The multi-functionality and resilience of the Mediterranean landscape: the traditional vegetable gardens from the Southern Portugal and Northern Morocco.

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Introduction

The Mediterranean landscape is the result of the historical accumulation of successive human interventions on the territory. As a social and cultural product, the Mediterranean landscape constitutes the result of the enormous and thousand-year-old effort of adaptation of the human communities to the circumstances of the environment in search of subsistence, but also, of beauty. The ancient texts confirm that the changes operated by Man in the landscape, in its economic viability and social utility were considered as something beautiful, an aesthetic attribute that connoted with an organized and harmonious landscape, is based on a deep relationship between resilience and beauty. In this continuous and permanent project of landscape transformation, an important culture based on the experience of traditional agriculture as a primordial activity of landscape construction has a special meaning and relevance. This experience constitutes a solid basis over which the historical process of occupation and spatial organization is to be (re)interpreted, considering the profoundly intricate relationship between population, water and agricultural practice. The interdependence between these three variables is related to the natural conditions of the landscape and the resulting characteristics of the action of Man.

The vegetable gardens are the testimony of the different strategies developed by Man when faced with diverse natural factors and distinct economic and social situations of each time, to ensure their survival, but also their enjoyment and visual delight. In the Mediterranean region the importance and the role kitchen gardens played and still play in the evolution of its landscape of intense and ancient human occupation is noticeable. Both in southern Europe and northern Africa, vegetable gardens are the result of successful experiences and knowledge transmitted between peoples and generations, constituting cultural legacies directly related to the sustainability and resilience of the Mediterranean landscape.

The present investigation starts from the contextualization of the vegetable garden in the Mediterranean landscape and proceeds to the study of its characterization in mountainous areas in the south of Portugal and in the north of Morocco, considering the different themes that interrelate human settling, land exploration and the use of water resources in the development of a landscape and an agricultural activity that, as basis of a rural economy, is deemed essential for the long-term development of both Nature and Society.

1. The Mediterranean Basin: landscape unity and diversity

Although it occupies a reduced area that corresponds to only one hundredth of the earth’s surface, the Mediterranean region plays a distinguished role in the history of the planet and in the history of mankind (BRAUDEL 1983:23). Its landscape translates the uninterrupted interaction between the natural and anthropic processes, the basis of its individuality and singularity as the birthplace of a distinct civilization. A Compendium of the natural and cultural history of the region, the Mediterranean landscape distinguishes itself both as a biophysical unit mainly defined by its geographical position, its climate and topography, and as a cultural unit settled throughout centuries from the confluence of different peoples and societies, and the respective exchange of experiences. Indeed, “… both in its physical landscape as well as in its human landscape, the Mediterranean… presents itself… as a system where everything mixes and recomposes itself into an original unit” (BRAUDEL 1995:620). From the conjugation and interrelation of both dimensions, ecologic and cultural, results the Mediterranean landscape unit that comes from an historical process of occupation and territorial organization that is based simultaneously in an ancient and dense network of urban centers and in the rural organization associated with a diversified agricultural mosaic linked to the promiscuity of the dry land and irrigation crops, but also to the woods and pastures. In this sense, the Mediterranean, source of cultures and a privileged space of the evolution of the western culture, appears to us as a unique space where cultures do not only overlap each other, but also influence and interact with each other, thus forming a unit where even their most disparate differences are a part of it.

The foundations of that unit, which integrates diversity and localism, are directly related with an historic model of spatial organization in which the clear distinction between the compact inhabited nuclei and the surrounding rural landscape, sprinkled with familiar agricultural explorations, determine a denominator common to the whole Basin: the Mediterranean agricultural civilization that expresses itself both through the cultures that have spread from one end of the region to the other, and through the agricultural practices with its constancy of characters in space and time (RIBEIRO 1991:11).

A starting and meeting point of the influences of civilizations, the Mediterranean is the place, at the same time, the same and divers, where the constant struggle of the communities (against the topography, drought, infertility of the soil, insalubrity) forges a landscape in which the diversity of the natural characteristics allowed the development of different strategies of exploration and use of the land, which conducted to a successive transformation of the landscape evolving into a multifunctional, profoundly humanized landscape. In this landscape, the population, the water and the agriculture, in their interdependence, constitute themselves as the cornerstones in the production of a treasure of experiences that, between permanence and change, consecrates a cultural and landscape identity which is associated to an essential heritage to the universal culture.

* 1. The Mediterranean landscape: water, agriculture and population

The Mediterranean, where Portugal is inserted, offers great landscape richness and diversity. The strategies of cultivation specific from this region, developed to feed the population under hash and austere contexts, have positively contributed to this diversity. Systems for the use of the land, vulnerable and complex, were focused on the continuity of the agricultural production taking maximum advantage from the annual climate variations. This was acquired by maintaining the balance of nutrients, using the natural resources, the mineral and water cycles, and the complexity and diversity of the landscape. This is translated through an agro-forestry-pastoral mosaic which, although with regional variants, is a common trait to both margins of the Mediterranean. The agricultural pattern based on the Mediterranean triad: wheat, vineyard and olive tree alternate with the pastures, the woods and the vegetable gardens. If the bread, the wine and the olive oil have always constituted the basis of the Mediterranean rural economy, consisting the great majority of its agriculture in the mass production of said products, having the olive tree as the only cultivation of worldwide importance that is confined to the Mediterranean region (RIBEIRO 1991:14), also the production of fruit (namely nuts), greens, legumes and vegetables also have a role and a fundamental importance both in the Mediterranean diet and in the configuration of the landscape. In it, the dry land and the irrigation crops combine themselves into an heterogeneous chess of which results a rich variety of products that constitutes the ideal of the Mediterranean people(s) and the construction of a landscape closer to their dream.

Throughout history, the Mediterranean Basin has always been associated to an ideal quality of life developed and maintained from a balance between abundance and need (ARONSON 2008:33). Intrinsic to the traditional model of occupation and spatial organization that underlies it, a cultural matrix can be found which, beyond the purposes of defense and communication, translates an inter-relation, fruitful and long-lasting, between the human settling, the presence of water, and its use for the development of an intensive agriculture. If it’s true that the sparse rural population always accompanies irrigation, it is also true that all vegetable gardens have their own city (RIBEIRO 2011:79). This symbiosis between the inhabiting and the production of food, considering a strategy of survival drawn from the presence and a use of the water resources (and fertile soil as well), is recurrent in the history of the humanization of this territory. Both to the north and the south of the Mediterranean, besides the agricultural practices of dry land crops that constitute an adaptation of skillful procedures, yet cautious, to the edapho-climatic conditions, one turns to irrigation as a courageous way of beating a challenge in a context of aridity and dryness: to water agricultural crops which, without watering, would never produce anything. This need to subtract agriculture to a total dependence of the climate and the rainfall system is at the basis of a typology of space that witnesses another side of the Mediterranean agricultural civilization: the vegetable garden.

1.2 Vegetable garden(s) in landscape and the landscape of the Mediterranean vegetable gardens

Associated to the colonization of the territory, since early times, the kitchen garden consubstantiates the soil fertility and the availability of water in the definition of a nutritional limit of which the survival of the population, be it focused or scattered, seems to depend. As a complement or supplement of the tree, bush or arable dry land crops, of which they contrast, the irrigated lands appear by work of man through a specific understanding of the landscape. Certain arid affinities of the topography are favorable to the installation of irrigation and to the construction of the vegetable garden, often after the drying of the lands, their flattening or terracing, namely foothill plains, grasslands, areas adjacent to bodies of water and hillsides or slopes with favorable sun exposure. In general, the irrigation is installed where getting water is made on the surface going from a rugged topography (mountain, mountain range) to a flat terrain (lowland, Vega) and to slopes, on hillsides or the source of water collection is at underground level (grasslands, floodplains). In both cases, irrigation comes from necessity. All Mediterranean irrigation comes from necessity (RIBEIRO 2011:75) and there is another landscape associated to it, the landscape of the kitchen garden, and another way of living in the rural area, based on an intensive and thorough agriculture. It’s to this mastery, naturally limited, of the water resources for the irrigation of the vegetable garden, through the use of complex resources and structures in getting and distributing the water (ponds, mills, irrigation ditches, waterwheels, wells, tanks, water streams, gutters) to the increase of the diversity of the sowed or planted species and to the increase of productions, that the consolidation of an historical process of occupation and land exploration and superior ways of material and spiritual life in the Mediterranean region are due. Here, rural life represents one of two contrasting sides: dry land, with their ingenious ways of adaptation to the lack of water, and irrigation that, thanks to the most rich and admirable set of collection, transport, storage and water distribution techniques, makes possible an entirely artificial agriculture (RIBEIRO 1989:226).

The water culture as the basis of an agriculture of proximity, of daily cares and thorough work, paints a distinct landscape, the landscape of the vegetable garden that, in the context of aridity and scarcity of the resources of the region, assumes a transcendent significance in terms of both social-economic benefits, as well as ecological and environmental benefits to it associated. The pattern of small property that is characteristic of the Mediterranean vegetable garden determines that it should be fractioned into tony plots where diverse crops are juxtaposed or overlapped, all watered: the trees and the vines, the cereals and the pastures, the vegetables and the legumes. The kitchen garden originates the production of fruits and greens, the production of meat and milk, but also of manure that is indispensable to the irrigated crops. On the other hand, it also suggests the architecture of production associated to the water, namely windmills and watermills and the hydraulic patrimony that organizes and supports it. The landscape of the vegetable garden is the result of a thorough and meticulous art of construction of plots and water streams, opening waterways and ditches, plantation of fruit trees and hedges, forking, weeding, watering and collecting fruits and vegetables. An authentic exercise of gardening that approaches the poly-culture of irrigation and the landscape of the kitchen garden to the Garden of Eden where a river watered every kind of delightful trees and delicious fruits to be eaten underlies the traditional horticultural practice.

The image, spatial organization and uses of the vegetable garden link man to earth in his conciliation with Nature and in his struggle for subsistence, but also in the creation of beauty. The horticultural art constructs a multifunctional landscape, useful and beautiful, and a living and evolving patrimony that, in the context of the needs and scarcity of the Mediterranean acquires a greater significance as structures of social and ecologic sustainability.

2. The traditional vegetable gardens of the Western Mediterranean: multi-functionality and resilience of the landscape.

Within the capabilities of the multi-functionality of the Mediterranean landscape, actions that combine functions of production (of food and biomass) with functions of regulation of the ecosystems and with functions of information of nature, geology, patrimony and aesthetics emerge. In this sense, combinations of production of food, inhabitation, leisure, water management, nature conservation and valuing of the culture, coexist inside the same system of use of the land (MATOS 2011:79). The multi-functionality of the landscape of the kitchen gardens integrates several functions in the same space considering: production of cereal, dairies, milk, honey, wood; protection and conservation of the soil, water, patrimony, environment, recreation and leisure connected to rural tourism, agro-tourism and ecotourism.

The landscape of the vegetable garden perfectly demonstrates the will of the human communities to build, with the available resources, a life and production project that cares about the conservation and perpetuation of the natural resources. In order to build the vegetable gardens, the terraces, the oak groves, there were centuries of obstinate, yet passionate, observations of the development of the plants, of the growth of the animals, of the water seepage. We are before the act of conceiving doing and feeling that converts itself into vital experience (ASSUNTO 1973:17) that translates, in turn, to the understanding of the multi-functionality of the landscape.

The Mediterranean created a civilization that, while being capable of fighting against topography and water: *Acqua, ora vita, ora morte* (BRAUDEL 1983:74) has organized rural life around dry land crops and practices, but also of irrigated crops that have their maximum expression in the vegetable garden. The vegetable garden and irrigation, associated to a diversity of structures and hydraulic elements, complete the face of the Mediterranean agrarian civilization, highlighting the construction of an expressive multifunctional landscape and of a singular rural heritage. This landscape and this heritage acquire a transcendent relevance in the mountainous areas both as an historic legacy and as a strategy of survival in a context of scarcity of natural resources, namely fertile soil and water, but also human resources. The mountainous landscape in the Portuguese southern territory and in the inferior third of the Riff massif, in its Mediterranean component, reflects this process of exploration of the land in which the populations and Nature established, since early, profoundly intricate bonds and relations that find in the kitchen gardens a significant example of perpetuation and resilience of a singular, living and evolving landscape.

2.1 Vegetable gardens in Southern Portugal: the case of riverside vegetable gardens in mountainous areas

The mountain ranges of Algarve, except the one in Monchique, correspond mainly to mountainous lands of schist, with a Mediterranean position, craggy topography and modest altitude, intercepted by a branched hydrographic network where the sparse, but precious, alluvial deposits and the possibility of getting water justify the presence of vegetable gardens. Apart from the mountain range of Monchique where the crops irrigated from a characteristic system of flowerbeds and hedges stretch, on terraces, through the hills, in the mountain range of Caldeirão, the vegetable gardens are confined to the margins of watercourses, often intermittently, or squeezed in their narrow adjacent areas

The riverside kitchen gardens of the western mountain range of Algarve constitute a singular example of land exploration that, given the dryness and aridity of the territory where they are, combines soil fertility, water management and scarce population as basis of a differentiated landscape pattern. This is determined by association of the settlement in the form of *montes* (that correspond to villages in the mountainous areas of higher altitude or to scattered buildings in the lower areas, in the transition to Low Algarve) to small properties (strips of land, fences, vegetable gardens), to the more fertile lands and water access, as a condition to guarantee the diverse fundamental resources to the traditional economy of subsistence that has always been a characteristic of this territory. It’s this historic model of landscape organization that consubstantiates the interdependence between the house and the irrigated crops that we briefly approach in the study cases of the riverside vegetable gardens of Odeleite, in Castro Marim, having in consideration a previous investigation, and in the stream of Gafa, in Tavira.

In both cases the construction of a riverside vegetable garden bore the careful execution of a dry stone brick wall associated with a drainage ditch for the waters that seeped from the hills or associated to both the support of the riverbanks by restricting its course and raising the quota of crop lands safe from floods, and the vegetable garden irrigation system.

In all kitchen gardens, irrigation, bucket by bucket, takes advantage of the proximity of the stream, where often in the summer the bed has to be dug in search of water, or the presence of a well, but also of tanks and waterways. The access to water has significantly conditioned the geometry of the land strips which translated into narrow sheets of crops, perpendicular or parallel to the stream given the greater or lesser surface of the irrigated lands. In the first case, the landscape of the kitchen garden is organized from the rectilinear geometry of the structure in an array of narrow strips of land, that guarantee to each family of the village of Fortes the access to water from wells to the irrigation of vegetables like tomato, bell pepper, green beans, cabbage, but also potato, sweet potato, corn and broad beans, alternated with vineyards and olive groves, and sometimes cereal crops as well (COSTA and BATISTA 2013:36). The spatial organization of the vegetable garden(s) reveals the singularity of the circumstances that are at its (their) origin. On the one hand, the change of the river bed of Odeleite that liberated a former meander and its transformation into a floodplain, through a slow and continuous deposition of sediments and organic matter. And, on the other hand, the appropriation that the population does of this floodplain that allows most families to ensure their subsistence through the production of food, fundamentally horticultural products, olive oil, wine and also bread.

Fig.1 – The landscape of the horticultural gardens of the Fortes village

As center of the circle of good lands, it’s from the village, located on a small hill of schist, that the floodplain is occupied through a radial and elongated agrarian structure which will allow man to access, from its own home, land and water. It will be through this intricate interrelation established between inhabitation and the working, daily and thorough, of the land, after drying it via drainage of rainwater by means of construction of a gutter and the opening of wells for irrigation, that a new landscape is created: the landscape of the vegetable gardens of Fortes (COSTA and BATISTA 2013:36).

In the case of the vegetable gardens of the stream of Gafa, the dispersion of the buildings along the route of the water determines that the narrow sheets of irrigated crops accompany it, materializing a continuous hallway of small kitchen gardens. Here, there interdependence between the house, in this case isolated and implanted on the superior third of the hill, and the vegetable garden, in this case parallel to the watercourse taking full advantage of the scarce flat lands squeezed between the riverbed and the steep cliffs, is repeated. The survival of one depends on the presence of the other, from a process of land occupation and exploration that certifies the usual strategy of subsistence in mountain context which translated, historically, into a mixed agriculture – tree, bush, arable – of dry land and irrigation which includes, in general, sowing lands, thorn orchards, fruit trees and vineyards (CAVACO 1976:75).

The housing, scattered along the line of water, appears as the fundamental place from which landscape and rural economy is organized, considering the characteristic pattern of small property and the traditional Mediterranean poly-culture based on the association of dry land and irrigation crops.

Through an intense agriculture exploration which associates, almost always, tree plantations (citrus, apricot tree, pomegranate tree), bushes (vineyard), greens (broad beans and peas) and vegetables, the riverside horticultural hallway demanded the construction of a loose stone wall which, sometimes, defines both banks of the watercourse for dozens of meters, associating to its support function, a function of water distribution ending in a gutter. The construction of the support walls and/or waterways has as its objective to stop both the erosion of the riverbanks and the loss of the scarce fertile soil, as well as the flood of the crops or its destruction given the violence of the floods in certain times of the year, and also to allow the circulation of water by gravity and its use in the watering of the vegetable garden.

Fig.2 – The traditional riverside kitchen garden

Understood as a precious good both for the frail family economy, and to their diet, the kitchen gardens and irrigated crops justify the construction of that infrastructure and hydraulic structures (wells, tanks, waterways) of which they depend for the production of food for themselves and for direct sale of the surplus in the nearest traditional markets. To the production of cabbages, green beans, cucumber, bell pepper, tomato, pumpkin, carrot, but also fruits, in the vegetable garden, joins the production of honey, eggs and goat cheese as a fundamental complement in the context of a subsistence strategy directly linked to the sustainable use of the land. Considering the increasing social and biophysical desertification the mountain range of Algarve faces, the presence of vegetable gardens, although scattered and scarce, holds a significance and a fundamental importance in the perpetuation of life (biological and human) and in their consecration as multifunctional structures of permanent diversity, and social-economic and landscape sustainability.

2.2 Vegetable gardens in the Riff of Northern Morocco: the case of ephemeral or seasonal kitchen gardens

The image, organization, diversity of uses and of irrigated crops of the vegetable gardens in the mountain range of Riff, reflect a model of land exploration that, in the broader context of its Basin, translates the specificity of the biophysical conditionings (relief, soil, water, climate) and cultural ones (agricultural techniques, hydraulic techniques and structures, diet) of the mountain areas, where the craggy topography and rigorous climate, the irregularity of the rain and the torrential regime, and also the food habits and social-cultural traditions, determine common traits to both margins of the Mediterranean, as well as singularities in spatiality, ambience and in the uses of the vegetable gardens in each of the banks.

The historic interchange of vegetable species and irrigation techniques between the eastern and western Mediterranean, between the European and the Maghrebian banks, justifies the affinity and the common denominators of the traditional kitchen gardens between the mountains of southern Portugal and northern Morocco. Here, man develops as strategy of subsistence, or even of survival, that originates the construction of perhaps the most peculiar vegetable gardens in the region. The seasonal or ephemeral community gardens of the *Oued Nekor* valley, in the Mediterranean side of the Riff, to the north of the coastal city of Al Hoceima, materialize, in their essence, the idea of landscape as a dynamic system in permanent mutation that expresses the spatial and temporal interaction of man with Nature, in all its diversity and creativity.

In the struggle against scarcity and necessity of local resources that characterizes the context of aridity and dryness in which he lives, the Berber farmer creates the possibility of diversifying and increasing food production, allied to the cycles of Nature in the shaping of a new, yet temporary, landscape, the landscape of the humid system of the kitchen garden, inscribed in the dry and hot season of the mountainous territory during the summer period. Through the adaptation to the harsh and severe circumstances of the means, and through intergenerational wisdom and experience related to the management and rational use of the soil and water, the populations collectively build a space of sharing for the fruits, cereal and vegetable production, as well as for pastures for cattle.

Fig. 3 – Community gardens set out along a bed river with fertile soil and water

Wisely and patiently, man controls the variable regime of river Nekor (with a significant hydrographic basin), with impetuous floods between October and the middle of May and a long dry period for the rest of the year. Taking advantage of the four hottest months of the year in which it doesn’t rain and, therefore, there are no floods, the farmer occupies the previously flooded riverbed, filled with nutrients and organic matter from the slimes put there by the floods during the rainy season, and which he enriches, every year, by manuring the land, flat and fertile, suitable for irrigation. As such, the access to water becomes a key-factor of which depends the success of the annual crops which, every summer, the vegetable garden provides. In a direct dependence of the mountain as a source of water, man obtains this precious resource both for consumption and irrigation, through the spillway of the river upstream of the area where he lives and practices horticulture, where the water falls by gravity through a system of canals to the house and the vegetable garden.

Fig.4 – The irrigation of the horticultural garden with a system of canals

The common origin of the water and the sharing of its use in a common space of agricultural production implicate the association of its beneficiaries and a great rigor in the use of said water. On the contour at the bottom of the hill that delimitates the upper part of the irrigated lands, a trough was built which runs through all its extension and, passing through small floodgates, the water is conducted in gutters until the land plots to be irrigated. This way, water assumes an essential role in the design of the kitchen garden as a vital and reverberating element, and as a structuring and backbone element of the ephemeral landscape. To it joins a geometrical chess with many different irrigated crops squeezed together associated to both a high number of farmers and to the idea of subsistence that underlies the division of the “valley” into an equal distribution of the fertile land per family. In the seasonal vegetable gardens of the Nekor river, in Morocco, man produces in the four months of the hot season, for immediate consumption or for food throughout the year, a vast array of horticultural products like potato, tomato, carrot, eggplant, artichoke, but also cereals, like corn and wheat, or fruits like figs, pomegranates or persimmon. The high fertility of the soil and the permanent availability of water for irrigation allows, in years when rainfall does not cause floods and extends the period for farming to five or six months, a significant increase of production, even providing two seasonal harvests in the crop rotation regime.

Fig.5 – The kitchen gardens in the bed river on the Summer time

Horticulture practiced in the previously flooded riverbed just during the dry season brings the mark of the climate, irrigation type and local diet. In it, many vegetable garden products are common to the whole Mediterranean diet and which names, of arab origin, testify the contamination between the two banks of the *Mare Nostrum: badhinjama* (*beringela* in Portuguese, eggplant), *al-khássa* (*alface* in Portuguese, lettuce), *isfannariya* (*cenoura* in Portuguese*,* carrot), *al-* (artichoke).

Fig.6 – Horticultural garden of the Nekor river near Tammelaht: A diversity of green tones and textures

Also here, in these parts of the Mediterranean, the vegetable garden, albeit intermittently given that it alternates with the rushing river that makes it disappear during the rainy season, is responsible for the introduction of elements of ecological, social-cultural and aesthetic diversity, which associated to its occasional presence in spatial and temporal terms grants it the dimension of a real oasis, considering the semi-arid territory where it is located. Also here, or especially here, the kitchen garden links man to land in his conciliation to Nature and in his struggle for subsistence, building a socially useful landscape and a living patrimony that is renewed every summer, acquiring a greater significance as a structure of social sustainability and landscape resilience associated to the condition of survival and a warranty of collective identity.

Conclusion

In the Mediterranean Basin the landscape is spatially and visually dominated by mountain. In it, the irrigated crops comprehend, throughout History, a decisive importance. Frequently confined to well-delimitated parcels on the side of a watercourse or associated to a seasonal dimension adjusted to the torrential regime, vegetable gardens here, traditionally, are inscribed in an economy of subsistence set on a scarcity and need of resources, and in a complex calendar of land exploration. Albeit the distinctive traits that mark each of the mountainous areas in this region, the existence of a common model of spatial occupation and organization which is based on the profoundly intricate relation between water, agricultural practice and population is surprising. As such, the identification and characterization of the riverside vegetable gardens that are typical in southern Portugal and northern Morocco were considered the basis for the (re)interpretation of the historical process of construction and transformation of the landscape. In both cases, the kitchen garden links man to land in his conciliation with nature and in his struggle for subsistence, constructing a multifunctional landscape, socially useful and aesthetically beautiful, and living and evolving rural heritage which, in the context of the mountainous territory, contributes to the sustainability and resilience of the Mediterranean landscape.

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