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PALESTINIAN DRY STONE STRUCTURES- AN ENDOGENOUS EXPRESSION OF CULTURAL LANDSCAPE

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Abstract

This paper aims to discuss the case of an existing architectural feature in the Palestinian environment: the Palestinian dry-stone structures within the larger framework of the historical development of the cultural landscape across Palestine. The current status of these structures is quite alarming, due to several factors, mainly the rapid modernization of the Palestinian community, the largely unorganized urban expansion seen on the area, lack of public awareness and the declining importance of agricultural activity within the Palestinian society and of course the continuing Arab-Israeli conflict. As a result, a large number of these agricultural structures in this area have been abandoned and destroyed over the past few decades.

Thus, the paper will analyse the characteristics and importance of this structure through a review of literature in this field, and provides an analysis of the Palestinian case in particular. Areas of focus include the importance of the dry stone structures and its role in Palestinian agricultural development and the culture generally, its architectural structure, patterns and types, and the materials and techniques of its construction. Furthermore, the paper illustrates the status and condition of the surviving structures and concludes with the future challenges and potentials of their preservation and development.

Keywords: *Dry-stone hut, retaining walls, corbelled stone construction, Mediterranean architecture, Palestinian traditional architecture.*

Introduction

Throughout the Mediterranean region, most of whose countries possess ample amounts of stone, traditional dry-stone architecture was exceptionally common and gathering the material had the added benefit of producing clean, tillable fields for agriculture. As a result of the profusion of different varieties of stone in these Mediterranean lands, the local people used this material for constructing their shelters, terrace walls, fences and monuments, benefiting from each variety's particular aesthetic, physical and geological characteristics (Houdalieh & Ghadban 2013).

Being part of this Mediterranean region, Historical Palestine enjoys a rich diversity of architectural features spreading across its landscape. These manmade elements employ a variety of building materials, with stone certainly being the oldest most widespread. Due to the abundance of dry-stone constructions, these structures are considered as main components of the complete model of local dry-stone architecture, which consists mainly of the traditional house, the watchtower (*Al-mantarah*), the retaining walls and the agricultural terraces they form and the open animal barns (Figure 1), all with significant use in agricultural activities. Whether of Mediterranean origin or not, these cultural structures dotting the Palestinian

landscape embody much about the local peoples and cultures, their needs, mental processes and knowledge base, stretching over many centuries. As such, they have proven to be a key landscape and architectural element, one that reflects the earliest modes of living and ways of thinking about and utilizing the landscape.



a



b



c



d

Images showing basic components of the complete model of local dry-stone architecture in Palestine: a) the retaining walls and the agricultural terraces they form, b) the watchtower (*Al-mantarah, hut*), c) the underground water cistern and d) the olive oil press, all with significant use in agricultural activities

These constructions have long dotted the terrain and traced the contours of the central mountainous region forming the heart of the country, extending from Ramallah to Hebron. Therefore, they constitute excellent examples of the traditional local architecture, reflecting a now largely lost way of life and conveying a sense of the day-to-day activities associated with this area (Ghadban 2012). Although many such features are presumed to have existed from late prehistory into the early historical periods (ninth to fourth millennia BCE), modern archaeological and survey work throughout Palestine have actually documented very few of them. The absence of these hypothetical constructions, however, would be due to the repeated, heavy use of the land throughout antiquity, not to mention natural forces like earthquakes and the decay or weathering away of the organic building materials (Houdalieh & Ghadban 2013).

The Palestinian dry-stone structures are traditional features that have developed architecturally over time in order to accommodate the farmer and his family. This form of traditional architecture spread throughout the entire Palestinian landscape, and follows closely the composition of the traditional Mediterranean architecture that has been a product of the larger cultural development along the eastern shore of the Mediterranean basin caused by the historical events that repeatedly produced great dislocation and mixing of ethnic groups. One result has been diverse populations— having different governing systems, customs and other cultural traditions— living very close together. In this way, the necessary conditions were established for mutual influence to take place, during the process of the formation, development and enrichment of inventive traditions and values (Ghadban, 2008).

It is worth mentioning that, despite their importance, nowadays, these structures are not given the attention and consideration they deserve. Following the division of Mandate Palestine in 1948 and the establishment of Israel, these structures were still frequently occupied and well used by their owners. However, and mainly after the Arab-Israeli war in 1967, the situation has changed. During the last decades, several factors influenced and some of them will continue to influence the current situation of these structures, such as: the ongoing Israeli practice of confiscating large amounts of Palestinian agricultural land and, especially, expanding the settlement's activity and building the separation wall, the Israeli continuing policy of maintaining Palestine's dependency on the Israeli economy, the continuously declining importance of agricultural activity, the involvement of more Palestinian people, including farmers, in administrative and governmental jobs, the continuing rapid and largely sprawl urban expansion that still consuming more agricultural land, introducing a new culture in addition to the existing local one and contributing to the destruction of more and more traditional structures in the area, including dry-stone structures. Thus, many agricultural lands were left abandoned and vulnerable, along with their distinctive, traditional dry-stone structures. Just as traditional agricultural practices are disappearing from the present-day life of the Palestinian villagers, so the importance of such constructions, and the attention paid to them, became also warning.

The aim of this study is to discuss the current situation of the dry-stone structures within Palestinian context, to discuss their role in the development of local agriculture in Palestine, to show their present status and conditions, to describe their characteristics in terms of location, structure, form, methods and techniques of construction, and to assess the value they hold in terms of cultural heritage and to see what measures are needed to the processes of their preservation and development.

For this purpose, the methodology implemented in this study included site visits, especially in the mountainous area of Palestine, to observe and document several dry-stone structures within these areas and to interview a number of people, both elders and younger to elicit their experiences with these structures. It also included a discussion of the development of the Palestinian dry-stone structures in a Mediterranean context through surveying of the existing literature related to the historical and ethnographic development of these features. In addition, a review has been made of the few studies that have been produced by scholars on Palestinian traditional architecture (A'rraf, 1985; Hamdan, 1996; Ghadban, 2008 and 2012 and Houdalieh & Ghadban 2013). Finally, an analyse of the Palestinian dry-stone structures in terms of history, location and density, cycle of life, spatial zoning, forms, materials and techniques has been done.

Several constrains occurred throughout the study, such as: the absence of a coherent documentation of the development of these structures, the risk of collapse of several structures due to their bad deteriorative condition and finally the absence of people with direct visual contact with the entire process of foundation of these structures.

Dry-Stone Structures

The vernacular dry-stone architecture evolved over time to reflect the environmental, cultural and historical context in which it exists. It has been constantly shaped by the traditions and customs of peoples and it thus reveals their ways of living, since all forms of traditional dry-stone structures were created in order to meet certain needs of the population in ways that reflect their values and accommodate their ways of living (Holm, 2006).

The traditional dry-stone structures were an especially common feature of this vernacular way of living, mainly around the Mediterranean basin. Due to the profusion of limestone in the Mediterranean countries, as well as the desired physical and aesthetic

characteristics of this material, the local peoples used it widely for constructing their dwellings, terrace walls, fences, monuments...etc.

A review of what is known as dry stone structures –their history, development, functions, forms and construction makes possible a better understanding of how these structures relate to the traditional stone structures found elsewhere, among other lands and cultures. Whether demonstrably Mediterranean in origin or not, these traditional structures are a result of complex mental processes, shaped by the available knowledge, the everyday needs of people and thus embody much about those who built them. Even more, they have shown to be a key architectural element that reflects the earliest modes of thinking of local ancestors and their way of life (Ghadban, 2012).

Originally, shepherds and peasants upon the agricultural terraces following the contours of the mountains and valleys (Fedele, 1965) constructed the dry-stone structures. These structures originated mainly in the Near East of the Mediterranean Basin probably at the beginning of the Early Bronze Age (2300- 1600 BCE). A dry-stone form consists of a linear, circular or quadrilateral arrangement of courses composed with corbelled stones; they were built either, linear to level the land, as freestanding to form shelter, as open barn or forming a continuous wall bordering the fields.

Juvanec (1998) claims that the main function of the dry-stone structures was as a shelter that provided a cool, shaded place for the peasant or field worker, and protected the occupants from wind, rain, sun, cold, heat and enemies. Watching was another main function of this shaded place, especially in Palestine, Spain and Malta, thus they were located on elevated spots with a view overlooking the nearby pasture and agricultural areas (Lassure, 2000). Horvatic (1999) discussed another form of their use as animal barns. Houdalieh and Ghadban (2013) examined the terraced walls in the quarter of A'in Qinia, next to Ramallah in Palestine and concluded that the major use of these structures has been for levelling the land, defining the borders of land parcels and/ or for domestic purposes (Figure 2). Dry-stone structures were also used for hunting, for example, the bird hunters used to shield themselves within unroofed circular structures in order to observe and hunt the birds in the surrounding area as in Malta and Catalunya. Likewise, they were also used for defence in Scotland and Ireland and for storing the crops, especially grains, in South Africa and many other countries (Juvanec, 2001).



The agricultural terraces in the in the fringes of Ramallah in Palestine, where terraced walls, with various dimensions, have been used for levelling the land and defining the borders of land parcels. A corbelled stone hut is built at a moderate height on the slope of the hills.

This brief review shows that the spread of these structures extended beyond the Mediterranean region to reach Ireland, England and even countries in southern Africa and Yemen. Walton (1951) reviewed two routes for the spread of the dry-stone hut (shelter), both originating from the Mediterranean and they are well defined. The first route shows the spread of corbelled huts from Italy westward through Sardinia, towards Spain and Portugal, then reaching to Western England, Wales and Ireland, and finally to Scandinavia. The second route follows an opposite direction towards the east, where these structures spread to Greece, and then southwards ultimately reaching South Africa or the "Orange Free State" as the area was then known. The route of spread to South Africa can be no more than a hypothesis until examples of such structures are discovered in the mountainous area of Yemen, in Ethiopia and Sudan at the beginning of the Twentieth Century.

The basic structures evolved of dry-laid stone, a form of construction often called "corbelled stone", which have been found scattered throughout the Mediterranean countries (In corbelling, each successive course of stone was offset toward the inside until the resulting structure, either linear or circular, could be achieved, thus producing the desired form of the dry-stone structure: hut, terrace wall, barns...etc. They originated mainly in southern Italy around the beginning of the Early Bronze Age (2300-1600 BCE) but are also documented in France, Malta, Spain, Croatia, Catalonia, Tunisia (Cassar, 1961: pp 65- 68) and in Palestine (Juvanec, 2001: p5). They were built either as freestanding structures or linked with stone-walled terraces bordering the fields (Walton, 1962: pp 33- 34) and originally constructed from limestone. Generally, the dry-stone structures were constructed using a dry-stone corbelling technique without any materials to bind stones together. For instance, Juvanec (2003) discussed four possible methods of construction a watchtower (hut), using patterns from four different European sites. He concluded that the corbelled constructions include 5 elements: the outer wall, the revetment wall, the corbelled vault, the infill material and the keystone. While in the other forms of use, the corbelling technique was mainly in a shape of freestanding double-face wall or retaining wall with wide lower part to counterforce the earth pressure generated as a result of levelling the land for agricultural purposes.

Many Palestinian provinces, underwent a slow process of modernization beginning in the mid-Nineteenth Century, and provoked by the Ottoman land reforms started in 1839-1840. Thereafter, they were increasingly exposed to Western culture and technology, a fact that produced fundamental changes in the nature of the local society and traditional culture and reflected a new matrix of needs, desires and modes of living. Some of the results were: fundamental changes in land tenure; the creation of modern state institutions; large-scale movement of people, both internal migration – particularly a slow process of urbanization – and emigration to other lands; changes in the occupational structure of the local population; a gradual exacerbation of social conflicts and inequities; and a growing integration of the local economy into world trade markets. In short, the increasing European influence led to the formation and dissemination of a new culture, superimposed as it were upon the prevailing traditional one (Al-Houdalieh and Sauders, 2009: pp 3-8).

Due to this economic enhancement, local urban structures started expanding their borders and this process of expansion and growth impacted the landscape and its agricultural terraces on the outskirts of the built up areas. The dry-stone structures, as a key element within this landscape context, experienced innovative modernization in terms of shape, structure, methods and technologies of construction, however they maintained their role as basic components for improving the quality of the agricultural land and even expanded that role, being used now for improving the living and working ambient of the peasants in certain cases.

Up until the 1948 Arab-Israeli War and the resulting division of historic Palestine, the dry-stone structures were frequently maintained and well-utilized. After that year, however,

the situation changed, and many agricultural lands were abandoned due to socio-economic and political forces. Consequently, the importance of agriculture as the key economic resource started to decline, and a large number of the area residents found themselves facing an uncertain political present and an equally ambiguous future.

These and other factors resulted in many agricultural lands being left abandoned and thus threatened with ruin. Most of the dry-stone structures in the Palestinian territories, although they were still used occasionally up until the end of the 1980s, are currently unoccupied, often damaged and in some cases totally destroyed. Certainly, the younger generations of Palestinians are not very aware of their presence as features in the Palestinian landscape or their historical and cultural significance.

Analysis and Discussion

The Palestinian dry-stone structures, share various qualities of the Mediterranean corbelled stone elements, and they are considered one of the most interesting Palestinian architectural phenomena and presenting a unique symbol of the people's relation to the landscape: their need for grazing lands and clear fertile fields, their rituals of agriculture and how they observed the passing of the seasons.

The first stone constructions known to have appeared in Palestine were discovered in the Natufian settlement of *E'in-Malha* (Eynan) in the north of Palestine, dated to ca. 8,000 BCE, where a village of circular corbelled stone huts with stone foundations was built. The inhabitants of *E'in-Malha* village also buried their dead in circular stone structures, similar to the houses in which they lived (Callaway, 1963: 76). Those primitive burials represented a kind of residence for the deceased, one which held all his needs, protected his body from wild animals, and identified his resting place, since death was viewed as a process of transition to another life. It is believed that corbelled stone structures, especially the watchtowers (huts) actually originated from those burials.

However, still there is no concrete evidence regarding when exactly the dry-stone structures first appeared. Most likely, their appearance coincided with the beginning of settled agriculture itself, which reaches back several thousand years before the present. Modern archaeological and survey works throughout Palestine (PECDAR, 1994) show that the dry-stone structures, mainly the peasant hut, with its dry-stone structure, exist on areas with specific archaeological sites, such as the cases in *'Ain-Qinia* village next to the city of *Ramallah*, *Al-Makhrour* Mountain next to the city of *Beit Jala* and the entire agricultural fringes of *Hebron city*. A very few of the many agricultural huts and terraces presumed to have existed from late prehistory into the early historical periods (ninth to fourth millennium BCE). However, the absence of these hypothetical constructions would be due to the repeated, heavy use of the land throughout antiquity, not to mention natural forces like earthquakes and the decay or weathering away of the organic building materials. Hence, the dry-stone structures are a main component in the complete model of the local landscape and its architecture, which consists mainly of the peasant house, the huts, the terrace walls, the open animal barns and the agricultural terraces.

The **location and density** of the dry-stone structures in the entire mountainous region of Palestinian territories have been influenced by several factors, they are: 1) the need for grazing lands and clear fertile fields, 2) safeguarding the crops, animals and fruits, 3) availability of sufficient quantities of stone, 4) the agro-climate and bio-climate necessary for the production cycle in each area 5) the distance from the living place to the agricultural field, and 6) the socio-economical factor that emerged from the increasing number of the people working in the agricultural sector, due to the consecutive division of properties among heirs.

All these factors provoked awareness towards agriculture increasing the area of fruit and crops fields, which by default led to increment in the number of the dry-stone structures. For example, the dry-stone huts (watchtowers) are situated geographically either on the summits of the mountains, or at intermediate levels on the slopes of the hills, and in flat areas in the valleys. Their placement reflects differences in the size of the various parcels of land, with each property, regardless of its size, usually containing a single hut. Thus, the distances between the huts reflect to a large degree the size of the individual properties. Placement of the huts was also affected by the necessity to define the proper situation and to choose the suitable environment for allocating these structures, as the placement of the huts parallel to the contour lines of the slope towards the valley makes their face toward the prevailing wind direction and that ensures the desired ventilation. Yet, the issues of ownership, protection from various natural and man-made threats, proximity to a watercourse and the desire for social contact versus the value of privacy were the major motivations behind the sitting of the huts.

The available statistics show that two forms of the dry-stone structures, mainly the corbelled stone hut and the agricultural terraced walls—beyond their undeniable rustic charm—played a key role in supporting the Palestinian culture and economy. They always have been closely related to Palestinian agriculture, which for centuries was the most common day-to-day activity and the one, which the local inhabitants depended upon most heavily as the basis of their economy (A'rraf, 1985). Ron (1976) indicated that in 1974 the occupied West Bank of Palestine contained 7715 huts, mainly built by corbelled stone techniques, distributed over an area of 412.5km², in addition to a huge number and length of terrace walls. He asserted that in 1945, the total number of the huts in the agricultural land was 5499 huts distributed over an area of 103.9km².

Apparently, the dry-stone constructions were associated with the yearly *peasant's cycle of life* in the country, since the need to terrace and improve the quality of the fields both for agricultural and livestock activities, watch and protect the cultivated land against animals and thieves; provide a cool, shady nook for the field workers and herdsman during hot summer days; protect people from wild animals and inclement weather, socialize with their neighbours in the field and to afford their owners an alternate living space for staying temporarily at a distance from their homes (Shehadeh, 2008). This was especially evident in the villages of the semi-arid central mountain areas—the environs of Ramallah, Jerusalem, Bethlehem and Hebron (Figure 3). The annual agricultural cycle in these regions was and still is marked by three seasons: 1) the early fruit and grain harvest, which takes place in May and June, 2) the season for gathering figs and harvesting the grape-vines, starting in July and extending until the end of September and 3) the olive harvesting season which takes place mainly during October and November. During these seasons the dry-stone terraced walls were essential in providing a suitable working conditions enabling the farmer to work in his land. As accommodation, the corbelled stone huts solved the problem of long distances separating some of the fields and the settled village; the distances between the village proper and its outlying agricultural lands were often between 4 and 6km, and the travel time (over irregular terrain) could be 2 to 4 hours (Hamdan, 1996: 228). These distances were too far to be traversed on a daily basis at a time when the only means of transport were either by foot or on an animal's back.

These huts also provided a nearby, convenient place for producing and storing the crops, usually within the ground-floor level of the hut until they could be transported or processed. It also served to enhance the quality of certain agricultural products, since some crops were handled right on the site. For example, presses were established close to this hut, allowing farmers to process their olives and grapes in timely fashion. Other fruits were spread across the yard areas or on the top of the roofs to dry, as a method of preservation, and then

stored inside. The internal environment of the hut was very conducive to such storage, since the inside/outside temperature differential of these structures at that time ranges between 8°C and 15°C, depending on the time of day (Ron, 1976:76). Corbelled stone hut thus facilitated the processing of certain crops, such as drying grapes into raisins, preserving figs, crushing and pressing olives into oil, and the pressing of grapes into juice, dibs (a thick fruit syrup), or wine (the latter was very common in the Bethlehem region, where grapes grew in abundance and the majority of the population was Christian). Afterward, the stored crops or finished produce were transported for trade or domestic use.



a



b



c



d

Illustrations showing a) a typical cylindrical two-story corbelled stone hut, b) a more recent quadrilateral version of the hut with well-shaped and ashlar stone courses, c) an internal staircase and d) how the stones were arranged in horizontal loops to form the hut vault.

A plot of private agricultural land was divided conceptually into two primary *spatial zoning*: the agricultural fields themselves, where planting took place, the zone of the hut and its immediate surroundings that include several components needed to provide the necessary facilities for living. As a result, the zone of the hut, which also accommodated the living and working activities of the farmer, was generally located on the appropriate elevated spot overlooking the fields, normally on a rocky platform so as to facilitate the construction and also not intrude upon fertile land. After the construction spot for the hut had been defined, the surrounding site was divided into the necessary additional external functional zones, so called, yards (or multiple yards, on different levels), where farm tasks like sorting and drying fruits

were carried out, and the animals were sheltered. Other facilities were also attached to the hut, such as a kitchen, the *taboon* (the traditional Palestinian-Arabic term used to describe the oven), which was usually constructed from clay and located in yard of the traditional house; it was used for a great variety of cooking and baking purposes), a well or cistern, rock-hewn marks, a fireplace and the basic installations of a wine- or olive-press (Figure 1 c and d). It was observed that in the majority of cases all these elements were situated at the north-eastern or south-eastern side of the hut, precisely for environmental reasons: protection of the western and north-western wind, receiving of afternoon shading, benefiting from the morning sunshine...etc and oriented toward the main entrance of the hut.

The dry-stone structures have been found in several different *forms*, all are complementary in function. However, two basic forma were essential, they are the terraced walls and the corbelled stone. In the lowland areas, few terraced walls were constructed and temporary wooden constructions called Pergola (Arabic: *arreesh* or 'Erzal) were predominant due to the scarcity of stone and the slight slope of the agricultural land (Hamdan, 1996: 223) and thus no stone constructions were erected (Figure 4). While in the mountainous areas, the situation differed, however: stone is abundant and the land must be cleared and levelled before cultivation can take place. This work itself required the farmer to construct terrace walls following the contours of the hills and mountains, in order to provide suitable level areas for planting, as well as to allow maximum rainwater to penetrate the soil, thus preventing soil erosion and making more moisture available to their crops. The agricultural terrace walls were of various dimensions, as shown in (Figure 2). They were built in order to convert the steep slopes into productive agricultural plots, to prevent run-off and erosion during the rainy season (and thus retain maximum moisture in the soil throughout the summer), to create a space to safeguard his animals, and, finally, to visually identify the boundaries of the various parcels of land. All structures were built in irregular courses using unworked fieldstones of different sizes. Approximately 87% of the individual walls are partially destroyed due to erosion suffered during the winter rainy season, the year-round grazing of animals on the terraces, and the abandonment of necessary maintenance by the owners over at least the past four decades. It is believed that the construction (and repeated rebuilding) of the terrace walls spanned many periods. The walls may have appeared originally in the Iron Age (1200-332 BCE), increased during the Byzantine period (332-627 AD) and flourished at the beginning of the Ottoman period (1516 AD).



a



b

Figure 1: Two illustrations showing a) the Pergola (Arabic: *arreesh* or 'Erzal) that was used in the lowland areas, and constructed by temporary wooden constructions due to the scarcity of stone and the slight slope of the agricultural land and b) the traditional corbelled stone hut in the mountainous areas, the roof was used for watching the fields and for sleeping and it was common to cover it with a pergola made of tree branches to provide shade during the day.

Also, he used the available stone material to construct permanent residences on his land, as these structures were then occupied during the various working seasons and ultimately became a genuine trademark of traditional Palestinian architecture. Meanwhile, the dry-stone huts are usually located in the fringes of urban and rural fabrics, at a moderate height on the slope of the hills, among vine-arbores, fig and olive trees and pastures (Figure 2). The huts can vary in the vertical dimension from one to three levels, according to the structural, functional and aesthetic needs of the owners. A typical three-level watchtower consists of a ground floor for livestock and storage, a first (upper) floor for living, and a second (top) floor in the form of an open roof-terrace used for various other activities. In all cases the various levels are accessible via an internal staircase (or in a few cases, external) (Ghadban, 2008: 225-238). A'miry and Rahal (2003: pp 33-78), in their survey of huts, arrived at a more elaborate classification with seven categories: round stone heaps, round, round retained, organic, organic-retained, square, and pyramidal.

Two main types of dry-stone huts were found in the Palestinian territories: 1) the very earliest round structure with simple form composed of stones of various sizes; these were mostly gathered from the site in the course of preparing the land for cultivation and stacked in heaps (Arabic: *rojoum*- Figure 5a) and 2) the corbelled stone hut (Figure 5 b, c and d), which is assumed to be the most popular version of these structures and is well-known throughout the mountains of Palestine, and even similar to the hut's structures in some other Mediterranean areas like Malta, Spain, France and Southern Italy. Other, more sophisticated circular forms being with more rooms and storeys were observed. Some of them are surrounded by curved enclosure walls and having more than one staircase connecting their spaces. They were more complex in terms of structure and characterized by greater concentration on architectural details. Moreover, a conical-shaped dry-stone hut is also very common, with one single large room, a conical corbelled dome inside and a flat roof accessed via an internal staircase used for various activities.

The *materials* used for the huts include unworked fieldstone, earthen mud, mortar (a mixture of earth with lime, ash, gravel and grog), plaster and wood. In principle, the building materials used depended on the intended style, size and shape of the structure and the financial means of the owner. The construction of the structures lasted from several months to more than a year, depending on the manpower and time available to be invested in the construction. The peasants would mostly collaborate in building the structures, in which case the owner usually provided the helpers with food and drink during the course of the work. Sometimes, however, the volunteer labourers brought their food with them, in order to minimize the cost of the project to the owner. In instances where the owner opted to pay for the labour, especially for the master-builder, the cost of construction could be considerable. The owner might pay either in cash or in kind, i.e. with a certain quantity of cereal-grain, olive oil, sheep or goats.



a



b



c

d

Images showing the most popular versions of the dry-stone huts well-known throughout the mountains of Palestine: a) the very earliest round structure with simple form composed of stones of various sizes; these were mostly gathered from the site in the course of preparing the land for cultivation and stacked in heaps (Arabic: rojoum) and b, c and d) the corbelled stone hut in conical, quadrilateral or cylindrical configuration, which is assumed to be, and even similar to the hut's structures in some other Mediterranean areas like Malta, Spain, France and Southern Italy.

The dry-stone hut was constructed according to the *dry-stone construction technique* seen elsewhere in the Mediterranean basin in the Pagliaddiu at Santu Pietru in Corsica, France and the girna in Mistra Valley, Malta and generally from rough unworked fieldstone, with irregular and polygonal forms, without employing any bonding material. The discussions conducted with residents in several regions indicated that the entire quantity of stone required for construction of the round huts and solid stone heaps had been gathered from the nearby areas where the structure was to be built. If the owner failed to collect enough stones for the new construction, he would quarry the surrounding bedrock in order to produce the needed quantity, using thick, pointed iron bars (*nukhul*), chisels and heavy hammers.

The analysis proved that the dry-stone structures were constructed in regard to the dry stone construction system of the Mediterranean. It is a dry stone structure; generally constructed from rubble natural stones with irregular and polygonal forms without using any bonding material. Following the general stone corbelling method, two walls of stone were constructed adjacent and parallel to each other; the stones were simply fitted in harmony with their natural form and not in regular layers. The space between the two walls was usually filled with small stones and soil. Larger stones were usually positioned at the bottom; while smaller stones are positioned at the top and regular shaped stones were used to frame the openings in the huts. The walls inclined according to the form of the structure. For example, in the terraced walls the external layer inclines in upper direction forming with the interior wall the so called retaining wall, while this inclination in the hut was towards the inside space to form the roof, which is a simple corbelled dome covered by stones and it was vaulted from inside and flat on the top. The simplest version of this round hut was without roof, consisting only of a space enclosed by the circular dry-stone wall about 2.0m high; this version was most common in the Hebron area. In the second version, proceeding upward toward the ground-floor roof level, a slight inward slant was introduced to the outer face of the wall, gaining more stability and gradually minimizing the weight of the structure. The internal faces of the same walls likewise incline gradually toward the centre, but beginning about 0.8 to 1.0m above the floor level, ultimately forming a vaulted (or domed) ceiling, which ordinarily had the shape of a barrel-vault or cross-vault (or in a few cases a hemisphere). The stones of the

vault were arranged either in horizontal loops or in V-shape (wedge-shape) manner (Figure 3d). The finished ceiling appears vaulted from inside but the almost of the exposed roof area was levelled, which allows the roof to be used for drying agricultural crops, watching the fields and for sleeping. It was common to cover the roof with a pergola made of tree branches to provide shade during the day. The roof was used for watching the fields and for sleeping. It was common to cover it with a pergola made of tree branches to provide shade during the day (Figure 4b).

Conclusions

The Palestinian dry-stone structures provide an excellent example of traditional architecture that reflects a former way of life in Palestine, conveying a sense of the simple, rural settings and activities that were such important parts of traditional local culture. It was, and still is, a perfect expression of a particular cultural heritage. They effectively symbolize the distinctive flavour of that once-vibrant rural society and, indeed, embody a whole host of social, economic, architectural, aesthetic, symbolic meanings and values. The form of the Palestinian dry-stone structure is utterly natural, for, though existing as a product of the human labour, it harmonizes perfectly with the environment. Built on a human scale, it does not intrude upon the landscape, and indeed, it is often hard to distinguish hut from the stony mountains and terraced lands on which they stand (Figure 6).

The analysis of this indigenous structure has shown that the construction of these structures was very directly related to the development of agriculture and the annual cycle of agricultural seasons. Thus, just as the importance of agricultural practice is vanishing from the daily life of modern Palestinian villagers, so the importance attached to such traditional constructions –and the attention people pay to them– are likewise vanishing. In the present day most of them is abandoned, and any appreciation of their previous important role in traditional Palestinian life has more or less vanished. With public and private transportation, becoming faster and easier, farmers typically travel to their lands in the morning and return back to their homes in the evening. In addition, transporting and processing the crops are also getting easier and more efficient with modern techniques. All this has contributed to a decline in the importance of these structures in all their previous functions: as an agricultural terrace, as a seasonal lodging, and as a place for the storage and processing of agricultural produce.



Images showing how the Palestinian dry-stone hut is utterly natural, for, though existing as a product of the human labor, harmonizing perfectly with the environment, has a human scale, it does not intrude upon the landscape, and indeed, it is often hard to distinguish hut from the

stony mountains and terraced lands on which they stand.

Therefore, in the present day it is essential to continue documenting and studying these cultural landscape structures and to raise awareness among the local public about their significance and values. Firstly, they deserve to be listed among the important local cultural heritage features that deserve to be maintained and preserved, since they truly form a fundamental component of the Palestinian cultural heritage and landscape. Secondly, despite the present trend of constructing more and more terraced walls and activating the agricultural produce in certain areas, a complete restoration is needed for exemplary types of these structures, to preserve their integrity within the physical landscape and to reintegrate them into the remembered, cultural landscape of Palestine. This will encourage their re-use for various modern functions, such as tourism, education and agricultural festivals. However, this issue requires thorough debates at the national level to define the potential aspects of re-use and restoration.

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