities (Pena-Huaman et al., 2022). The building has a directly link with the climate the economy, the materials and construction techniques.

The housing a fundamental human right, the house is the first building greated by humans, from which all others have evolved. The meaning people associate with a house is "home", it is an evolving psychological construct based on people's cultures, traditions, and personality traits. The house is first and foremost a place of connection of relationships that are fundational and life-giving (Ismail Farahat et al., 2023). The house is a place where the dwellers feel comfort into (Mousavi & Nochian, 2014).

The rural housing refers to the dwelling and residential areas located outside of cities and towns, characterized by low population density and often associated with agriculture or natural landscapes. The rural housing:

- At the level of physical characteristics, rural housing is the place occupied by buildings and their facilities; it is built from strong materials such as stones and cement or fragile materials such as reeds and wood. The rural housing takes two forms which are clustered and dispersed. The layout of rural housing varies according to the economic and social possibilities including traditional, modern or a combination of both.
- At the level of social function, the rural housing is a place for human residence in the rural setting. It is any place where one or more people can take shelter and realize all their needs such as sleeping and eating. The rural housing is a space where family decisions are made and the distributions of roles between family members take place.

- At the level of economic function, the rural housing is a space for practicing various activities such as agriculture, commerce, and industry, storage and cattle breeding.

3.3 Characteristics and Typologies of the traditional architectural rural housing in the Doukkala area

The local population has interacted to cope with the natural milieu of Doukkala, as it has built various architectural housing rural vary according to building materials, geometry, and function, and local environment, economic and human factors. This diversity has contributed to the existence of a rich variety of architectural housing: traditional rural housing built with local materials and skills associated certain time periods.

3.3.1 The Tazota housing

The name Tazota refers to an authentic dry stone building which is culturally implemented in the countryside of Doukkala (Nakkouch & Filali, 2025). The Tazota is a distinctive form of architectural traditional rural housing in the area of Doukkala. Limestone is one of the materials used in the construction of Tazota; it takes a cylindrical or square geometric form. The tazota used for human shelter, and storage, and actually the Tazota is used for tourism as an authentic and unique material heritage in the area of Doukkala.

The tazota is an ancient building its origins go back to the Roman period and was found in the Doukkala area in 15th and 16th centuries, and was associated with the Portuguese period. The Tazota in the Amazigh indicates overturned bowl (figure 3). The Tazota also refers to a place in the Middle Atlas in the vicinity of the city of Sefrou in Morocco.

Figure 3: Tazota is a Building in Doukkala Area.
Source:Field work, 2024.

The characteristics of the tazota housing vary in terms of building materials, construction, techniques, and constituent element:

- Materials and construction techniques and the elements of the tazota

✓ The materials

- The stones: The limestone is one the materials used in construction. It is a rough flat oval form. The local geological characteristics helped the existence of limestone, to constitute an essential element in the rural milieu of Doukkala. The process of extraction limestone was an essential factor in purifying the agricultural exploitation from the stones to practice agricultural activity so that the extraction process of limestone contributed the emergence of the tazota housing. The abundance of limestone and the facility of extraction also contributed to the appearance of the tazota in Doukkala area.

- Dry stone construction is an ecological and sustainable technique that requires few external materials and little energy. Dry stone remains an ecological solution for building sustainably and integrated into the paysage.

- The straw: The earthen plaster is used in the terrace of the tazota building, and the interior of tazota. The walls are paved with clay mixed straw and the straw or the sugarcane or the reeds is used in roof sealing the vaulted of the tazota building. The reeds are used in the doors and the windows of the tazota.

- The earthen plaster: The mud mortar is compacted in the form of a layer 10 to 20 centimeters; it is used in the construction of the cover and the waterproofing of interior walls, ceilings and terraces.

- The wood: The local wood is used in the manufacture of frames as well as door and windows openings.

✓ Construction techniques

The tazota is built with limestone without the use of any soil mixture to hold or assemble the stones together and ensure the stability of the construction. The binder is replaced with pebbles in different sizes, used either as wedges at the well level or as cover above the slab. These pebbles are compacted using a mallet to ensure their stability and allow the upper layer to be superior.

Before starting the construction process of the tazota housing, the stone are extracting from the agricultural exploitation, and the stones are sorted and gathered in heaps according to size: large, medium, small. The stones biggest are placed at the base of the heaps. The tazota housing takes a square or circular form, and does not require supports or foundations in the constructions process, but a few centimetres are dug into the ground or the surface to serve the as the base for the construction of the walls.

In the first step, the lower part is built containing the entrance with the stairs, and in the second step, the upper part or the vaulted is built, that the construction of the stairs is an essential element in the construction of the upper part. The height of the lower part ranges between 2.20 and 3.00 meters, and the thickness of the walls range between 1.50 and 2.80 meters. The ceiling height of the tazota varies from 4 to 6 meters. The process of building a tazota requires "The maalem" who belongs to the area and masters the construction of the tazota and then his assistants.

The walls of tazota are built with stones vertical reaching a height of 1.80 meters maximum. The stones laid at an angle of 15º to the outside, which causes the stones to slide out of tazota in case of collapse or a fall. The thickness of the walls varies between 1.50 to 2.80 meters. This thickness decreases as the facing rises.
The vaults of tazota built in a circular form using stones slanted 15° to the outside, the height of the vaults varies between 1.60 and 1.80 meters, the thickness of the vault walls varies between 0.60 and 1.20 meters, and the vault are covered with three layers: the first of cover of stone, the second of strew, and the third dust to protect tazota from infiltration of precipitation.

✓ Tazota housing elements

The tazota housing consists of the following elements:

- The stairs: The tazota of the double truncated cone has one or two external stairs on the side leading to the terrace of the upper truncated cone to spread the agricultural products in the sun for drying. Sometimes a second staircase may start at the terrace of the lower truncated cone to climb to the summit of the vault. Each step of the stairs built with stone blocks, large stones 30 to 40 centimeters wide, 50 to 60 centimeters long, and 20 centimeters high on

average. The spaces between the stones are filled with small stones or pebbles for stability. The tazota of the simple truncated cone do not contain stairs.

- The entrance: The entrance is located in the median axis of the tazota, generally orienting or facing east or southeast. The width of entrance bottom varies between 1 and 1.20 meters, and the width of the upper base between 60 and 80 centimeters. A door is made of panelled wood and fixed on a wooden frame which is attached to the entrance. It can be fixed either on the right or left side of the entrance.

- The Windows: The tazota has two types of windows: the first is a window of at least 50×50 centimeters allowing ventilation and lighting, located into the wall of the vault and the above the lintel of the door. And the second is a window of at least 30×30 centimeters, on the side wall approximately of 1 meter above the ground level. The windows provide permanent natural ventilation inside the tazota. These windows of tazota are adapted to the climatic conditions so that tazota remains cool in summer and warm in winter.

- The niches and shelves: Inside and mid-height of the vertical wall are created niches or shelves square form with a shallow depth. Most of these niches have been created after the construction by extraction of stones from the wall. The shelves are used to store kitchen utensils and other objects.

- The tazota housing faces some constraints (figure 4) such as demolition, and absence of preservation by the local population and the state in the context of sustainable development.

Figure 4: Tazota building demolished and the absence of the preservation.
Source: Field work, 2024.

3.3.2 The Toufri housing

The Toufri (local name) is a distinctive traditional rural housing in the area of Doukkala that has a rectangular or longitudinal form. The Toufri is built 3 meters underground place at a depth of about 3 meters in the ground, composed of several spaces of

regular or irregular forms, and served by a corridor at the same underground level. A slope or steps (in the form of a staircase) allow access to the place. The limestone is one of main materials which are used in the construction of the Toufri housing. The Toufri consists of an external part built with juxtaposed limestone, sloping towards outside, leaving an entrance whose base expands at the bottom and narrows at the top. The terrace of the Toufri is covered with juxtaposed limestone stones, straw materials, and earthen plaster. The exterior part forms a cover to the lower part dug underground at a depth of 3 meters (M.H.U.A.E).

The toufri is used as a place for preservation and storage of gain and straw materials (figure 5). According to research Sergio Gnesda, who specialize in vernacular architecture that is based on the use of locally available resources to realize the needs, and reflect the local environment culture and historical context in which it was found. The toufri and tazota were built in the local environment cultural and materials by the local populations without the intervention of any architect. The toufri is signified to the conservation in Berber (Gnesda, 1996).

Figure 5: The Toufri is a building in Doukkala area.
Source:Field work, 2024.

The existence of limestone and the facility of extraction are for practicing agricultural activity. The local population has gained skills to collect stones and use them in the construction of tazota and toufri. These two juxtaposing buildings exist in the same place and rural local environment.

3.3.3 The kayma (tent) housing

The Kayma (local name) or tent (Dresch, 2018) is an old traditional housing, built of dress or cloth supported by the wooden column, ropes, pegs fixed in the ground (figure 6). The tent was used as a traditional housing for settling the local populations and the nomad in the Doukkala area. The use of the Kayma began with the arrival of Arab tribes during the 14th century to Doukkala; it remained prevalent until the beginning of the 20th century. The kayma was diffusing in all circles and tribes forming Doukkala area.

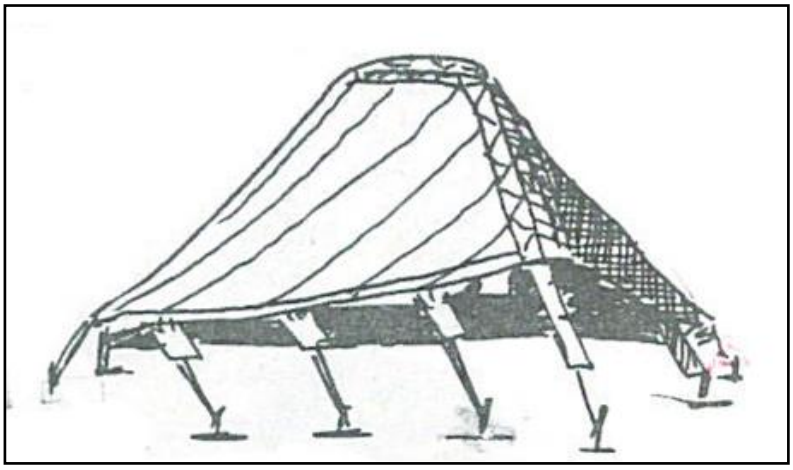

Figure 6: The Kayma Housing Form.
Source:Pascon, 1980.

The kayma housing reflects the poverty of the tribes in Doukkala area. The existence of the kayma was associated with the absence the peace. The kayma was used as a housing that helps to move in search of safe place due to fear of the Europeans colonists in Doukkala area. The local populations continued to use the kayma housing until the beginning of the 1940 despite the amelioration of economic and social situation. The name of the kayma is still rooted and circulated in the minds of Doukkala populations. Actually, the name of the kayma indicates to the traditional housing in Doukkala area

3.3.4 The Noala housing

The Noala (local name) is an ancient traditional housing with a spacious space covered with the straw (the thatch), built within dry stone walls which allow inhabitants to defend themselves against danger. These high walls (Gotha) supported by cactus barriers (Guillaume, without a year) (it takes a circular form), could be compared to the circular military tent in the form known as "The Makhzen" comparable to the ancient Numidia "The Mbalia" that gave rise to the Berber "tent", and also comparable to the housing in Black Africa.

The Noala (Dresch, 2018) housing built with thick sugarcane that is fixed in the ground in the form of a circle, and later sewn. The Noala is covered with either reeds, hay or strew, and the Noala takes the form of a cylindrical cone, and a small door and the niches for ventilation and observation.

The Noala has diffused in Doukkala area at the beginning of the 20th century (figure 7). The 1938 census accomplished by the French protectorate authorities, confirmed the importance of the Noala existence within the housing structure in Doukkala area in the 1930.

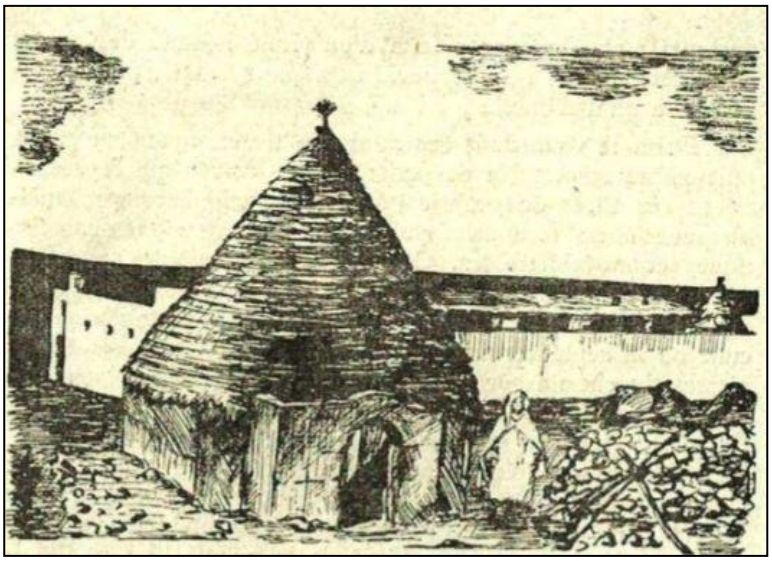

Figure 7: The Noala is Covered with the Strew (The Thatch) and Supported by the Dry Stones and Cactus.
Source: Chavent, n.d.

Actually, Doukkala area has witnessed transition in rural housing, and the function of the Noala has changed and from a housing family to housing built in agricultural exploitation for the purpose of guarding. According the terrain observation in Eastern Doukkala during 2024 (figure 8), we observed the existence of the Noala built with reed materials and covered with the hay in the territory of the khmis ksiba commune, which are used as guard and leisure housing.

Figure 8:The Noala is Covered with the Reed and the Hay in Doukkala East.
Source:Field work, 2023.

3.3.5 The Manzah housing

The Manzah (local name) is a distinctive traditional rural housing in the areas of Doukkala, associated with influential persons, or those who had authority in the government in ancient time, such as the family of the Tounsy kayd, or who had an important social place in Doukkala area. The manzah is also associated with scholars who are known for Islamic jurisprudence, such as the jurist Ben Rhaili in Doukkala east. The manzah refers to the walking as the person climbs to the second layer or floor of the manzah for the walking and see his private property.

The manzah housing (figure 9) in that period reflects the socio-economic situation of the person within the society of Doukkala. The manzah housing is built from local materials of limestone, the soil, the cement, the iron, it is paved inside and outside with clay mixed sand, the roof is covered with the wood, clay, sand and the cement. The thickness of the walls of the manzah varies between 40 and 50 centimeters, and consists of two layers (lower and upper room). The staircase is built on the side of the lower room to climb to the upper room characterized with spacious space for shelves and windows.

Figure 9:The Manzah Housing is Built by the Tounsy kayd family in Doukkala East.
Source:Field work, 2024.

In fact, the manzah housing exists in Doukkala area, but it is exposed the degradation as it has abandoned and not maintained and preserved. The manzah is considered a tangible heritage which needs the preservation.

3.3.6 The Zawiya housing

The Zawiya is a religious, scientific and social establishment rooted in Moroccan society. The Zawiya used in multiple purposes such as achieving social peace, solidarity, economy, medicine, and the study of Islamic jurisprudence such as the Zawiya Tounsiya.

The Zawiya Tounsiya is located in the Aounate tribe which is a territorial commune in province of Sidi Bennour, about 33 km east of the city of Sidi Bennour. The Zawiya Tounsiya was founded in the twelfth century (1126/1714) by the sheikh Tounsy Ben Mbarak.

The Zawiya Tounsiya was built with local materials such as limestone and soil. The exterior and interior walls were paved by the clay mixed with the sand, and the roof was covered by the wood. This zawiya consists of rooms to accommodate students, school, bookcase, and the jurist housing.

The Zawiya Tounsiya (figure 10) in that period constituted a collective housing as it had 100 rooms to accommodate students in order to study the sciences of language, grammar, the science of the Quran and everything that preserves the origins of Arab Islamic culture. Actually, this zawiya used as a collective housing by the grandson of Sidi Ahmed El Tounsy, where they spend religious and family occasions and leisure time which might take place weekly or monthly. These celebrations or occasions belong to zawiya in everything.

Figure 10: The Zawiya Tounsiy a is a Collective Housing in the Tribe of El Aounate.
Source: Field work, 2023.

The religious and scientific function of the zawiya have disappeared due to the absence of efforts to preserve this zawiya by the grandson of the Tounsy family and the state. Not only the absence of efforts but also modern schools appeared which leaded to

leaving Zawiya and enrolling in modern education. The zawiya is exposed degradation and neglection by the grandsons of Sidi Ahmed El Tounsy. It is a tangible heritage in Doukkala area that needs preservation to be sustainable heritage for the future generation.

3.3.7 The French colonial housing

Doukkala was an area of attraction and settlement for the French colonists during the Protectorate period in Morocco They settled in places with agricultural potential. These colonizers practiced the Bour cultural and the cattle such as: the colonialist Meneuze, Genin, Bertar, Jelmoud, and Fautaine. The French colonizers built rural housing associated with the farms with a local folkloric character.

The French colonialist "Fautaine" is an example in the eastern part of Doukkala area (figure 11), exactly in the basin of the Aouja valley, and he was exploiting farming agricultural of about 583 hectares. The colonialist built a rural housing in the farm agricultural consisting of a group of rooms, the stores rooms, and the equipment rooms. This housing was built with local materials of soil, limestone, and thick walls ranging between 40 and 50 centimetres tiled with mud mixed with the sand, and a roof consisting of local materials such as the wood, the Reed plant, and the soil or the dust, and surrounded by a thick wall between 40 and 80 centimeters, also tiled with mud mixed with the sand to protect the house. After Morocco independence and the departure of the colonialist Fautaine, the state reclaimed the exploitation farm, part of which was distributed to farmers and the rest part was planted with eucalyptus trees, and the forest guard became the occupant of the French colonial housing.

Figure 11: The French Colonial Housing is a Built in Doukkala Eastern Part.
Source:Field work, 2024.

This housing is a tangible heritage built with local materials, but it has been neglected and only a few traces remained due to the absence of efforts to preserve the French colonial housing. So, it must be preserved for future generations as a very important aspect of culture and history of Morocco.

3.3.8 The traditional housing

Doukkala area is characterized by a variety of forms of architectural traditional housing according to the building materials used. We distinguish between three forms of traditional housing: The first form is earthen plaster brick housing whereas the second one is limestone housing. However, the third one is schist stone housing.

- **Earthen plaster brick housing**

The brick housing is a traditional housing built from the bricks made from local earthen plaster, (figure 12).This housing is diffused in some the douars such as the douar of Ouled Taleb. The brick housing is used by humans and animals. This housing is traditionally built and requires local skills in construction operations. The walls of the houses are characterized by a weak thickness of between15 and 20 centimetres whereas the roof is covered by light materials such as reeds, the wood and the plastic with a layer of dust. However, the walls are tiled internally and externally with the same building materials. The brick housing consists of sleeping rooms, kitchen, and toilet. This housing does require neither the cement, the iron, nor the supports in the construction operations.

Figure 12: The Brick Housing is Defused in the Douar Ouled Taleb in Doukkala Area.
Source:Field work, 2024.

The brick housing is characterized by poor resistance to natural conditions such as the precipitation, and is also characterized by the fragility of the materials, especially the bricks made from the flood soil. This housing needs to be maintained and controlled continuously.

- **The Limestone housing**

The limestone housing (figure 13) is considered the most defused in Doukkala area, built with white-collared lime stone. Its walls are built with limestone stones tightened with the soil. The thickness of the walls varies between 40 and 50 centimeters. This type of housing does not need supports or tiling sometimes, especially the exterior face of the wall, and the interior walls are tiled either with the mud mixed with the sand, cement mixed with the sand. The limestone housing consists of bedrooms, kitchen, the storage rooms, the stables, and one entrance for humans and animals. The roof is made with reeds, wood and plastic with a layer of soil, iron, sand and gravel mixed with the cement.

The limestone housing was built without recourse to documents or design by an architect, but built according the decisions and engineering of the local population. This housing is built with limestone stones that reflect the local environment or the milieu as these limestone stones are either extraction locally or importation from other areas. This housing is built by people who are specialized in the construction "The Maalam (local name that refers to a professional person)" and his assistants. This housing is built according to the available materials.

Actually, the limestone housing has undergone an important transformation in construction materials as the roof is made with cement and iron materials whereas the walls are built with cement bricks and sand. There is also an integration of the local and non-local materials or the transformations towards to modern housing. These factors have impacted on the traditional housing which results in losing the identity and the local specificity. The limestone housing is characterized by robustness, resistance and sustainability, and housing adaption to climatic conditions.

Figure 13:The Traditional Housing is Built by the Limestone Stones in Doukkala Area. Source:Field work, 2024.

- **The Schist stone housing**

The housing built with gray-coloured schist stones are considered the least defused in Doukkala area as it is defused in limited spaces, especially in the eastern part of the Doukkala area along the Rhamna plateau. The schist housing (figure 14) is built with schist stones mixed with clay. It is characterized by thick walls ranging between 40 and 50 centimeters, and the roof covered by the reeds, wood, and a layer of soil, or cement and iron that are used in the roof and the walls. The latter is paved with cement and sand. The exterior face of the walls does not need tiling or supports of the construction. This housing is built by a specialized person in the schist stone construction (The Maalam) and his assistants. The schist housing is characterized by solidity, sustainability, and resistance to natural conditions such as the precipitation. The schist housing is similar to limestone housing in terms of geometric form function. It reflects the impact of the local environment, because the schist stone is a locally extraction material.

Figure 14: The Schist Housing is built by Locally Extraction Stones in Ouled Jarrar part.
Source:Field work, 2024.

The schist housing is a tangible heritage built by local materials, but in the actually period, the local population is transformation to modern housing built from non-local materials, despite the complexity of the legal process of obtaining building permits.

3.4 The fragile rural housing: characteristics and typologies

The fragile Rural housing is built from materials such as reeds, hay and tree branches. This housing is widespread in the Doukkala area. This housing, on the one hand, is associated with socio-economic factors such as poverty and lack of materials. On the other hand, security factors are associated with guarding agricultural exploitation. However, the legal factors are the refusal of public authorities to grant building permits which result in resorting to the use of fragile materials as an alternative solution. The fragile rural housing is characterized by diverse characteristics in terms of forms, geometry, materials, and function.

3.4.1 The Laazib housing

The Laazib (local name) is a fragile housing, which has spread in Doukkala area. The Laazib is associated the phenomenon of pastoralism during the seasons of the year. The Doukkala area is known since ancient times for its pastoral-agricultural activity with poor resources, so that the laazib housing is element of the strategies of the farmer drawing on the cattle activity for to reduce from the risk such as the deficiency of the pasture. The Laazib housing is used as a shelter for humans and the cattle, and we distinguish two different types of the Laazib:

- **The Temporary laazib housing**

The temporary laazib (figure 15) is associated with specific periods of time during the year especially when there is the deficiency pasture in the exploitation associated with the fundamental housing. The farmer moves the cattle to another exploitation characterized by the pasture abundance by either individual or collective the property. The farmer built laazib housing by mixed local materials such as reeds, wood, fences, and built the corral or "The Zriba" (local name) for the cattle, and a place or house for the shepherd. According the terrain observations, the temporary laazib is most spread in summer especially in the east of Doukkala area.

Figure 15: The temporary Laazib Housing is Built with the Corral and House of the Shepherd.
Source:Field work, 2024.

- **The Permanent laazib housing**

The permanent laazib is characterized by the permanent stability which is built far from the fundamental housing. The laazib is built by the solidity materials such as limestone, schist or bricks; sometimes it is built with fragile materials such as reeds, wood, and sider (Ziziphus spina-christi). This housing (figure 16) is associated with some structures and equipments such as the corral, the well, and the hay pile. The farmer is linked to the laazib housing in daily movements between the fundamental housing and the laazib housing.

Figure 16: The Permanent Laazib Housing is Built with Fragile Materials and Linked to the Well.
Source:Field work, 2024.

3.4.2 The Aacha housing

The Aacha (local name) is a fragile housing similar to the Noala housing in terms of the construction; it is built with mixed materials such as reeds and tree branches. The roof is covered with straw or plastic. The aacha housing is classified as temporary housing. The aacha is inhabited by one or two persons either permanently or temporarily for guarding the agricultural exploitation. The aacha is built in agricultural exploitation that is far from the fundamental housing to control or protect the cultivation from planting to harvesting. The construction of the aacha reduces the moves between the fundamental housing and the agricultural exploitation in the rural areas. The aacha housing (figure 17) can be transformed into a permanent or fundamental housing when it is provided by a well and its equipments such as solar panels in case the person is obligated live in the aacha permanently to guard the well and practices the agricultural activity. According the terrain observations, we confirm that the aacha is the most spread during the spring and summer season in Doukkala area.

Figure 17: The Aacha Housing is Built with Mixed Fragile Materials in Doukkala East.
Source: Field work, 2024.

3.4.3 The Fades housing

The fades housing (figure 18) has transformed from cities to rural areas; it is built from different materials such as tin, wood, bricks, and plastic. The fades housing is inhabited by one person or a family. It is sometimes associated with a specific activity such as selling building materials or equipments of wells. According the terrain observations, many persons built the fades housing so that they faced difficulties in obtaining a building permit from the local authorities. In this case, the person initiates the construction of the fades housing as a camouflage for local authorities.

Figure 18: The Fades Housing is Built with Mixed Materials in Doukkala East.
Source:Field work, 2024.

The fades housing consists of bedroom, reception room, kitchen, the storage, the stables, and some tree planting. This housing is characterized by the faiblesse resistance to natural conditions such as the precipitation and the temperature, and needs constant maintenance and control.

3.5 Characteristics and Typologies of architectural rural housing modern and transformations in the Doukkala area

The architectural modern housing is widespread in the Doukkala area, and is associated with the economic, social, spatial... factors. This housing is built from modern's materials such as cement, cement bricks, iron... this housing is characterized by several characteristics in terms of form, geometry, building materials and the function.

3.5.1 The container housing

The container housing is spread in Doukkala area, and is associated with the amelioration of the economic and social conditions. The container consists of one room equipped with air conditioning and fossil electricity or solar energy. The characteristics of the container housing are the transformation facility and resistance of the natural conditions such as precipitation and wind. This housing (figure 19) is inhabited by one person or more for guarding the agricultural exploitation or controlling plants from

growth to harvest. The container housing is used by the rich people since it is very expensive when compared to the Noala or the aacha housing in the construction costs.

Figure 19: The Container Housing is Built in the Farm of Ben Sahraoui in Doukkala East.
Source:Field work, 2024.

3.5.2 The Modern housing

Doukkala area has witnessed economic and social transformations which were manifested in architectural rural housing. The transformation from the traditional housing to modern housing built either with a mixture of local and non-local materials or built with non-local materials such as cement bricks, sand, and iron. This housing (figure 20) is characterized by thin walls ranging between 15 and 20 centimeters. The walls are paved from the inside and outside to resist precipitation. However, the roof is built with cement, iron, and sand. The modern housing consists of either one or two layers with a terrace for drying clothes. It also contains a bedroom, reception, and kitchen. This housing does not require a large area for construction which sometimes does not exceed 100 m2 compared to the limestone housing or the traditional housing, which may exceed 1000 m2.

Figure 20: The Modern Housing is Built with two Layers in the agricultural exploitation. Source:Field work, 2024.

The modern housing is built either by local population or non-local individuals settling in cities for leisure. It is often surrounded by either a cement brick wall or an iron fence and tree plantations. It is also equipped with surveillance cameras. The function of this housing is limited to shelter only and sometimes is not related or unattached to the stables. Through terrain observation in east Doukkala, we have noticed that modern housing has begun to spread in the rural areas of Doukkala, and has become juxtaposed to traditional housing.

3.5.3 The Modern sophisticated housing

The modern sophisticated housing is associated with rich persons; it is classified in the bragging housing manifesting the social level of the person or the status of the person in the local society of Doukkala. This type of housing has become spread in the Doukkala area, built by either local residents or from other regions; it takes villas or palaces and luxury decorations. The modern sophisticated housing is either built with mixed components that are local or non-local materials; it consists of one layer and decorated with gypsum and tiles. This housing contains rooms, sitting room, bathrooms, cistern, private well, private guard and various plants. The modern sophisticated housing (figure 21) is surrounded by a wall built either of stones or bricks. The person may settle in this housing permanently. The person's moves to the housing might be weekly or monthly.

Figure 21: The Modern Sophisticated Housing is built by Ben Sahraoui in the agricultural exploitation.
Source: Field work, 2024.

The Doukkala area has witnessed a dynamic in architectural rural housing (figure 22), and the result is an integration of traditional and modern housing in the douars of the Doukkala area.

Figure 22: Integration between architectural rural housings in the douars.
Source:Field work, 2025.

4 Discussion and contribution

The area of Doukkala is known by three typologies of architectural rural housing which are traditional, fragile and modern:

- The architectural traditional housing is characterized by its diversity in terms of form, geometry and building materials which was used by the populations of Doukkala for multiple functions. This housing, including the Tazota and toufri, is now an architectural heritage that is used as a tourist attraction for its economic,

social and spatial implications. However, the old traditional housing has been exposed to negligence and deterioration.

- The fragile housing is built from fragile materials such as reeds, tree branches and straw and is classified as temporary housing. This housing is used for multiple functions such as guarding, the nomadic, and selling some agricultural materials or building materials and as a person housing. The fragile housing is widespread in Doukkala area such as the aacha and the laazib housing, but it had been exposed to degradation causes due to natural factors and the nature of the fragile materials
- In brief, Doukkala area has witnessed the transformations in the architectural rural housing. The local population is transferred towards the modern housing built with the local materials or non-material. This mutation is associated with multiple factors:
    - The amelioration of the economic and social situation of Doukkala population.
    - Doukkala benefited from the hydro-amenagement project in 1950, which practiced the cultivation of value-additional such as sugar beet, alfalfa.
    - The emergence of the well irrigation or exploitation of the phreatic table, which practiced the cultivation of value-additional such as alfalfa, onions, potatoes, tomatoes, the miller.
    - Internal and external migration, these migrants build modern housing or transform traditional housing to modern housing as a result of their ameliorated social status.
    - The emergence of secondary housing built by persons living in cities.
    - The emergence of local actors who invested in Doukkala and built luxurious housing.

These factors have contributed to the transitions towards architectural modern housing and relative abandonment of traditional housing. The shift toward modern housing has several economic, social and environmental drawbacks such as reducing agricultural space and agricultural production in the rural area of Doukkala.

The architectural rural housing faces some constraints such as the tazota and Toufri housing that have been exposed to deterioration and demolition. The absence of the maintenance and preservation of traditional housing heritage in Doukkala area is another factor. The state intervention was limited to preserving some Tazotas that are used in tourist attractions. The architectural of modern rural housing also faces several constraints such as the complexity of the process of obtaining a building permit from public authorities, but in this case, the local populations opt for the fades housing or the secret building in the rural of Doukkala area.

This study contributes to enriching academic research as there is an absence of scientific articles and studies that refer to all typologies of architectural rural housing in English. This study constitutes a fundamental base for local geographers interested in subjects related to rural housing, architectural heritage, and rural tourism.

This study contributes to the importance of preserving architectural rural housing as a material-cultural heritage that has economic, social and identity value. The state must preserve this architectural heritage as it is a crucial part in the sustainable development of Morocco. We hope this study has been a real contribution in a way or another to shed some lights on this material culture.

5 Conclusion

Doukkala area has an interesting diversity of architectural rural housing which varies in terms of form, geometry, and materials used in the construction and the available conditions. The environmental, economic, and social conditions provide an indispensable factor in the diversity and the geographical distribution of the housing in Doukkala area. The housing plays multiple roles such as sheltering humans and animals and practicing various functions including industry, agriculture. The local population has created innovative housings such as Tazota, Toufri, Manzah and modern sophisticated housing.

The tazota, Toufri and the Noala are example of these housings, because they require the local skills in the construction process. Moreover, they are built with original local materials which reflect the local and rural environment such as the limestone. In fact, this housing attracts tourists as it is a very important architectural heritage.

At the end of this study, I suggest some recommendations:

- Preserving the heritage of architectural rural housing as a part and parcel of sustainable development
- Reconstructing the dilapidated houses.
- Sensitizing the local population to the importance of preserving the heritage of architectural rural housing.
- Valorising the heritage of architectural rural housing through making Tazotas and Toufri attractive destinations for tourists.
- Encouraging rural tourism to explore the heritage of architectural rural housing through providing suitable services near those destinations
- Controlling the expansion of modern housing construction.
- Preventing the construction of modern rural housing at the expense of agricultural space

List of abbreviations:

- R.G.P.H: Recensement général de la population et de l'habitat.

- M.H.U.A.E: Ministère de la l'habitat de l'urbanisme et de la l'aménagement de l'espace

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Povzetek

Regija Doukkala se nahaja v osrednjem Maroku. Zanjo je značilno polsuho podnebje. Glede na razvoj jo delimo na štiri prostorske enote: del Oulja zaznamuje intenzivno namakalno kmetijstvo, ki temelji na vodnjakih; del Sahel temelji na pašni živinoreji; ravninski del temelji na namakalnem kmetijstvu v dolini reke Oum Errabia; jugovzhodni rob pa se opira na samooskrbno kmetijstvo (Bour), ki je odvisno od padavin. Doukkalo naseljuje devet plemen, ki živijo v sožitju z naravnim okoljem. Ta plemena so oblikovala različne tipe podeželskih bivališč, ki se razlikujejo po obliki, materialih, geometriji in funkcijah.

Regijo Doukkala zaznamujejo trije tipi podeželske arhitekture. Prvi tip je tradicionalna arhitekturna podeželska hiša, zgrajena iz lokalnih materialov in znanj. Primeri so bivališča Tazota, Toufri, Manzah, francoska kolonialna hiša, Zawiya, Noala in šotor Kayma. Ti tipi bivališč predstavljajo otipljivo kulturno dediščino območja Doukkala. Drugi tip je »krhka« arhitektura, zgrajena iz nestabilnih materialov, kot so trstika, seno in veje; tovrstna bivališča (Aacha, Laazib, Fades) so začasna. Tretji tip pa predstavlja sodobna arhitektura, zgrajena iz lokalnih in nelokalnih sodobnih materialov, kot so cement, betonske opeke in železo. Ta tip se vse bolj vključuje v tradicionalna in krhka bivališča po vaseh (douarih). Primeri vključujejo sodobno hišo in kontejnersko hišo.

Regija Doukkala je doživela dinamičen prehod v arhitekturnem razvoju, saj se lokalno prebivalstvo vse bolj usmerja k sodobnim oblikam bivališč. Ta prehod je povezan z izboljšanjem gospodarskega in socialnega položaja prebivalcev Doukkale.

Namen te študije je prispevati k mednarodnim akademskim razpravam, saj primanjkuje znanstvenih člankov v angleščini, ki bi obravnavali vse tipe podeželske arhitekture. Študija poudarja pomen ohranjanja podeželske arhitekture kot materialno-kulturne dediščine z gospodarsko, družbeno in identitetno vrednostjo. Maroška država bi morala bolje zaščititi to dediščino in spodbujati razvoj podeželskega turizma za doseganje trajnostnega razvoja.