

LAKE GARDA LEMON HOUSES: A MEDITERRANEAN LANDSCAPE IN AN INTERNAL LAKE

Alberta Cazzani¹, Stefano Barontini²

¹Politecnico di Milano, DASTU

phone +39 02 2399 5026, e-mail alberta.cazzani@polimi.it

²Università degli Studi di Brescia, DICATAM, via Branze, 43, I-25123 Brescia (IT)

phone +39 030 371 1280, e-mail stefano.barontini@unibs.it

Abstract – Lemon houses (locally, *limonaie*) are ancient terraced citrus gardens that still shape the landscape of a wide area along the NW shore of Lake Garda (Northern Italy). Here, thanks to lake's microclimate, to SE exposure of the gardens and to the development of an original agricultural technique, lemon houses allowed a fruitful and international citrus trade that, already settled during the 16th Century and despite the sensitivity of lemon trees to cold temperatures, flourished during the Little Ice Age and reached its maximum development between the 18th and 19th Century. Now, that the citrus trade is no more central for the economy of the area and the citrus cultivation has become ancillary to other functions of the landscape, in view of designing future scenarios for that area, we propose an interpretation of Lake Garda *limonaie* as a deeply anthropogenic, labour intensive, multifunctional landscape that, not only in the local flora and in the steep calcareous slopes, but also in its bioclimatic adaptation and in the central role of the irrigation as an axle of the citrus cultivation, shares many characteristics with the symbiotic relationships established between humans and nature, typical of the oases of the wider Mediterranean basin. We therefore conclude that any intervention which aims at preserving the fragility and peculiarity of the area, as well as the intangible cultural heritage of the citrus cultivation, should be framed in a holistic agroecosystemic perspective, deeply rooted in the knowledge of lemon houses' past.

Lemon houses and Lake Garda

When Renaissance agronomist Agostino Gallo, from Brescia, dealt with citrus fruit growing in the Seventh day of *The twenty days of agriculture and the pleasures of the villa...* [14], he introduced the theme by comparing the peculiar climatic and vegetative conditions of Lake Garda NW shore, in Northern Italy, to those of Ligurian and Southern—Italian coasts, and he stated that he would not have treated of citrus fruit growing in these areas, in favour of those cultivated along Lake Garda shore. The recognition of typical Mediterranean features in Lake Garda landscape and climate is in fact ancient, and particularly the coast running for some tens of kilometres from Salò to Limone is exceptionally rich in Mediterranean flora and agriculture, as holm—oaks, cypresses, capers, laurels, myrtles, agaves, olive groves, vineyards and, particularly, citrus groves.

This peculiarity is due both to the presence of a great lake and to the local geomorphology. The lake (with a surface of 370 km², a volume of about 49 km³ and a contributing basin of 2260 km², measured at the lake outlet) locally mitigates the climate.

The presence of a calcareous—rock barrier, uphill the cultivated area and facing SE, protects from winds and allows to store the Sun heat, thus reducing daily temperature excursions. The territory, naturally prone to Mediterranean cultivations, was continuously and intensively modified by anthropogenic action since the 15th Century. The slopes were terraced with dry—stone walls and landfill, in order to cultivate citrus, olives and grapes, which sustained a flourishing economy for about five centuries.



Figure 1 - *Limonaie* characterise the landscape, with their system of terraces and pillars, Limone (Lake Garda, Italy. Postcard, first 1900s).

The most typical cultivation of Lake Garda Western shore has undoubtedly been the citrus fruit growing, already documented since the 15th Century [4, 5, 9, 11, 12, 13]. This cultivation shaped the shore, particularly in Gargnano, Limone and Toscolano Maderno, with many lemon houses (locally: *limonaie*, Fig. 1) linked with a dense network of features (irrigation channels, storage houses, roads, cypress trees planted as windbreaks or rockfall barriers and chestnut groves to provide the required wood). *Limonaie* are traditional local structures, unique of their kind, to cultivate citrus trees in terraced gardens, exposed to the Sun and protected from the winds by great walls. They were transformed into greenhouses during cold months (from November to March), because citrus trees, planted in whole soil, cannot bear cold temperatures. Since their first appearance, lemon houses rapidly gained a remarkable degree of standardization, both in the structures and in the agricultural technique. In order to face the great amount of water required by citrus trees in wet climates, and the structural water scarcity of the soil along steep slopes, the lemon houses adopted a very precise irrigation system, based on the use of flumes to distribute the water tree by tree, typical of many Mediterranean water—scarce cultivations (Fig.2). These protective structures – together with the lake’s warmer microclimate – made Garda Lake the Northernmost point in the world where lemons grown commercially. At 600 meters above sea—level, Garda lemons are also the highest. In the gardens, particularly lemons

and citrons were cultivated, mainly to be exported in Northern Europe. In the middle of the 19th Century, at the time of their maximum development, almost 50 hectares of land were devoted to citrus fruit growing, with about 35 000 productive trees and an average amount of harvested lemons ranging between 15 and 20 millions of units.

The deep social and economical changes of the 20th Century, viz the development of transportations, the discoveries in the pharmaceutical fields which reduced the preciousness of citrus fruits and laurel, the intense tourist development of the area, together with some diseases which affected the trees, dramatically conflicted with the great cost of skilled manpower which was required to produce citrus fruits in this area. Citrus fruit growing lost its economical return and has been slightly abandoned. Now Lake Garda lemon houses, even if rarely cultivated and only partially conserved in all their structural components, still represent an emblem of NW Lake Garda landscape and a unique heritage which still requires to be investigated, protected and set off [1, 5, 8, 13].



Figure 2 - Inside a recently restored *limonaia* in Gargnano in Winter months: the *limonaia* is closed and covered. The irrigation system and many features of traditional citrus fruit growing may be recognized.

History and architecture of lemon houses

The history of the lemon groves of upper Garda covers a period of over seven Centuries, from the date of the introduction of the first lemon trees at the end of the 13th Century until today. The development of the *citrus gardens* was gradual and progressive, until reaching maximum expansion and productivity in the mid—19th Century. Local tradition, as reported by Giuseppe Solitro in 1897 [18], attributes the first introduction of

lemon in the upper Garda in the 13th Century by a monk who planted in the Gargnano Franciscan convent – founded before 1266 by San Francesco himself – a citrus tree probably coming from Liguria or Sicily. In support of this tradition, lemons, oranges, citrons and Adam's apples are carved on the 14th Century capitals of the convent cloister.

The creator of the monumental terraced buildings, nor the start of their construction is unknown. However, the presence of citrus groves had made the NW Garda shore special and extraordinary since the 15th Century: for Felice Feliciano in 1464, Toscolano was “embalmed with the scent of citrons” and “shaded by the leafy branches of lemons and citrons” [11, 12]. Even Marin Sanuto who in 1483 describes *Zardini de zedri, naranzari and pomi damo* (“Gardens of citrons, oranges and Adam’s apples”) [11, 12] and Jacopo Bonfadio in 1548 reports orange, lemon and citron gardens and highlights the strong connection between natural and cultural landscape: “The gardens here are the gardens of the Hesperides and Alcinous and Adonis. The countrymen industry has done so much that Nature incorporated with art [of agriculture] has itself become an art and together they have produced a third Nature to which I cannot give a name” [7, 12]. It is therefore demonstrated that if the cultivation of citrus fruits could already be widespread from the 14th and 15th Century, in the 16th Century the architectural layout of the *limonaie* was designed and set in all the components that we can still notice today. In this regard the aforementioned Agostino Gallo in 1569 [14] describes the *limonaie* completely defined in the architectural components, constructive techniques, materials and maintenance practices. The cultivation of citrus fruits initially spread to Maderno, Toscolano and Gargnano. Even if in Limone the presence of lemon groves has been documented since the beginning of the 17th Century, it was the noble Bettoni family who, starting from the end of the 17th Century, built monumental *limonaie* in Limone for an intense lemon production aimed at high profitable marketing [11, 12, 13, 19].

Even today the *limonaie* are a distinctive landscape feature, particularly the tall, stone perimeter walls, some of them eight to ten meters high, built on the terraced land to protect lemon trees from the winds that blow down from the mountains behind. Thin stone pillars stand sentry—like along the terraces, built to secure a grid of wooden beams. During the Winter months, the *limonaie* were closed by wood plank roofs and large window panels facing the Sun, turning the structures into seasonal greenhouses. The wood parts that were used to cover and close the *limonaie*, were put away during Spring and Summer in tall store storehouses called *caselli* that stood next to the lemon houses themselves. They were necessary for storing materials, but also for the covering and opening works.

The Garda lemon growing was extremely labour-intensive. Building the structures was only the first step. They must be maintained, closing and opening them with the seasons, lighting fires inside when the temperature drops below freezing, cultivating and watering the trees, harvesting and distributing the fruits. All the effort was worth it though because lemon growing was highly lucrative. Most of the money made from Garda lemons was from exports to Central and Northern European countries. There was no real competition, as lemon from the South of Italy would not last long enough to reach all the markets where Like Garda lemons were distributed. Their durability remained a key competitive advantage well into the 20th Century. Giovanni Barbaro in 1614 wrote: “This area abounds with oranges, citrons and wonderful sort of lemons... The owners make great profits by selling them in German lands and especially lemons, though they spend a lot of money in the upkeep of their gardens” [7].

The lemon industry was highly organized. In 1840, *limonaie* owners founded the Società Lago di Garda, a pioneering agricultural cooperative, whose historic headquarters can still be seen abandoned at the edge of Gargnano [6,10,17]. There were the golden years, when Gargnano – center of citrus fruit growing – produced 4 to 5 million lemons a year, out of a total for the area of 6 to 7 million. The years of maximum production of the Società Lago di Garda were those between 1840 and 1860, with about 125 million total lemons delivered, with a peak of 9.7 million in 1852 (of which 7 million from the Gargnano lemon houses). The Società Lago di Garda organized the collection and separation of the lemons into categories, from superior to poor. Then they were shipped to Desenzano, the largest town on the lake, where they were mostly sold to German agents and prepared for shipping to Austria—Hungary, Prussia, Russia, the Ottoman Empire, Britain, Sweden and Denmark. Only the poorest quality lemons were consumed locally [5]. However, at the end of the 19th Century production started to decline and the entire lemon growing culture was abandoned. Since then, the landscape has changed. Many *limonaie* have been left to decay and collapse, others have been converted into other agriculture purposes or into houses.

Traditional irrigation system

The link between the lemon houses and the irrigation is deep and the importance of the irrigation for the gardens has been already recognized in ancient times. Agostino Gallo, even if referring that some gardeners used to irrigate the trees, and other ones still not, reports in the cited Seventh day [14] that irrigated trees give much more numerous, beautiful and early fruits than the not—irrigated ones. He therefore states that gardeners, who don't have commodity of sources, wells or cisterns nearby the garden, devote a great labour to bring the water to the trees, as any one of them requires more than two *brenta* of water each irrigation. *Brenta* is a vernacular word standing for the Italian *gerla* and for the Venetian *zerla*, which means wicker pannier. Traditional wicker panniers' volume is some tens of litres but the word *zerla* was used also as a volume measurement unit for liquids and corresponded to 49.7427 litres [15]. This note reported by Agostino Gallo is therefore in agreement with (and a lower limit of) the more recent traditional practice according to which each tree would require between 100 and 300 litres for each irrigation during the warm season. The difference between the two data might account for the fact that Gallo's knowledge of the local agriculture reflected the climatic conditions of his era, at the beginning of the Little Ice Age. Accounting for the presence of one productive lemon tree in every space between two pillars, for the citron trees between them and for the nursery, each terrace of a garden had many tens of trees. These little data gives a rough idea of the great amount of water required for each irrigation, so that an irrigation system was not only needed, but it fastly developed and soon gained a remarkable degree of standardization as the other features of *limonaie*. Moreover, the necessity of water availability nearby the gardens contributed to shape the landscape as well as the necessity of solar radiation, so that many terraces clung to the rocks of the slopes in order to being near to the sources.

The traditional hydraulic system of the *limonaie* is divided into three fundamental parts: (1) the water collection and storage works, (2) the water distribution network inside the lemon houses and (3) the drainage network to remove the excess water. The collection and storage works are always upstream of the garden or, more commonly, of the system of

gardens which were irrigated with the same water supply. These works are in turn of three types: direct water intake from a stream, storage tanks and natural or artificial sources. The direct intake from a stream was separated from the irrigation channels by a stilling basin, from which the water was usually taken by means of a submerged intake, as it is common in many traditional irrigation systems. Tanks' volume ranged from about 1 m³ to some hundreds of cubic meters (as for the big reservoir upstream of the lemon houses of Bettoni family in Bogliaco, nearby Gargnano), depending if they were used only as stilling basins or partitioning basins, or they were used as a reservoir for big *limonaie* systems. The pumping of water directly from the lake was introduced in recent times and it is practiced only for those gardens that are located on the lake shore.

The water, conveyed by means of the external works toward the upstream terrace of the garden, was distributed to the plants by means of flumes that run along the retaining walls upstream of the terraces and are equipped with at least one little rectangular spillway at each field, i.e. every 4 m or 5 m (Fig. 2 and Fig. 3). The traditional flumes were mostly made of pink marble or grey sandstone, both being common in the area. Particularly the pink marble, from Verona caves, was used in the lemon houses for all the most relevant stone details. Some flumes may be found also built in sided—up roof tiles but they should be attributed to more recent interventions. The flumes were sustained by brackets or, sometimes, by pillars, at a height ranging between one and two meters from the base of the wall. The measured slopes of the flumes range from 0.01 m/m (e.g. in the *limonaia Pra' de la Fam*, Tignale) and 0.1 m/m (e.g. in the *limonaia La Malora*, Gargnano). In the same *limonaie*, measured flume sections are (reversed) trapezoidal and range 11 cm to 12.5 cm for the larger base, 5 cm to 5.5 cm for the smaller base, and the depth is about 6.5 cm. It is worth noting that almost all the observed sections, also in other lemon houses, show the same shape and dimensions, which are close to the section of least hydraulic resistance.

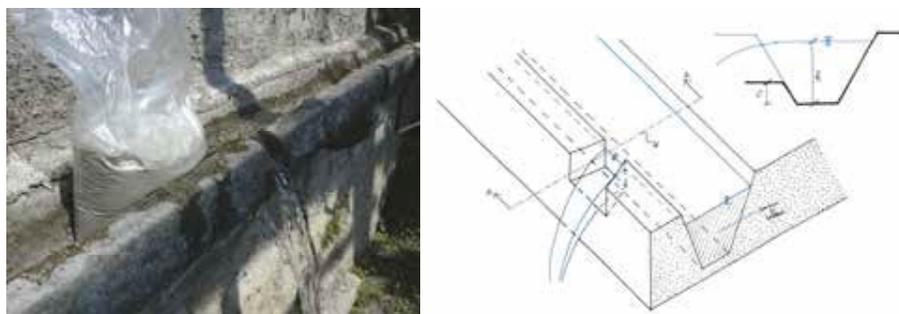


Figure 3 - Spillway, activated by the backwater of a sand bag, at *limonaia La Malora* (Gargnano, left) and sketch of a typical section of a flume with the activated spillway, as measured at the *limonaia Pra' de la fam* (Tignale, right), [3].

An underground pipe covered with stone slabs, the *caladria*, allowed the water to flow down to the terrace downstream. At the *La Malora* lemon house a *fistula* brick segment was observed that was probably part of a *caladria*. Such frustum—of—cone shape

is locally very common for small pipes since the Roman Era. Even if during the inspections carried out some small variations were observed in the slope, in the section dimensions of the channels and in the shape of the section of the spillways, it was verified that the internal water distribution system was characterized by a meaningful degree of standardization, as the other functional elements of *limonaie*.



Figure 4 - *Fistula* of a *caladria* discovered by the owner at the lemon house *La Malora* (Gargnano).

In order to irrigate the plants, each spillway was activated with the tailwater induced by means of a sandbag put across the flume, downstream of the spillway. The slope of the flume was such that only one spillway is activated at a time, and the irrigation was performed plant by plant, from upstream to downstream. The spilling water was conveyed into a pond at the foot of the plant by means of a wooden (orthogonal) dihedral. During previous flow measurements [3], it was verified that most of the spillways were capable of delivering flow rates between 7 litres and 15 litres per minute, with quite a small discharge coefficient (with respect to theoretical values) which deserves to be further investigated. Such discharge made it possible to supply the irrigation needs of 100 litres to 300 litres per plant, every eight days in the warm season, in a time interval from 10 minutes and just over half an hour. Since it was possible to activate only one spillway at a time, considering the large number of adult and young trees for each terrace, we may conjecture that in the warm season the water distribution was almost continuous.

A Mediterranean landscape and its present days

The complexity of the irrigation system, the detail with which special parts were carved into the rock and the central role played by the irrigation in the lemon groves, also at shaping the systems of lemon houses, evidences the typical patterns of the water—scarcity irrigation. This observation might be paradoxical in a wet climate as that of Lake Garda is,

but it is justified by the great amount of water required by citrus growth (especially at mid—latitudes) and by the difficulty of managing the water on the steep slopes of the NW Lake Garda shore. A typological comparison, between the traditional irrigation of lemon houses and other traditional irrigation systems in the Mediterranean basin, makes it much more similar to the irrigation system of Spanish—Arabic gardens than to those of the inner Alps (see e.g. the Swiss *bisse* and *suonen*). This is remarkable because nearby the lemon houses district, in the river Chiese valley on the NW slopes of the same hills, an important productive district of hydraulic factories was supplied, in the same era, by channels that are typical of the inner Alps [2]. Not only the irrigation, but also the selection of local and valuable varieties destined for trade (the Salò citron, and the Maderno lemon, called *madernina*) and of ancillary varieties (laurels, capers), the contribution of skilled workers that developed a standardized production system deeply adapted to the territory, the ability of the gardens to face the climatic changes – it is worth noting that the gardens, despite the sensitivity of lemon trees to the cold, had their maximum development during the Modern Age, that is in the midst of the Little Ice Age –, the relationships with the networks of supranational trade, all these characteristics make it possible to speak of Lake Garda *limonaie* as of an oasis, where the echoes of the wider Mediterranean basin are perceived, where the deeply anthropogenic landscape is characterized by a structurally symbiotic relationship between humans, nature and climate, and where the agricultural practice naturally aimed at preserving the functions of the ecosystem (Fig. 5).



Figure 5 - The NW Lake Garda landscape, still notably characterized by several *limonaie* at different levels of conservation, connected to other traditional Mediterranean crops as olive groves, vineyards, laurel groves, meadows and woods.

Today it is particularly important to set conservation and recovery treatments not only considering the maintenance of the historical landscape and documentary value of the lemon houses, but also including the agronomic and productive one. In this sense, there is a risk that historical cultivation techniques will be lost and that construction elements, materials and plant species that are not compatible with the local and traditional landscape will be introduced. Although awareness of the unique and exceptional value of the *limonaie* landscape is growing, there is still the risk of losing the peculiarities of the tangible heritage and above all of the intangible heritage related to them. The *limonaie* landscape is the result of a complex process of territorial transformation and of a continuous maintenance work carried out by farmers and gardeners for centuries [5]. The future management of this unique traditional rural landscape will be possible only if policies and strategies, aimed at the knowledge, dissemination and promotion of this exclusive heritage, are defined.

The future of *limonaie* is yet to be written

The lemon groves have long been part of Lake Garda landscape. Goethe noted in 1786, discovering Limone, that “the terraced gardens planted with lemons, give a feeling of order and wealth. The entire garden is adorned by white, square pillars, all in row, each a certain distance from the others, in such a manner as to resemble a staircase, gradually climbing up the side of the mountain” [7,11]. This complex landscape system was set and built without an architect plan. In this regard, *limonaie* are considered by Bernard Rudofsky “architectures without architects”. He defined the Lake Garda *limonaie* like “skeletal architecture”, underlining “the charms of this exotic architecture” that he picked for the cover of the first edition of his book [16]. Rudofsky rightly claims that: “Vernacular architecture does not go through fashion cycles. It is nearly immutable, indeed, unimprovable, since it serves its purpose to perfection. As a rule, the origin of indigenous building forms and construction methods is lost in the distant past.” The fact that *limonaie* have lost their economic importance has led to the loss of management skills and has caused the current decay and fragmentation of a complex system. However, the *limonaie* – in different states of conservation – are still typical components of NW Lake Garda landscape and provide an architectural—cultural heritage that is unique in the world [1, 5, 8].

If seen under the light of the paradigm of the oasis, it is possible to recognize in the lemon houses not only the historical and aesthetic function, linked to the conservation of their memory and of the value of the landscape, but also the whole wide range of functions and ecosystem services recognized in the Millenium Ecosystem Assessment and that are specific to oases, such as the cultural role played in the networks of the international trade, the function of agri—food supply, and the regulatory function of biodiversity on the climatic changes and that of the terraces on the hydrogeological hazard. The agri—food supply function is not related only on the citrus production – traditionally devoted to the trade –, but also on the ancillary horticultural productions, which are traditionally oriented to local consumption. As well as the oases, the lemon houses are fragile, because they are anthropogenic ecosystems, and they require to be faced as a whole agroecosystem, thus going beyond the bifurcation between musealization and touristic vocation, from one hand, and abandoning and change of destination, from the other hand. Moreover, to convey them back, to their pristine agricultural vocation via an agroecological

perspective, might partially readdress the nowadays mainly touristic vocation of Lake Garda. The knowledge of the mass, energy and labour fluxes which shaped the landscape are crucial to reconnect the architectural and cultural fragments of its nets, and any intervention, which aims at preserving the fragility and the peculiarity of the area, should be framed in a holistic agroecological perspective, deeply rooted in the knowledge of lemon houses' past. In this way the peculiarity of Lake Garda lemon houses will be preserved and they will provide all the services they can, thus opening a range of possible scenarios which, alongside the conservation and musealization of the structures and of the cultivation technique as an immaterial cultural heritage, will combine the integration with supranational cultural paths with the return to a renewed agroecological productive vocation. The unique architecture of the *limonaie* must be considered as the result of a particular and complex historic landscape project that needs to be analysed and surveyed, to prepare re—use and management plans and define conservation treatments and standards for the preservation and valorisation of this exceptional tangible and intangible heritage.¹

References

- [1] Badiani B., Barontini S., Bettoni B., Bonati S., Peli M., Pietta A., Scala B., Tononi M. & Vitale N. (2017) *Lake Garda lemon houses (Italy): Opportunities of a sensitive, marginal area in urban planning*, Change and Adaptation in Socio—Ecological Systems, doi: 10.1515/cass-2017-0010, 3 (1):111–118.
- [2] Badiani B., Scala B., Barontini S., Aliverti L. & Ghirardi A. (2020) *Gli opifici idraulici della Valle Sabbia. Conoscenza e conservazione*, Nardini Editore, Firenze.
- [3] Barontini S., Vitale N., Fausti F., Badiani B., Bettoni B., Bonati S., Cerutti A., Peli M., Pietta A., Ranzi R., Scala B., Tononi M. & Zenucchini V. (2016) *L'irrigazione tradizionale delle limonaie del Garda tra scarsità idrica e antropizzazione del territorio*, in Proceedings of the XXXV Convegno Nazionale di Idraulica e Costruzioni Idrauliche, Bologna, 14–17 September 2016, doi: 10.6092/unibo/amsacta/5400, pp.1235–1238.
- [4] Bettoni L. (1879) *L'Agricoltura nei contorni del Lago di Garda*, Tip. Bernardoni di C. Rebeschini, Brescia.
- [5] Cazzani A., Sarti L. (1992, 1997) *Le limonaie di Gargnano. Una vicenda, un paesaggio*, Grafo, Brescia.
- [6] Cazzani A. (1997) *La Società Lago di Garda: uno storico fulcro dell'economia gardesana*, in: AA.VV., “La chiesa di San Francesco e la Società Lago di Garda a Gargnano”, Grafo, Brescia, pp.67-91.
- [7] Cazzani A. (edited by) (1999) *Giardini d'agrumi. Cedri, aranci e limoni nel paesaggio agrario italiano*, Grafo, Brescia.
- [8] Cazzani A. (2007), *The limonaie of Garda Lake: a Cultural Landscape to preserve*, in: AA.VV., “Orangerien in Europa von Fürstlichem Vermögen und Gärtnerischer

¹The present paper was conceived and written jointly by the two authors. In particular, Alberta Cazzani developed Sections: *Lemon houses and Lake Garda, History and architecture of lemon houses*; Stefano Barontini developed Sections *Traditional irrigation system, A Mediterranean landscape and its present days*. The authors collaborated in the writing of the *Abstract*, of *The future of limonaie is yet to be written and for the final revision of the manuscript*.

- Kunst”, ICOMOS, Hefte des Deutschen Nationalkomitees – Journals of the German National Committee, n.XLIII, ICOMOS, Nationalkomitee der Bundesrepublik Deutschland, pp. 71–77.
- [9] Cigognetti G. (1988) *Architettura bioclimatica e territorio: le limonaie del Lago di Garda*, Abacus (13):16–25.
- [10] Erculiani G. (1940) *La Società Lago di Garda*, R. Codignola, Brescia.
- [11] Fava D. (1985) *I limoni a Limone sul Garda*, Cassa Rurale e Artigiana di Vesio Tremosine, Tip. Squassina, Brescia.
- [12] Fava D. (2005) *Limonaie e limoni a Limone sul Garda*, Grafo, Brescia.
- [13] Fava D. (2006) *Tra le limonaie di Limone sul Garda. Un percorso tra storia e cultura*, Comune di Limone sul Garda, Grafica 5, Arco.
- [14] Gallo A. (1569) *Le vinti giornate dell'agricoltura et de' piaceri della villa delle quali sette non sono più state date in luce, & tredici di nuovo son ristampate con molti miglioramenti*, Appresso Gratoso Percaccino, Venezia.
- [15] Martini A. (1883), *Manuale di metrologia, ossia misure, pesi e monete in uso attualmente e anticamente presso tutti i popoli*, Loescher, Torino.
- [16] Rudofsky B. (1964, 1987), *Architecture Without Architects*, University of New Mexico, Albuquerque.
- [17] Samuelli T. (1883), *Origine della Società Lago di Garda*, Tip. Conter, Salò.
- [18] Solitro G. (1897), *Benaco*, Giò Devoti, Salò.
- [19] Tedeschi P. (2019), *The noble entrepreneurs coming from the bourgeoisie: Counts Bettoni Cazzago during the nineteenth Century*, Business History, doi: 10.1080/00076791.2019.1653283.