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# Sustainable beauty for algarvean gardens: cross-boundary solutions between the humanities and the sciences

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**ABSTRACT**

The research project 'Sustainable Beauty for Algarvean Gardens: Old Knowledge to a Better Future' addresses the lack of sustainability and heritage identity of the Algarve gardens. In this paper, I give a description of the project's aims, methods, and expected outputs, and argue that more sustainable solutions might be found in the early modern period, when estates were self-sustainable. To do so, I examine Alonso de Herrera's *Book of Agriculture* (1513) – a theoretical landmark in the Iberian Peninsula – for its illustration of artisanal practices carried out in the Algarve between the sixteenth and the nineteenth centuries. In doing so, I show that these horticultural practices can be implemented in both designed landscapes and small-scale productive farms. Finally, I stress that the search for landscape identity should be conducted at the same time as the search for increasing sustainability, since an awareness of landscape heritage serves as the basis for ensuring its sustainability.

**KEYWORDS**

Algarve; landscape identity; sustainability; Iberian agronomy; Alonso de Herrera; horticultural practices; irrigation systems

## Introduction

The contemporary environmental crisis in the Mediterranean is the final stage of a prolonged ecological crisis that has intensified over the past 200 years. According to James McGregor, this critical situation has its origin at the turn to the nineteenth century, which saw the beginnings of a 'contravention of the norms of the historical past' (McGregor 2015, 8) based on a constructive management of the earth. From then on, traditional constraints on the use of land and labour steadily disappeared, and for two centuries there were few ethical concerns and limitations regarding growth and agriculture. Moreover, the deterioration of the Mediterranean landscape has to be seen through the lenses of global capitalism, trends in the tourism industry, and EU agricultural policies. These global and general visions have undermined a focus on the region's ecologic balance.

The southern region of Portugal – the Algarve, typically known for its white sandy beaches and blue seas – has been one of the major targets of touristic exploitation for the last several decades. Due to its climate, the creation of 'tropical paradises' on the Algarvean coast has required the introduction of non-autochthonous plants whose maintenance requires an additional water supply that clearly surpasses the capacity of the region's

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hydric resources. This creates issues of sustainability, loss of biodiversity, and identity. The Algarve's mainland has also suffered the consequences of exploitation by tourism: while picturesque villages have been maintained as images of rural times, the once-productive fields surrounding them are neglected.

I argue that in order to recuperate the Algarve landscape, we must go back in history and locate the grounds for more sustainable land use. Only cross-fertilization between historical texts and scientific practices such as horticulture and hydraulic engineering can help us understand the artisanal practices of the common farmer that shaped patterns of the Algarve landscape and its geographical and cultural identity. In order to address these topics, the project 'Sustainable Beauty for Algarvean Gardens'[1] draws on the fruitful interrelationships between the sciences and the humanities: it serves as an example of a new way of 'doing science' based on historical texts, and it aims to influence contemporary landscape patterns by turning texts into practices and by applying historical ethics to the (re)creation of gardens and landscapes in southern Portugal. My paper begins with an introduction of the aims of the project and the conceptual framework in which landscape identity and Mediterranean sustainability are grounded. I then address the methodology used to promote cross-fertilization between theoretical texts and artisanal practices and conclude with a discussion of the expected results. Focusing on specific cases that illustrate the environmental problems faced by the Algarve landscape, and taking a multi- and cross-disciplinary approach, I will demonstrate the lessons we can learn from history through the study of agronomic theories and historical horticultural practices and suggest how we can revive the latter. To achieve a better understanding of the forces that shape landscape patterns, this paper brings together texts such as treatises on agriculture, descriptions of the kingdom of the Algarve, agricultural reports, and documents including parish memories and processes of the Inquisition to serve as a springboard for imagining more sustainable landscape practices. Notably, apart from highlighting traditional land uses, historical sources also transmit cultural memories. My approach is based on the belief that the concepts of sustainability and landscape identity are interdependent, and that sustainability becomes feasible if we return to knowledges and practices of a time of self-sustainable estates and land use. In the context of perceptions of plant variety, which are crucial for awareness of landscape identity, it is important to note that the Algarve landscape and horticultural practices in the region did not change considerably for four centuries. It, therefore, seems pertinent to work with a long duration approach as proposed by Fernand Braudel, and I consider the early modern times to the nineteenth century as a period with comparatively consistent plant variety, horticultural techniques, and irrigation systems. Following Pierre Nora (1989) and John Gillis (1994) who focus on the relationship between memory, landscape, and identity, I argue that memories of landscape, plant varieties, and their perceptions are the cornerstone for landscape identity awareness.

The interest in landscape identity gained momentum when designed landscapes clearly surpassed the hydric resources of the Algarve, and some gardeners and farmers, many involved in the Mediterranean Garden Society, criticized the excessive use of lawns and

[1]The lack of sustainability of the Algarvean gardens is the focal point of the cross-boundary research project between the arts and the sciences: 'Sustainable Beauty for Algarvean Gardens: Old Knowledge to a Better Future' (IF/00322/2014), funded by the Portuguese Foundation of Science and Technology.

exotic species in a region of Mediterranean climate. They proposed that the solution to limited water resources lay in choosing different vegetation and principles of garden design that respect the region's traditional vegetation identity (Rodrigues 2014b). In this regard, Filippi Olivier's work on Mediterranean plants is an important reference (Olivier 2007, 2016): as a practising horticulturist he has conducted various experiments in his nursery to argue that only eco-friendly attitudes and deepened knowledge of native plants can promote wiser choices for Mediterranean gardens. Olivier proposes to use plants from the local countryside in garden design, and, for him, the scrubland ecoregion of the *garrigue* is one of the best sources of inspiration for species selection for dry gardens in the Mediterranean.

Although based on Olivier's and McGregor's broader conceptual frameworks, my research is distinctive in its methods and scope. In the project 'Sustainable Beauty for Algarvean Gardens,' I make a stronger case for building bridges between local historical analysis and current practices by testing early modern horticultural practices (an aspect not covered in this paper). Moreover, I emphasize the local over the global and make greater use of Iberian and Algarvean agronomic and garden history. The ultimate aim is to supplement current landscape practices with solutions that promote both sustainability and identity. I share McGregor's view in *Back to the Garden* (2015, 8) that up to the nineteenth century no distinction existed between productive land and wild nature and that while, influenced by Romantic thought, we identify these notions as distinct, a continuum between these landscapes characterized the Mediterranean. For example, in the nineteenth century, the distinction between the pleasure garden and the vegetable garden did not occur in southern Portugal, as most vernacular gardens were a mixture of vegetable gardens, orchard, olive grove, and some flowers. In the 1872 Report of the Algarve Agricultural Society, the region is described as follows:

> Its culture is mixed and includes grain, vegetables, orchards, and vineyards. However, there is a special feature in this region, namely the cultivation of fig trees, which, together with almonds, olive trees, and carob trees, are unevenly spread across the region. On the borders of the properties, the fig trees, together with vineyards, give the coast of the Algarve a pleasant and picturesque aspect due to which it has been called a garden – many call it so, and the aspect is further increased by the huge palm and elegant banana trees that protrude in many orchards and backyards. (Algarve Agricultural Society 1872, fl. 40; my translation)

In concert with McGregor's conceptual framework, the whole of the Algarve can thus be considered a 'natural' garden. Therefore, the same kind of design principles and horticultural techniques, botanic species' choice, and water systems can be applied in gardening design and small-scale productive estates.

## The problems faced by the Algarve landscape

The southernmost region in mainland Portugal, the Algarve, is bounded in the west and in the south by the Atlantic Ocean; in the north it is delimited by the Odeceixe river, the hills of the Monchique Mountain, the Caldeirão Mountain and the Vascão River; and to the east by the Guadiana river, which separates this region from Spain. Although geographically not part of the Mediterranean basin, the Algarve has a Mediterranean climate that is characterized by long, hot, dry summers and cool, wet winters. Typical landscape in the

region includes scrub and Mediterranean scrubland, woods of oak trees and riverine forests in the upland areas of the mountains, dryland orchards in the intermediate zone of the mainland, called Barrocal, and cliffs, dune, and lagoon systems on the coast.

The Algarve has the typical elements of Mediterranean vegetation, such as holm-oak, stone pine, willow, wild olive, cork-oak, kermes oak, rosemary, mastic tree, spurge flax, oleander, and approximately 1500 native species of flowing plants (Thorogood and Hiscock 2014, 7). The native species are well adapted to the Mediterranean climate: most plants do not grow during summer, some of them surviving as dormant underground bulbs or corms – in a process that recalls the hibernation of animals – until new growth is triggered by the first rains in the autumn. Traditionally, the vegetation of plants adapted to summer drought and winter growing season was complemented by strategies that reduced survival risk: outfield cultivation of grains and legumes as well as garden vegetables, aromatics and herbs, orchards of fruits, vineyards and olive groves, and, in addition to agriculture, animal husbandry.

Dryland orchards of fig, olive, carob, and almond trees, vineyards, and citrus groves characterized the Algarve landscape for 400 years. But, changes in landscape identity and a decrease in cultivated land has been enormous in the last decades, during which the Algarve lost more than half of its productive farms, and its cultivated area was reduced from 136,779 ha in 1989 to 88,297 ha in 2009 (PORDATA 2017). However, the water extracted from surface and underground sources almost doubled between 1995 and 2009, increasing from 42,597 to 73,616 $m^3$ (61,410 $m^3$ extracted from surface and 12,206$m^3$ from underground sources, PORDATA 2017). Moreover, following worldwide climate change, rainfall in the Algarve is showing signs of decreasing. In 1970, the value of annual rainfall was 617,4 mm, compared to only 343 mm in 2015 (PORDATA 2017). At the same time, the population increased from 314,841 in 1960 to 451,006 in 2011 (PORDATA 2017). However, the Algarve is one of the most popular tourist destinations in Europe, accommodating approximately seven million tourists each year, and this impacts greatly on the water demand, the local landscape, and the ecological equilibrium. The current water shortage is largely due to the tourism industry and the designed landscape related to it – golf courses and hotel gardens in particular. The amount of water spent on the upkeep of designed landscapes that do not respect the biophysical conditions of the area is often underestimated and perceived as a comparatively negligible factor. However, parks, gardens, and designed landscapes account for 7,9% of total water use in the world (Sousa and Nunes 2014, 111). Their long-term upkeep requires intensive irrigation with extensive economic and environmental expenses, along with cultural costs that cause the destruction of landscape identity. In view of climate change, the problem can only increase.

Following McGregor's conceptualization of the Mediterranean landscape, I select two case studies – one covering designed landscape in the coastal area and the other focusing on the productive mainland. I redraw the chronology proposed by McGregor because, in the Algarve, the harmonious relationship between human communities and the natural world, showing in a visible landscape continuum, was only disrupted ca. 1950 and not ca. 1800.[2] The Algarve landscape faces a major problem in the coastal region, which

[2]Landscape disruption in the Algarve was caused by both the development of the tourism industry and the abandonment of agricultural fields, which occurred simultaneously around 1950. See Águas (1991, 30–31) and Guerreiro (1993, 4).

has fallen victim to exploitation by tourism, low environmental protection and unplanned construction. The idea of 'tropical paradises' promoted by the tourism industry resulted in lawns with palm trees and turquoise swimming pools. These are not sustainable in this region since lawns require permanent rainfall or artificial irrigation. Moreover, the number of golf courses is clearly too large when considering the hydric resources of the Algarve. The lawn on golf courses require water and by supplying it, the ecological capacity of the Algarve landscape, considering both biodiversity and hydric resources, is being depleted. This is even more problematic as the south of the Iberian Peninsula is highly vulnerable to desertification, as pointed out by the United States Department of Agriculture (USDA) and the French Scientific Committee on Desertification. Regions south of the Tagus River are at high risk of desertification due to low levels of rainfall and high levels of exploitation by tourism.

Another main problem faced by the Algarve landscape is the neglect of agriculture in the Barrocal, which some writers call the 'deep Algarve' in reference to the cultivated lowland regions with tight villages and occasional country houses set in parkland. Abandoned fields and, consequently, the neglect of traditional irrigation systems such as *noras*, wells and channels that used to bring water from springs into the fields, illustrate the problem. As the *nora* was a key-feature of the landscape, it is currently used as a symbol of the Algarve in tourism contexts, such as restaurants, museums, and parks, and some areas have benefitted from association with traditional irrigation systems or watercourses. Depleted of any function, *noras* and wells now are nothing more than symbols of a lost landscape. To recover it, the rebirth of some traditional artisanal practices and water management to inform current practices might emerge from studying Iberian agricultural treatises.

## Herrera's text as a landmark for the study of horticultural Iberian practices

Among the diverse agronomic and gardening literature that can help us understand how horticultural knowledge and practices shaped key features of the Iberian landscape (Rodrigues 2016), I have chosen Gabriel Alonso de Herrera's *Book of Agriculture* (1513) as the theoretical cornerstone of the project. I do so for three reasons: first, it was written on the Iberian Peninsula in Castilian in the early modern period. Second, it has had a long-term impact in Portugal: although first published in 1513, it embodies a long tradition of Hispano-Moorish agronomic wisdom (Butzer 1994), and there is evidence that it circulated in Portugal until the nineteenth century[3] when it was partially translated into Portuguese by António Gamarra and published in two editions, one in 1841, the other in 1849. The third reason is that Herrera was ecologically-minded and he advocated sustainable horticultural practices once they had been tested on Iberian soil (as he reports throughout the several editions of his book published during his life-time) (Rodrigues 2014a).[4] As James Casey

[3]There have been several editions over the centuries: 14 were published in the sixteenth century, 15 in the seventeenth century, and 3 in the eighteenth century (Casey 1999, 45). I identify the editions that circulated in Portugal in Rodrigues (2014a) and (2016). In this paper, I use the edition from 1546 as it is in good condition for consultation at the National Library and, although published after the author's death, was 'plenamente corregido y anadido en muchas cosas necessarias y p. tenecientes' ('perfectly reviewed and added to regarding many necessary and pertinent things') (Herrera 1546, frontispiece; my translation).

[4]The editions published during his lifetime were: Alcalá de Henares: en casa de Arnao Guillén de Brocar, 1513; Toledo: Arnaio Guillén de Brocar, 1520; Alcalá de Henares: Miguel Deguía, 1524; Toledo: [s.i.], 1524; [Zaragoza?: Jorge Coci], 1524; Logrono: Miguel Deguía, 1528; Alcalá de Henares: Juan de Brocar, 1539.

points out: 'The emphasis in these writings is more on fertility than on productivity – on the balance which one can achieve with nature rather than on its transformation' (Casey 1999, 45). That Herrera embeds ecological thought in agronomic knowledge throughout the book renders his text particularly interesting for my project, since we share the same rationale.

Gabriel Alonso de Herrera (1470–ca.1539) received a good education: in 1492, he was sent to Granada to become a clergyman, but soon became known as an expert in agronomy. Due to the connections of his brother Hérnandez Alonso de Herrera, a professor at the University of Alcalá de Henares, Gabriel was invited by the university dean, Cardinal Francisco Jimenez de Cisneros, to write a book on agriculture addressed to farmers. Gabriel Alonso de Herrera argues that he was the first to write specifically for landowners, and he did so in Castilian rather than Latin, as they were more likely to be able to read their native language (Herrera 1546, fl. 4v.). His text was timely: comparable texts written on agriculture in Italy or Greece were not particularly useful for the Iberian Peninsula since the soil and climate of these regions were different (Herrera 1546, fl. 2). Herrera's treatise is systematically structured. It is divided into six books, the first of which focuses on general aspects of soil. The second book addresses vineyards, usually cultivated on terraces, an essential feature of the Mediterranean landscape. It covers the most suitable soils, climates, and locations for vineyards, addresses the time and techniques of planting, weeding, grafting, and pruning vineyards, and, finally, turns to wine production and the construction of wine cellars. The third book covers the cultivation of trees, while the fourth is dedicated to the cultivation of vegetable gardens, including cultivated varieties, composts made with green and animal manure, horticultural techniques and the use of irrigation systems. The fifth book is on farm animals, including a chapter especially dedicated to beekeeping and raising honeybees. The final part presents a moon calendar that details which activities the farmer or horticulturist must carry out in order to achieve the greatest possible benefits.

Although Herrera quotes classical authors such as Theophrastus, Cato, Varro, Pliny, Virgil, Columella, Palladius, and the Italian Pier de Crescenzi, I argue that the intellectual roots of his ecological concepts go back to Islamic and Hispano agronomy rather than to Graeco-Roman geography and agronomy, which is focused on places and peoples. Since Herrera worked in Granada's kitchen gardens, he was able to learn Islamic horticultural practices, and describing the fertilization methods of kitchen gardens he states: 'as we saw the Moorish do in the old Granada' (Herrera 1546, fl. 111v.; my translation). Karl Butzer provides a table with the comparative structure and contents of Classical, Islamic, and Medieval works on agronomy from Varro to Herrera, covering a multitude of topics including soils, fertilizers, irrigation, arboriculture, fruit trees, olive cultivation, vineyards, field agriculture, and garden cultivation (Butzer 1994, 19). A comparison between the two most complete treatises is particularly fruitful. Like Herrera's work, the 34 chapters of Ibn al-Awwam's *Book of Agriculture* from the twelfth century begin with a characterization of soils and their improvement, followed by a chapter on the preparation and use of manures and composts (Ibn-al-Awam 1864–1867). The third chapter is dedicated to water, including the construction of wells and *noras* as well as the preparation of land for irrigation and the irrigation of fruit-trees. Several chapters deal with garden cultivation, including the choice of the site, the placement of trees, the planting and maintenance of fruit trees and flowering plants grown in the Iberian Peninsula. Further chapters are dedicated to the improvement, preservation, and conservation

of fruits, vegetables, seeds, and grains, including those that benefit the soil. Ibn Al-Awwam's text constituted the best compendium of Islamic agronomic and horticultural knowledge, comprising Nabataean, Greek, Persian, and Roman techniques. His book also contains knowledge of Al-Andalus' agronomic practice, and through Herrera's treatise it became available to any farmer who could read Castilian. However, Herrera did not only gather theoretical and practical knowledge produced by others but also added his own.

In accordance with Pamela O. Long's conceptual framework, I consider Gabriel Alonso de Herrera a 'superior artisan' (Long 2011, 14–15). He was a skilled gardener who learned from his father in Talavera de la Reina and, having been sent to Granada to become a clergyman, he was able to study the classics and add this knowledge to his artisanal horticultural know-how, which he continued to develop throughout his life as a gardener. He valued empirical knowledge gained from practical experience over theoretical norms disseminated by the classics and even held that farmers knew more than scholars and classical authorities: 'I am not surprised by rumours that any rustic farmer knows more about the things of the country than Columella, Pliny, Cato, Palladio, and that learned man, Marco Terencio Varro' (Herrera 1546, fl. 2v.; my translation).

Cayetano Segura, who did archival research on Herrera in the beginning of the nineteenth century, found documents related to the Mendonzas, a branch of the Marquises of Mondejar, that list expenses on gardening made by Herrera (Herrera 1818, vol. IV, 345). They shed light on how his contemporaries perceived his artisanal skills: 'Mr Alonso de Herrera is so well-versed in agriculture and has learned so much from the Moors about mixing some trees with others that I entrusted this task to him' (Herrera 1818, vol. IV, 345; my translation). In his testament dated 1528, Diego de Raya, the first Dean of Guadix in southern Spain, stated that 'Gabriel Alonso de Herrera planted and governed when he walked through these countries,' and he also recommended him as an expert in horticulture and gardening:

> Herrera was so knowledgeable about plants and trees, and he had so much pleasure in planting his garden that he knew more than all of his time and more than the Moors, and if [any doubt exists], one can compare this garden to that of Muley and that of Diego Lopez Abenafara and others; And you would see the difference […]. (qtd. in Herrera 1818, vol. IV, 345; my translation)

The knowledge Herrera acquired during these decades resulted in important additions to his book in the editions of 1528 and 1539[5], and this shows that the horticultural knowledge Herrera provides matches the artisanal agronomic practices in the Algarve and that his book sheds light on the Iberian history of landscapes.

## Traditional horticultural and irrigation practices used in the Algarve

The texts analysed above reflect the knowledge available in Herrera's time, not only embodying Classical and Islamic traditions but also including empirical knowledge. Although the impact of the text is not easy to trace, it is, nevertheless, a key text for

[5]The 1818 edition, published by the Economic Royal Society of Madrid, inserts the additions made after the first edition and highlights these two as the most significant modifications made during his lifetime (Herrera 1818, vol. IV, 330–333).

bridging the theoretical and horticultural practices that shaped the dominant patterns of the Mediterranean landscape. In an analysis of its advice on fig growth, I will show how Herrera's text can be used to shed light on the Algarve's agronomic history.

Herrera dedicates the 27th chapter of the third book to fig growth (Herrera 1546, fl. 83v.–87). He discusses the climate and the most suitable places for fig trees, how to plant them, the different ways of grafting and fertilizing them, and the various processes for drying the fruits. Herrera advises that planting seed figs is not advisable as they take a long time to grow. Instead, he proposes three ways of grafting that accelerates the growth process. Furthermore, he describes the method of assuring pollination of various edible figs through hanging 'cabrahigos, ' or 'higueras locas' (crazy fig trees), in order to carry pollen from the male plants to the female flowers, causing irritation and, consequently, early maturation (Herrera 1546, fl. 83v.). We can assume that the horticultural techniques described here were those used in the Algarve, and it is especially interesting that Herrera describes an early maturation process known as 'figs of touch.' In his *Description of the Kingdom of the Algarve* (circa 1600), Henrique Fernandes Sarrão, born in the Algarve and lawyer of the Court and House of the Supplication in Lisbon, provides a detailed description of this process. He begins by stressing that fig groves dominated the Algarve landscape in the sixteenth century and that the fig's growth was more certain than bread (Guerreiro and Magalhães 1983, 110), a feature noted as a particular characteristic of the Algarve by both native and foreign authors. Sarrão distinguishes two types of fig trees and focuses on the 'figs of touch,' which were placed next to each other on a thread. Thus, small insects could travel between the figs and, by causing a kind of irritation or 'allergic reaction,' accelerate the maturation of the fig. He argued that figs matured through this process were sweeter and could be used as gifts (Guerreiro and Magalhães 1983, 110–111).

In the late eighteenth century, the German botanist and traveller Henry Frederick Link believed that the method described by Herrera only occurred in Greece and the Algarve (Link 1801, 448). He states:

> [F]or here are some varieties of figs, and those very excellent, that fall to the ground unmatured, unless punctured by the gnats. To further this, another otherwise wholly useless variety of fig-tree is grown, wherein these insects, which are larvae of an ichneumon, abound. These trees are called figos de toca from tocar to touch. From this tree branches are broken and hung upon that intended to be impregnated. Here the larvae come forth, perforate the fruit, and the perfect animals place themselves on the figs of the tree on which these branches are hung, puncture them, and thereby advance their maturity. This method of ripening figs, which is certainly excellent, was known to the ancients, who called it 'caprification.' (Link 1801, 448)

Sarrão points out that fig trees require a lot of work and do not bring high profit for farmers; indeed, we know that only a small number of fig farmers were rich (Guerreiro and Magalhães 1983, 110). However, processes of the Inquisition show that fig merchants were among the elite in seventeenth-century Algarve (Côrrea 1992, 73–93). As Sarrão states, figs were exported to Flanders, where a part was re-exported to Central Europe (Guerreiro and Magalhães 1983, 114), and in the late eighteenth century, figs were the basis of one of the Algarve's most successful businesses as it was the only province of Portugal from which dried figs were exported (Link 1801, 449). In the second half of the nineteenth century it continued to be 'the most important fruit tree in the Algarve' and 'the

main source of agricultural wealth of this province, and its fruit [were] one of the main foods of poor people' (Algarve Agricultural Report 1872, fl. 52v; my translation). Although the document does not mention the caprification, there is evidence that this method of fig growth had become systematic in plantations in the Algarve (fl. 53). However, fig exports disappeared from the Portuguese Agricultural National Statistics in 2013, and the expression 'figs of touch' ceased to be used once the horticultural practice became forgotten. Curiously, in 2014, a farm in Castro Marim announced the relaunch of fig culture in the Algarve, as though it was new to the region.[6] In the same year, the ExpoAlgarve announced the fig tree as part of 'strategic cultures for the Algarve' and promoted it in workshops teaching how to grow them.[7] These events confirm the near total amnesia of the Algarvean agronomic tradition and traditionally dominant species.

In addition to the horticultural techniques that this project hopes to revive through a better knowledge of the horticulture practiced in the Iberian Peninsula and the Algarve, I also seek to show how Herrera's book contributes to our knowledge of the traditional irrigation systems used in the vegetable gardens. In the fourth book, he mentions the square form of the gardens and describes how they were irrigated – built on a downward slope, so that water could run down easily and make irrigating the fields easy. Land is then divided into squares and flowerbeds, and the main channels, or water leadings, are identified. Secondary and partial channels serve to irrigate the flowerbeds of each section (Herrera 1546, fls. 111–111v.). With the water running through a geometric grid powered by gravity, the success of vegetable gardens depended on their location in the system. As the quality of irrigation was dependent on field topography, water lines regulated the layout of farms and villas that used the gravity irrigation system, so the Portuguese landscape architect Aurora Carapinha (1995, 312–316) concludes. Vestiges of such vegetable gardens can be found throughout the area of the Barrocal.

For a world in which a drop-by-drop system is seen as the ultimate solution for horticulture and garden irrigation, later editions of Herrera's treatise offer important advice as they offer critiques on direct irrigation through pipes or similar systems. Regarding the most economical means of watering trees, they consider 'as ridiculous and even harmful all maxims that propose to water the trees through pipes, tiles, horns, & c.' (Herrera 1818, vol. III, 81; my translation). They stress that the system is impracticable in large plantations and detrimental to the plants since diseases and other circumstances can affect them through the watering tools (81). As Herrera advises farmers to work in harmony with nature, using traditional irrigation methods to transform drought lands into fertile ones, principles of sustainability and ecology mark the tone of his treatise.

## Patterns conveying landscape identity and sustainability

The history of the Algarve landscape can be traced through descriptions of the Kingdom of the Algarve in books on botany and in agricultural reports from the sixteenth to the nineteenth centuries. Fray João de São José, clergyman of the Order of the Hermits of St. Augustine of the Province of Portugal, provides the earliest overview of the Algarve

[6]https://www.rtp.pt/noticias/economia/quinta-de-castro-marim-aposta-na-exportacao-de-figos_v760108 (accessed 12 March 2017).

[7]http://www.sulinformacao.pt/2014/11/alfarroba-amendoa-azeitona-e-figo-sao-apostas-de-futuro-para-a-agricultura-do-algarve/ (accessed 12 March 2017).

landscape (1577). More detailed information is given by the description of a local, Sarrão, but both convey images of a fruitful landscape dominated by fig groves and featuring vineyards and olive, almonds, and carob trees. Two seventeenth-century descriptions, Duarte Nunes Leão's *Description of the Kingdom of Portugal* (1610) and Alexandre Massay's *Description of the Kingdom of the Algarve* (1621), also highlight the species mentioned above but add orange trees, which were probably (re)introduced to the landscape at the turn to the seventeenth century. The parish memories of the city of Faro, ordered by the Marquis of Pombal in 1758, list fig, almond, and carob trees as the dominant species. In the late eighteenth and nineteenth centuries, the knowledge of dominant species could be traced through descriptions of the Algarve and agricultural reports as well as through travel journals. For example, the German botanists Johann Centurius Graf von Hoffmannsegg and Link came to Portugal between 1799 and 1804 and published a book describing the Portuguese flora (1809–1820). According to Link, fig groves continued to dominate in the Algarve (Link 1801, 446–456). In 1846, the German botanist Heinrich Moritz Willkomm visited southern Portugal, followed by Karl Albrecht Ludwig von Seebach, who published a book on the Monchique Mountain (1879). Hermann Friedrich Joachim Freiherr von Maltzan published a travel book on the area between the Algarve and St. Vincent Cape, entitled *Zum Cap S. Vincent. Reise durch das Königreich Algarve* (1880). Although these sources do not distinguish between different types of landscape, it is noticeable that botanists focus on the endemic flora and agricultural reports on the productive landscape. The unpublished 1872 Agricultural Report addresses four fields of productive landscape: the first section is dedicated to farm animals, manures and prairies; the second to forestry; the third to kitchen gardens and orchards; and the fourth to vineyards and olive trees. Lastly, the descriptions by the Portuguese João Baptista da Silva Lopes's *Economic Memory of the Kingdom of the Algarve* (1841) and Charles Bonnet's *Memory of the Kingdom of the Algarve* (1850) provide later overviews of the Algarve landscape. Like the other sources, they highlight an extensive list of ornamental plants, vegetables, and fruits that were grown on the Iberian Peninsula. However, this particular history of the landscape came to be largely forgotten.

I began this paper by criticizing 'tropical paradises' in the Algarve, and although the topic could be addressed through the lens of ecology as an example of an unsustainable landscape, I chose to discuss it in terms of a pattern that fails to convey the landscape's identity. In what follows I delineate the rationale that lies behind this critique. The 'tropical paradises' promoted by the tourism industry are built with swimming-pools, lawns in the design of English gardens, and palm trees. This is an international model replicated anywhere in the world, with no respect for the biophysical conditions of the place and without regard to whether it is built in a tropical or arid region. Therefore, 'tropical paradises' fit the category of 'non-places,' a concept introduced by Marc Augé in *Non-Places: Introduction to an Anthropology of Supermodernité* (1995), where he argues that places such as airports and supermarkets do not hold enough significant meaning to be understood as 'places.' Airports and supermarkets of the same brand tend to look the same everywhere. For example, outlets of Carrefour in Portugal and in France look identical and sell the same products. Similarly lacking identity, hotels and golf courses created as 'tropical paradises' can also be included under this umbrella term: 'tropical paradises' look the same in the Algarve as they do in Thailand. Although landscapes are subject to constant change, there is a reaction against the creation of this type of landscape in the Algarve as it is

considered ill-adjusted to the particular conditions of the region. The critique is headed by the Mediterranean Garden Society and their local branch in the Algarve (Rodrigues 2014b).

According to Olivier, it is misguided to imitate English lawns in the Iberian Peninsula, not least because it can never produce a satisfactory result (Olivier 2007, 10). He suggests a historical correlation between the expansion of the British Empire and lawns as a key-feature of British landscape identity and as characteristic of the English garden in opposition to the French or formal garden (Olivier 2016, 18–19). Like other products from England in the nineteenth century which held a global model function, the English landscape garden was copied everywhere. This gardening style with lawns as a key feature became much easier to achieve once the technique of automatic irrigation spread in the 1970s (19). A second historically-derived influence is the landscape composition of lawns with palm trees, first used in nineteenth-century southern France and commonly denoting wealth and glamour. Originally the model for high-end tourist destinations, it soon became the generic face of middle-class holidays worldwide. Although one might view this critically, the regional economy in the Algarve is dependent on the tourism industry. To persuade stakeholders to return to more eco-friendly practices that protect both environment and landscape identity, we will have to revive a sense of attachment to the region. And with a notion of identity as dynamic rather than static – all the more if it includes living beings – landscape identity can actively be shaped. Crucially, attachment to landscape grows out of memories of familiar sights of trees, fields, rivers, and hills and is embodied in people's sense of rootedness. When these are lost or partially replaced – for example, by palm groves and bonsai-shaped olives which currently proliferate in the Algarve – we fail to recognize our collective memory in the altered Algarve landscape.

## Conclusion

To finally address the discussion of the global versus the local, while landscape is part of a global heritage and thus of worldwide concern, we cannot ignore the local dimension and the equal relevance of the region's unique environmental potential reflected in the diversity of its scenery and traditional artisanal and water management practices. Since local practices giving way to global perspectives turned out to have negative effects on landscape sustainability, solutions can only come from a deeper understanding of scientific knowledge and landscape perception that will inform a visual model to replace the unsustainable 'tropical paradises' on the southern Iberian Peninsula. Building bridges between historical texts, traditional artisanal practices, and current challenges faced by the Mediterranean landscape can help reshape present trends in designed and productive landscaping. There is enough historical evidence to reconstruct the layout, the dominant species, the horticultural techniques, and the irrigation systems so that landscape architects and horticulturists can suggest projects pointing the way forward in terms of sustainability and identity and, additionally, supporting the ethical guidelines of the European Landscape Convention.[8] In this way, we create the conditions to protect the region's traditional values and to foster attractive and well-balanced bio-cultural landscapes. As we have

[8]The European Landscape Convention (1981) is a treaty known as the Florence Chart that presented a significant revision of the concept of landscape, its protection, and its planning at an urban and countryside level. Its ultimate goal is to provide well-being to all citizens and generations to come by protecting European landscapes.

seen, this can be achieved by basing current practices on lessons from history and ecology, or, in other words, by drawing on a cross-fertilization of ideas between the humanities and the sciences.

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