HISTORICAL IRRIGATION SYSTEM AT L'HORTA DE VALÈNCIA

ACKNOWLEDGEMENTS

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Ajuntament Godella

Ajuntament Meliana

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Ajuntament Pobla de Farnals

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Name/Title of the Agricultural Heritage System

Historical irrigation system at l'*Horta* de *València*[1].

Requesting Agency/Organization

A grouping of public administrations led by *València* City Council and Consell de l'*Horta*, a partnership body created by Generalitat Valenciana, Diputació de *València* and the *València* City Council. The group is supported by other municipalities, by the Regional Parliament (Corts Valencianes), by the local public universities and the Valencian delegation of the Higher Council for Scientific Research.

Responsible Ministry (for the Government)

Ministry of Agriculture, Fisheries and Food of Spain (MAPAMA).

Location of the Site and Accessibility

Comunitat Valenciana (Valencian Community), Spain.

The GIAHS site corresponds to the historical irrigation system belonging to the City of *València* and the municipalities of L'*Horta* district. The site is a historical peri-urban agricultural area in the outskirst of the city of Valencia and of 44 municipalities of the Comarcas de l'*Horta Nord*, *Horta Sud* and *Horta* Oest, so it is easily accessible from the city of Valencia. It is located at 39°28′00″N 0°22′30″W. The Northern GIAHS coordinates are 39°37′44″N 0°17′47″W (Puçol), the Western coordinates are 39°31′3″N 0°30′16″W (Manises) and the Southern coordinates are 39°16′45″N 0°16′30″W (El Perelló).

Area of Coverage

Non-urban areas covered by the irrigation sytem that define the site spread over a total of 17 km^2, of which 12 km^2 are located in the protected territory defined at the P*lan de Acción Territorial de la Horta* (PATH), and 5 km^2 in the *Albufera* Natural Park and related canals. Of the total area, around 10 km2 are cultivated, with 8 km^2 in the Historical *Horta* and 2 km^2 in the rice area of the Natural Park corresponding to City of *València*.

Agro-Ecological Zones

The Northern, Western and a significant part of the Southern shores of the GIAHS site are covered by small agricultural plots, irrigated by the historical channels whose secular water distribution rules depend on the *Real Acequia de Moncada* and the *Tribunal de las Aguas* that occupy most of the system. The southern shore of the irrigation nertwork flows into the *Albufera* Natural Park where small-scale fishing activites coexist with rice irrigated areas. The peri-urban irrigated land can in turn be classified in sectors corresponding to citrus, fresh vegetables and rice, as core cultures adapted to different soils and water sources.

Topographic Features

The lowland plain in the Mediterranean coastal belt rises progressively from the sea towards the inland. From a height of 60 m over the sea level, the water flows down from the *Turia* river (*Assut* de *Moncada*) feeding *Acequias* by gravity and then land plots.

Climate Type

Mediterranean climate.

Approximate Population (Beneficiary)

6,000 families form the agricultural community. Food and environmental benefits extend to the population of total Metropolitan area.

Figure 1. GIAHS site zoning: Strict Historical *Horta* (in highlighted green colour) and the *Albufera* lagoon to the South.

"[...] rural people in the area preserve local culture and language modalities that are characteristic of the *HortaHorta* district."

Ethnicity/Indigenous population

Not applicable. However, rural people in the area preserve local culture and language modalities that are characteristic of the *Horta* district.

Main Source of Livelihoods

Agriculture, Fisheries, Tourism and Services.

SHORT SUMMARY

"The *Horta* of *València*", henceforth *L'Horta*, is a historical district of the Valencian Community, formed by a system of cultures irrigated by the *Turia* river, from where a system of irrigation channels, originally designed in medieval times, spreads over the area, flowing down by gravity. The irrigation network extends around the City of *València* and spreads over dozens of municipalities in the North, West and South districts of the Metropolitan region. Geographically, the irrigated area encompasses a coastal plain with a smooth slope that declines slowly from inland to the sea. *L'Horta* is the result of: i) a historical structure, dating from centuries ago, based on an irrigation network (acequies), rural roads, farmhouses, etc. that define their physical heritage; ii) an agricultural system, rich in Mediterranean crops, that originates and coexists with this structure and configures a colourful and changing landscape scenery throughout the seasons; iii) a hydraulic culture represented by millenary water use rules, herited from Medieval times and governed by institutions such as the *Real Acequia de Moncada* and the *Tribunal de las Aguas*. It is a territory where, over the centuries, the Valencian farming community has built a unique landscape, whose value surpasses the strictly productive and grants this GIAHS site the status of a historical witness and a millennial legacy. The Southern irrigation channels end up in the *Albufera* Lake, whose present configuration as a sweet water reservoir has been fed by water lefts from the historically irrigated areas, a natural park where rice and traditional artisanal fishing contribute to a living and vulnerable system. *L'Horta* is one of the most relevant Mediterranean *Huerta* landscapes, a space of proven productive, environmental, cultural, and visual values, in spite of pressures from urbanization. Its traditional water management contributes to stabilise water supply and demand, thus making the traditional system to fit with the new streams of sustainable development such as the circular economy, enabling the continued use of the territory without depletion or damage.

EXTENDED SUMMARY

"The *Horta* of Valencia", henceforth *L'Horta*, is a historical region of the Valencian Community, formed by a system of fields irrigated by the *Turia* river, from where a system of irrigation channels, originally designed in medieval times, spreads over the area. The GIAHS site is a non-urban territory that covers 17 Km^2 of peri-urban agricultural areas including Mediterranean gardens, rice culture with small-fishing activities of the *Albufera* lake at the South. It extends around the City of Valencia and dozens of municipalities in the North, West and South ends of the Metropolitan region.

Geographically, it is a plain that rises slowly from the sea inland. *L'Horta*, as a GIAHS site, is the result of:

i) historical structure, dating from centuries ago, based on an irrigation network (*acequies*), rural roads, farmhouses, etc. that define their physical heritage;

ii) an agricultural system, rich in Mediterranean crops, that originates and coexists with this structure and configures a changing scenery throughout the seasons;

iii) a hydraulic culture represented by water use institutions such as the *Real Acequia de Moncada* and the *Tribunal de las Aguas*.

iv) An irrigation network that, in its southern shore, flows in the *Albufera* Natural Park where rice and artisanal fishing contribute to a biodiverse, living and vulnerable system. The sweet water of *Albufera*, a lake which is separated from the sea by a one-km wide strip, has been historicaly fed by water lefts of irrigated fields and channels.

L'Horta is one of the most relevant Mediterranean *Huerta* landscapes, as recognised by the Dobris report, published by the European Environmental Agency in 1995. It is a space, shaped by many generations of farmers, of proven productive, environmental, cultural, and visual values, in spite of pressures from urbanization. Its traditional water management network and rules, dated from many centuries ago, fully fit with the new streams of sustainable development such as the circular economy, enabling the continued use of the territory without depletion or damage. It is a territory where, over the centuries, the Valencian farming community has built a unique landscape, whose value surpasses the strictly productive and grants this GIAHS site the status of a historical witness and a millennial legacy. The irrigation network with its main ditches, arms, branches and small derivations, has remained working for centuries and largely unchanged, although some derivations have been covered by past urban development plans.

L'Horta irrigated area benefits to 6,000 small agricultural family holdings sized between 0.5 and 1 hectares and thousands of farmland plots. The products, which are obtained in the irrigated plots, partly contribute to the families' own consumption but are mostly commercialized, with substantive orientation to local and municipal markets. It remains, however, a vulnerable system, not only due to the urban pressure but also due to the lack of generational renewal of small farm-holders, with 60% of them with an age over 55.

The historical irrigation network and the land structure divided into very small plots have allowed agricultural resilience to changing conditions, with a significant group of local varieties.. *L'Horta* has some crops that are unique or at least enjoy conditions that are hardly found in other parts of Europe. It is worth mentioning the tiger nut (*cyperus esculentus*), called *Xufa* in the region, as well as a number of horticultural from Asia and America adapted to the Mediterranean climate. Rice was introduced during the Arab rule, and was kept as a basic staple with local varieties that are basic for the local gastronomy and have reached international recognition, with dishes like Paella. The diverse habitats found in the irrigated areas and in the *Albufera* favour the presence of a large number of flora and fauna, closely related to the cultural ecosystem. However, the site is a vulnerable food system, endangered by water pollution and growing human activity in the área.

The site is a well-known farmer-managed irrigation system with rules of distribution established in Medieval times and governed by the *Tribunal de las Aguas* and *Real Acequia de Moncada*, both functioning since the Middle-Age. In this area water management has conditioned the development of the existing landscape since ancient times. The complex system of channels dates back to Muslim times and is still used for gravity irrigation. Their main water source is the *Turia* River from where the *Acequia* de *Moncada* starts at 60 mts. over the sea level and, downstream, the seven ditches governed by the *Tribunal de las Aguas* are derived, the water always flowing down by gravity. The mosaic of small plots resulting from this type of irrigation system, characterized by its sustainability, has not only survived for centuries but has continued to exist to date. Its maintenance is dependent on the transmission and application of a specific cosmology, which is closely linked to knowledge of water use and distribution.

In practice, water is distributed among farmers according to customary rules. Water is shared by applying a contiguous order of irrigation from top-to-bottom of the system. Once water is available at the head of the system, irrigation starts field by field and channel by channel until tail-enders have finished irrigation. Water is flowing according to stablished rules that open and close distribution gates. Plots follow one each after another following a smoothly declining slope that favours gravity irrigation and the water flow from upper to lower fields.

No water flowing in a downstram ditch is allowed to be pumped to upstream ditches. The distribution rules allow to manage water scarcity periods or to prevent from dramatic floods in periods of torrential rains.

An important social organization in the site is the *Tribunal de las Aguas* (Water Court), the oldest institution of justice in Europe, declared Intangible Cultural Heritage by UNESCO in 2009. This ancient court has the authority over all the *Acequias* and is responsible for enacting and enforcing their traditional rules for distributing water. The volume and quality of rural infrastructures reflect several styles corresponding to different historical periods. The enormous wealth of hydraulic and architectural heritage in the system is evolving to new uses that are helping to recover farmhouses in their different forms (*barracas, alquerías, molins, etc*).

The historical system at *L'Horta* has influenced local culture and living institutions. Among the core examples: *La Tira de Comptar*; the Valencian language; the rural arquitecture; and the *Albufera*'s water management and fishing. *L'Horta* is a peri-urban system, which allows farmers and fishermen to have a direct contact with Metropolitan markets. This facilitated the creation

of spaces like *La Tira de Comptar*, a farmer wholesale market that is testimony of the history and traditions that persisted from the 12th century and has maintained its value over time. Local markets, fairs, music, arts and literature are also representative of the love of Valencian agricultural community for their own culture.

The Paella Valenciana, the most famous Spanish dish, has local rice as the core ingredient, cultivated in the *Albufera* area for centuries, complemented with local traditional products from l'*Horta* and Valencia region. Without the millenial irrigation network and the "short grain rice" culture in the region, the Paella would not have become the reality that it is nowadays.

Landscapes are the graphic expression of the relation between human, culture and territory. A core element of the landscape is the agricultural mosaic and the natural channels that define large areas of metropolitan market gardens, as well as interstitial agricultural spaces between the existing urban cores. The traditional urban land bordering of *l'Horta* plays a fundamental role in adding value to the rural environment. The system offers a horizontal connection between the city and the countryside, plenty of cultural, physical heritage and green corridors maintained by smal farmers, generation after generation.

Given the Sustainable Development Goals, in particular Goal 2 (Zero Hunger) and Goal 6 (Water and Sanitation), and the challenges posed by the need for climate change adaptation (a future with water scarce resource) and mitigation (the quest for a sustainable water use) the irrigation system at l'Horta represents a singular way of governing a basic common resource: water.

1

SINGULARITY OF THE GIAHS SITE

TERRITORIAL COVERAGE

The area of coverage is located within the terms of *Horta Nord*, *Horta* Oest and *Horta Sud* districts, and the City of *València*. A map is included in Figure 2 with the administrative districts, *Horta Nord*, *Horta Sud*, *Horta Ouest* and the city of *València*. They form the area traditionally known as "*la Huerta de València*" (or *l'Horta* in Valencian language). In the following paragraphs we will define the GIAHS site coverage, which is inside *l'Horta's* districts.

Figure 2. The Valencian Community and L'*Horta* administrative districts

These districts contain 45 municipalities that cover a total administrative area of 63 km^2. However, we have to further restrict the zoning approach for the GIAHS. Of the administrative area, we can consider the GIAHS site as the agricultural irrigated system inserted into a historical and natural territory formed by:

- The historical irrigated areas of the *Horta Nord*, *Horta Ouest*, *Horta Sud* districts and within the municipality of *València*. This territory is known as the Historical *Horta*. We refer to the agricultural **area dominated by the system of historical irrigation of the** *Acequias* **governed by the Water** Court **and the** *Acequia* ***Real de Moncada*****.** These irrigation communities are "historical" in the sense that their origin dates back to the age of King Jaume I's rule, in the XIII century, even with previous antecedents in the Islamic period. The *Acequias* form a network of ditches that derive from the *Turia* river, starting at the *Assut de Moncada*. Along with these organized irrigation channels, the historic *Horta* also considers smaller perimeters areas or irrigation networks that have been called *Francs, Marjals i Extremals*, which correspond to lands located around the capital that, since the time of the King Jaume I (1238), were not included in the irrigation communities of the *Tribunal de las Aguas* or Water Court.

- The GIAHS site extends to the sector of the *Albufera* Natural Park belonging to the City of *València* located to the South of the area covered by the Historical *Horta* (*Albufera de València*). The Natural Park represents one of the most interesting traditional humanized landscapes of the Spanish Mediterranean and one of the areas of greatest ecological value of the Iberian peninsula. Its freshwater are fed by leftovers of the irrigation system so we can consider that the *Albufera* lake is largely a consequence of the existence of historical irrigated areas, so there is a natural connection between the *Albufera* lake and the Historical *Horta*. As an essential ecosystem belonging to the City of *València*, with a still active traditional fishing activity, we consider it as a part of the proposed GIAHS.

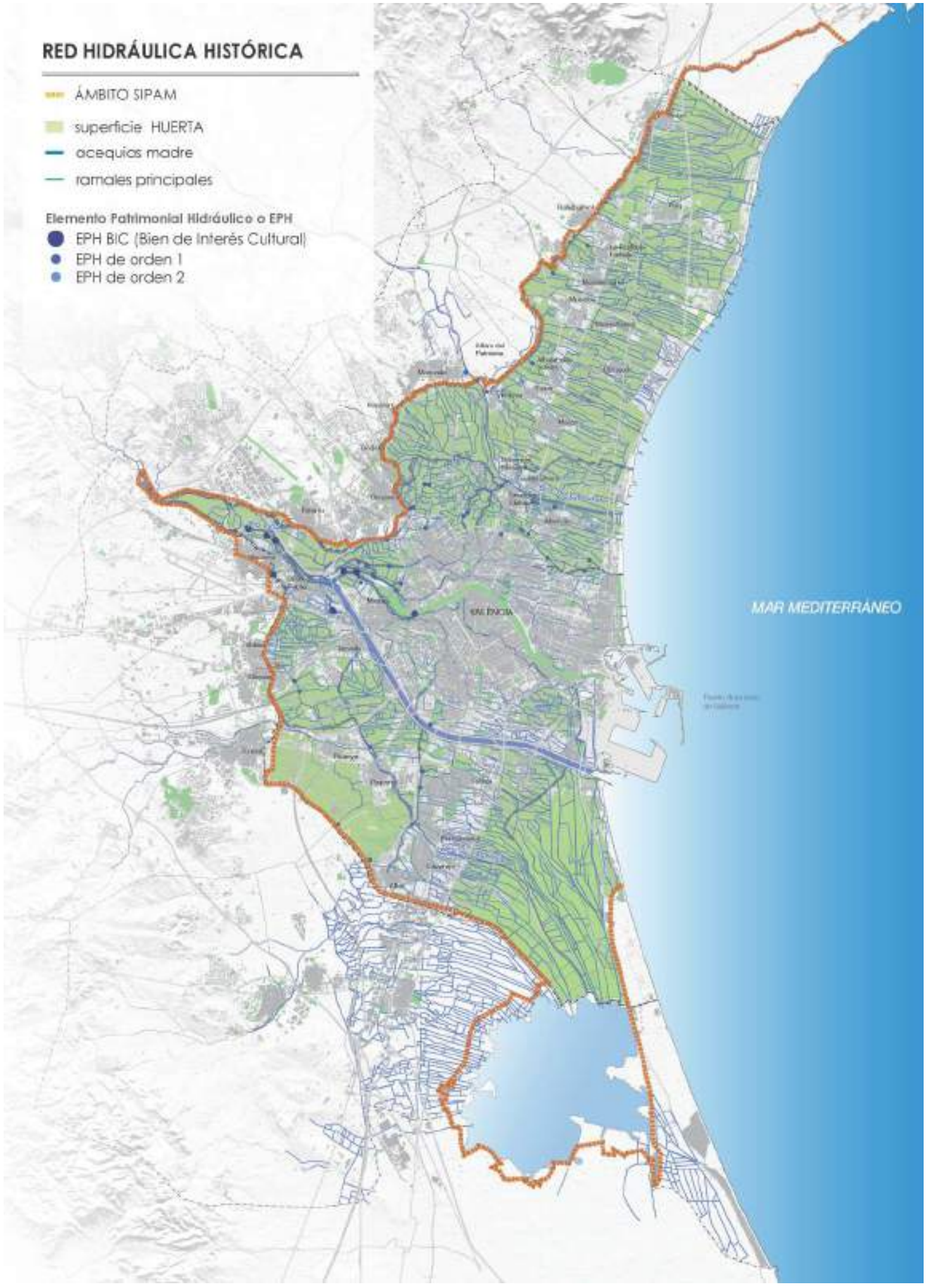


Figure 3. GIAHS site's area and its irrigation network

"Most of the municipalities included in *Horta Nord, Horta* Ouest and *Horta Sud* districts contribute to the GIAHS. The membership of Alcasser, Picassent, San Antoni de Benageber, Beniparrell and Silla can be questioned because they are outside of the Historical *Horta*"

The site's area belonging to the Historical *Horta* is reduced to 12 km^2, of which around 8 km^2 correspond to the farmland irrigated by historical channels (Acequies) distributing water from the *Turia* river. Other areas are covered by irrigation infrastructures, rural buildings and roads, margins and uncultivated non-urban land.

The site's area belonging to the municipality of *València* included in the *Albufera* Natural Park is around 5 km^2, of which 3 km^2 correspond to the *Albufera* lake and related canals and 2 Km^2 of irrigated rice land. An environmental strip covered with pine forest and a scrubland of one kilometer wide occupies the area between the lake and the eastern coast shore. Through this coastal strip the three channels of drainage or "golas" (of the *Pujol*, the *Perellonet* and the *Perello*) are opened to regulate by gates the level of waters of the lake and allow the flood of bordering land that is dedicated to the cultivation of rice, of which around 2 km^2 are located in the sector of the city of *València* belonging to the Natural Park. In summary, we consider in the GIAHS site this rice area (2 Km^2) plus the *Albufera* lake which is basic for the maintainance of rice and fishing activities (3 Km^2).

In summary, **the non-urban areas covered by the GIAHS site spread over a total of 17 km^2, of which 12 km^2 are located in the Historical *Horta* and 5 km^2 in the Natural Park. Of the total area, around 10 km^2 are actually cultivated, with 8 km^2 in the Historical *Horta* and 2 km^2 in the rice area of the Natural Park belonging to City of *València*.**

Most of the municipalities included in *Horta Nord*, *Horta Ouest* and *Horta Sud* districts have irrigated areas that contribute to the GIAHS. We are not including strict urban areas in the territorial site's definition as the GIAHS concept refers to the preservation of agricultural heritage. However, it is worth noting that a part of the historical irrigation channels are flowing underground, although they are hidden due to urban growth in times when L'*Horta* lacked of urban protection.

As regards to Valencian municipalities belonging to the GIAHS site's candidate, the contribution of Beniparrell and Silla can be questioned because both contribute with surface to the Natural Park but depend on the Real *Acequia* del Jucar, an irrigation system that does not belong to the *Turia* river network. Other municipalities, such as Benetússer, Emperador, Lloc Nou de la Corona, Rafelbunyol and Tavernes Blanques, are inside the Historial *Horta* area but already lack agricultural land. Actually the municipalities with protected non- urban areas to be considered in the GIAHS would be 35 of the 45 mentioned above. However, the GIAHS Plan needs to consider all the municipalities interacting with the system. The GIAHS plan will have to consider the historical irrigated areas of the Metropolitan Area of *València* and of the districts of *l'Horta Nord*, *l'Horta Ouest* and *l'Horta Sud*), with the following list of municipalities, at least, considering their irrigation system and surfaces.

Alaquàs, Albal, Albalat dels Sorells, Alboraya, Albuixech, Alcàcer, Aldaia, Alfafar, Alfara del Patriarca, Almàssera, Benetússer, Beniparrell, Bonrepós i Mirambell, Burjassot, Catarroja, Emperador, Foios, Godella, Lloc Nou de la Corona, Manises, Massalfassar, Massamagrell, Massanassa, Meliana, Mislata, Montcada, Museros, Paiporta, Paterna, Picanya, Picassent, Pobla de Farnals (La), Puçol, Puig (El), Quart de Poblet, Rafelbunyol, Rocafort, San Antoni de Benagéber, Sedaví, Silla, Tavernes Blanques, Torrent, València, Vinalesa y Xirivella.

Irrigated areas inside the strict area of the municipality of *València* represent a significant part of the GIAHS site, extending to 5 Km^2, including 3 Km^2 of horticultural cultures, as a part of the historical Huerta, and 2 Km^2 of rice cultivation, as a part of the Albufera system. See Figure 4 which shows in green the irrigated agricultural areas within the muncipality of *València*. Agricultural and natural systems within the City of *València* account for about 30% of the total GIASH site's area.

Figure 4. Non-urban areas (in green) within the municipality of *València*.

SIGNIFICANCE OF THE PROPOSED GIAHS SITE.

The GIAHS site is largely shaped by the maximum perimeters of the *Acequias* of medieval Islamic origin, in some cases, with antecedents of Roman age. *L'Horta´*s global significance is given by the value of its irrigated agricultural system[2], its historical background and its contemporary relevance. Its ecosystem is recognized as an identity frame of collective heritage and legacy[3].

The morphology, roads, ditches, farms, rural constructions and mosaics of crops that structure *L'Horta*, and the secular communal water management network, configure a landscape that survives in a densely populated coastal region. The ecosystem is not only the result of many generations of responsible water management but also provides environmental, agricultural, cultural and patrimonial services that contribute to improve the quality of life of those who inhabit it and to the whole Metropolitan area.

Figure 5. L'*Horta* landscape
Source: *Horta* Action Plan

L'Horta is defined by its historical structure, its agricultural activity and its irrigation management system. Even today, the irrigation system set up by the *Acequias del Tribunal de las Aguas* ("Water Court"), *the Acequia Real de Moncada and the Canal del Turia* ("*Turia* Channel") is well preserved, maintaining live the millenary water culture that defines Valencian population.

This irrigated landscape has been modelled through centuries of history, with a Roman background and an Arabic heritage, designed with care since the Al-Andalus period until the end of the Middle Age. The landscape matrix has evolved during centuries with several influences without losing its and its basic water structure, which is, in fact, the basis for crop adaptation and diversity. The acequies or irrigation ditches, the traced-line fields, the *barraques*[4] and hundreds of *alqueries*, the traditional farmhouses and mills, are few examples of secular structural elements of the GIAHS site.

This cultural landscape is not free of threats. According to the Territorial for *l'Horta*, the analysis of changes in land use reveals that in 1950, 10% of the historic *Horta's* irrigated areas had already disappeared; in 2006 this trend had increased alarmingly, reaching 30%. In the last half-century, pressures have emerged from rapid industrialization, urbanization and the boom in services, tourism and the modern counter-urbanization. These pressures have increased social mobility and the system's vulnerability. The GIAHS site declaration, together with the legal plans recentlly aproved to protect this space, are crucial to keep the heritage.

Valencian society has recently recovered consciousness of the cultural landscapes and the need to support its heritage: they are part of the collective memory, printed not in books or documents but directly in the territory (MUÑOZ, 2009; MIRALLES-GARCIA, 2013).

Preserving *Horta* is essential to guarantee the historical identity sign and, at the same time, one of the most important future assets of this differentiated, unique and quality territory. That is the relationship between *L'Horta* and its neighbouring metropolitan area, a nearby landscape, not always seen by urban citizens but always sensed.

Box 1. L'*Horta* explained: a documentary

The following documentary underlines the singularity of L'*Horta* as an irrigated landcape, unique in extent and quality, and shows the threats to its survival, as well as the possible conservation alternatives that are taking place in the planning of the territory.

The value of this documentary is that reports on the pressures that threaten the permanence of the proposed system. **Produced in 2012 by the University of** *València***, it is one of the most complete documentaries on the** *Horta***. The documentary was produced in a time where the future of the** *Horta* **was more pessimistic and it was still early to believe that legislation as the** *Horta* **Protection Law, passed in 2018, would become a reality.** The *Horta's* Territorial Action Plan, which develops practical action to preserve the area, is nowadays in its final stages before approval.

Click here for a video in English language: http://mediauni.uv.es/uvtv/tv_detalle/index.php?Evento_ID=1074&&Idioma=EN

HISTORICAL PERSPECTIVE

L'Horta of Valencia is unique as a historical melting pot of cultures (ROSELLÓ, 1995; GUINOT, 2008). This space of interaction between irrigation communities and nature dates back more than 1,200 years. The origins of this agricultural frame go back to the 8th century with the arrival of the Islamic clan groups, who founded the first Andalusian (from Al-Andalus, the Islamic Spain) ditches and

"The Reino, or Kingdom, of Valencia became integrated into the Aragón Crown in the 13th century, after the region's reconquest by King Jaume I."

built the hydraulic spaces. These irrigation systems initiated in the *Turia* dams, mother ditches and arms for the irrigation of the farmhouse are essential to understand the GIAHS.

The Muslims had brought a diet of monsoon type, with plant and animal products typical of rainy areas, with summer cycles in a large part of them and that could not be stored. Settlers introduced a host of new products to the region, known to historians as the "Arab Agricultural Package," which included nuts, oranges (which eventually became Valencia's primary export), artichokes, and eggplant—though the area they stumbled into was water-scarce (Butzer & Kraus, 1985). To adapt them to the Mediterranean climate, irrigation was necessary. The aforementioned crops are key elements of the GIAHS site, and have been maintained in *l'Horta* thanks to the irrigation network. The system implied an innovation in the standard Mediterranean agriculture of wheat, vineyard and olive trees.

The settlement of the Muslims in Al-Andalus configured the rural landscape towards a colourful "garden" vertebrated by ditches, with a key characteristic: the proportional and equitable distribution of water among the users and a coherent distribution of the spaces of residence. With some precedents of the Roman era, it was in the 10th century that the framework took form, with the original Tribunal (or "proto-Tribunal" in Tom Glick's phrasing) laying the foundation of the irrigation system.

In Islamic times (711-1238) the hydraulic spaces were endowed with a catchment point, in this case the *Turia* River dam, a circulation channel (the mother ditch) and many secondary canals that carry the water to the plots. The network was adapted to the irregularities of the soil. Along with it there were still areas of dry land, others with agricultural uses and some depopulated. In total, eight hydraulic systems were set up and keep being the core of the current irrigation network. (Rovella, Favara, Mislata, Quart-Benàger-Faitanar, Tormos, Rascanya, Mislata and Montcada) plus the F*rancs and Marjals*.

The hydraulic landscapes under the Islamic rule era (VIII - XIII centuries) were characterized by a design of territory based on small orchard units indidualized for tribal communities that settled on the territory in small villages that were called "qaryas" or *alqueria*. ESQUILACHE MARTÍ (2015) provides evidences of the construction of the *Horta* in the Islamic era in three Phases (Figure 6). Phase 1 with the first settlements and irrigated spaces, sometimes several per *alqueria*, which were organized in a parallel strip to *Turia* river. This phase can be dated between the Arab conquest on 714 and the end of the Emirate period, at the beginning of the 10th Century. Phase 2 starts approximately at the beginning of the 10th century with the military subjection of the tribes that did not recognize the Omeya rule until the beginning of the XI, that is, during the Caliphate and the first years of the Taifa period. And, finally, Phase 3, when new hydraulic spaces appear and break with the proportionality of the initial tribal design, with a larger number of farms owned by the state oligarchy of the Taifa period. Phase 3 would continue until the Christian conquest of the beginning of the thirteenth century.

The Reino, or Kingdom, of Valencia became integrated into the Aragón Crown in the 13th century, after the region's conquest by King Jaume I. In establishing the special legal code for the region, historically known as *Els Furs*, Jaume I further ensured that "inhabitants of the city and Kingdom of Valencia" could maintain control of their water and rivers. Taking as reference the 'Llibre del Repartiment' it is estimated that in 1238 there were more than 200 population centers in the irrigated area of Valencia before the Christian conquest of Jaume I, with a

“Low-medieval gardens were characterized by cereals, especially wheat and rye, and vineyard. Vegetables and fruit trees occupied small plots and margins. From the XVI the mulberry trees were introduced.”

greater density in the areas closest to the wall of the city of Valencia. All this was accompanied by a network of roads that structured the countryside and the city, a tandem that has always been present.

This network of irrigation communities remained rooted in Arabic practices transferred to and modified for Christian conditions. According to Thomas Glick, “Valencian irrigation institutions come onto the historical stage full-blown in the thirteenth century and for the most part remained in tact until the nineteenth century” (GLICK, 1970 quoted by HUDSON-RICHARDS & GONZALES, 2013, p. 101).

It was an initially open model of water circulation that evolved in the centuries after the Christian conquest as a result of the pressure on the land that implied a tighter control of water, closing with gates and padlocks and subjecting the infraction of irrigation rules to severe fines.

In the fourteenth and fifteenth centuries, already under Christian rule, *l’Horta* was developed into two peri-urban rings. A first ring, close to the city, with abundant settlements dispersed in farmhouses (now isolated country houses) and some concentrated nuclei such as Benimaclet, Orriols, Marxalenes, Benicalap, Beniferri, Campanar, Soterna, Malilla or Ruzafa. And a second ring, on the that the city exerted a minor influence, characterized for a lower presence of dispersed settlements and a greater number of concentrated nuclei (Almassera, Meliana, Foios, Vinalesa, Massamagrell, *Moncada*, Benifaraig, Burjassot, Alfafar, Sedavi, Paiporta), linked to the main access roads to the city and to the main hydraulic units.

Under the Christian rule a new feudal society was developed with large farms of the nobility and the bourgeoisie as well as small properties in the hands of tenants (still there is a legislation protecting the historical tenants’ rights). All the possible territory was cultivated, and the land distribution development overlapped with the Islamic one. The legal custom already emerged to state that if land was already irrigated, then it held water rights by virtue of that irrigation, and was, as such, inseparable from the land itself. This is also a fact nowadays. The amount of water an irrigated plot received depends on its size. The communities of irrigators during the medieval period were the original levels of such local organization, and anyone who happened to use any water from an irrigation or canal system is a member. In addition, the *Horta* near any town was also considered part of the town, and those farmers were also residents of the town. The entire region worked on a close interdependence between rural *Horta* and urban centers, laying down the historical foundations of the peri-urban nature of the proposed GIAHS site.

The irrigation system has allowed for some crop changes since Medieval times. Low-medieval gardens were characterized by cereals, especially wheat and rye, and vineyard. Vegetables and fruit trees occupied small plots and margins. From the XVI the mulberry trees were introduced. Despite the changes after the Christian conquest, various aspects of the Islamic period remained. One is that of communications, with paths already with Islamic roots, such as the 'Camí de Silla' or those connecting to the sea as it happens with so many villages in the lands of the *Acequia* de *Moncada* from Meliana to Puçol. The morphology of the hydraulic systems also remained.

After 1492 new crops were introduced, such as tomatoes, peppers, corn and potatoes arrived from America, to which were added carrots, lettuce, melons or the beans. All these keep

"The territorial scheme based in two rings was prolonged during the seventeenth, eighteenth and xix, consolidating the current municipal distribution."

part of the current crop diversity of the site. **The system allowed the incorporation of new varieties from the New World, which made it extremely rich in biodiversity.** Later in the present report, we further refer to several varieties of tomato, beans, peanuts or peppers, among others, that arrived from America and have been adapted to the local conditions, thanks to the basis created by the irrigation system.

The territorial scheme based in two rings was prolonged during the seventeenth, eighteenth and xix, consolidating the current municipal distribution. Throughout the nineteenth century the forms of land ownership change and the urban expansion of the city starts. The legal crisis, due to the loss of privileges that affects the nobility, caused the reduction of large estates. This, together with the confiscation of the lands of the clergy a further ragmentation of the property was produced. There was a generalized increase in tenants and leaseholders, who populated l'*Horta* with *alquerias and barracas*, densifying the landscape. At the end of the nineteenth century, the polyculture started to define the image that this area shows at present: rice in the South from the *Acequia* of *Moncada* to Burjassot and Puçol.

At the same time, during the twentieth century, there was a decline in cultivated area in the Historical *Horta*. From 11,350 hectares of irrigated land in the mid-19th century between the seven ditches of the *Tribunal de las Aguas* and *Moncada*, at the end of the 20th century this space had fallen to 7,600.

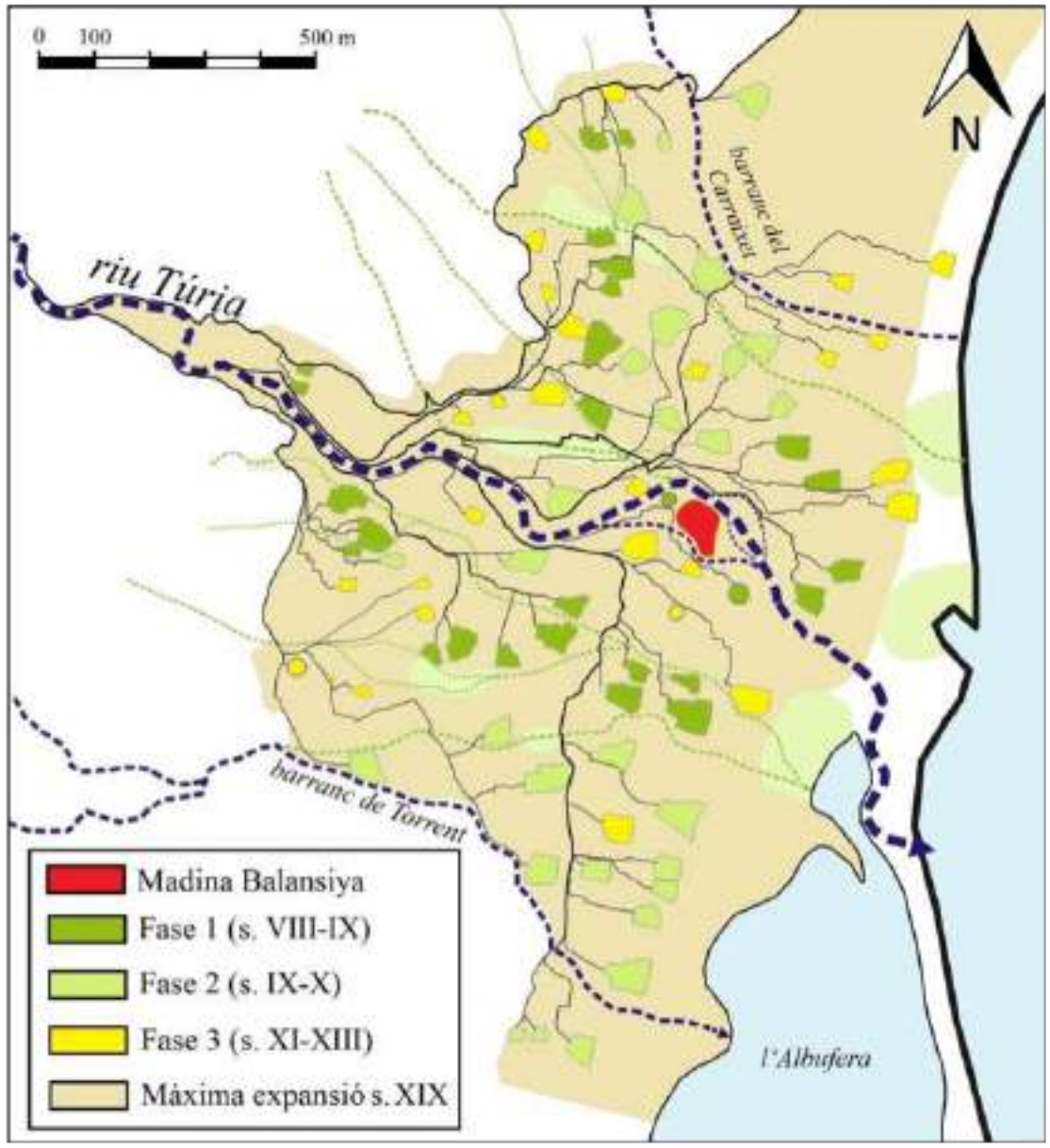


Figure 6. Identified irrigation spaces in the Islamic period
Source: Esquilache-Martí (2015)

In addition, the growth of the city of Valencia -which was beginning to start a tentacular expansion around to the main communication channels, especially after the demolition of the City walls marks the turning point of the rural system. The traditional *Horta* was losing ground by the construction of large infrastructures such as the new river bed in the 70s of the past century as well as by the recent urban expansion. At the same time, some local varieties have been subjected to market pressures and are in danger of extinction (see corresponding section). The expectations of the urban development, the low profitability of agriculture and the social devaluation of the farmer's work were among the main causes of this abandonment. The current objective is to stop the degradation of this millennial peri-urban landscape, one of the last spaces of Mediterranean metropolitan *Horta* that survive in Europe.

THE HISTORICAL FORMATION OF THE SYSTEM IN SCHEMES

One way to see the formation of the Huerta irrigation network is to illustrate the historical expansion of the system through schemes, which we present for the irrigation area governed since the 13th century by the *Real Acequia de Moncada*. The schemes have been prepared by Sales Martínez (2015).

The historical irrigation of the Mediterranean Huertas is the result, in this region, of a long process of formation and of the action on the natural space of subsequent social formations. The anthropization of the spaces on which the current irrigation of the *Real Acequia de Moncada* is based goes back to the beginning of the Roman colonizing presence in the second century B.C. and the foundation of the city of Valencia, with an agriculture of dry land based on the typical crops of the Mediterranean trilogy and an appropriation of the space framed within a land division based on the typical Roman land organization that has left few remains on the territory.

From the 8th century onwards, the consolidation of a new social group formed by Arabized Berber classical groups of Islamic religion implied a change in the agricultural production model. Irrigation overcame the climate limits in order to obtain productions more in line with the dietary needs of the new ethnic-social group. This how the process of formation of the irrigated space begins and lasts until today.

The first stage of irrigation went through the use of native water resources that appeared on time and around which the settlement process would begin, in which the farmhouse as a productive-housing nucleus will mark the preeminent form of occupation and territorial organization for several centuries. A spatial complex that combines the presence of populated and cultivated islets with intermediate spaces dedicated to reserve, supply of raw materials and grazing.

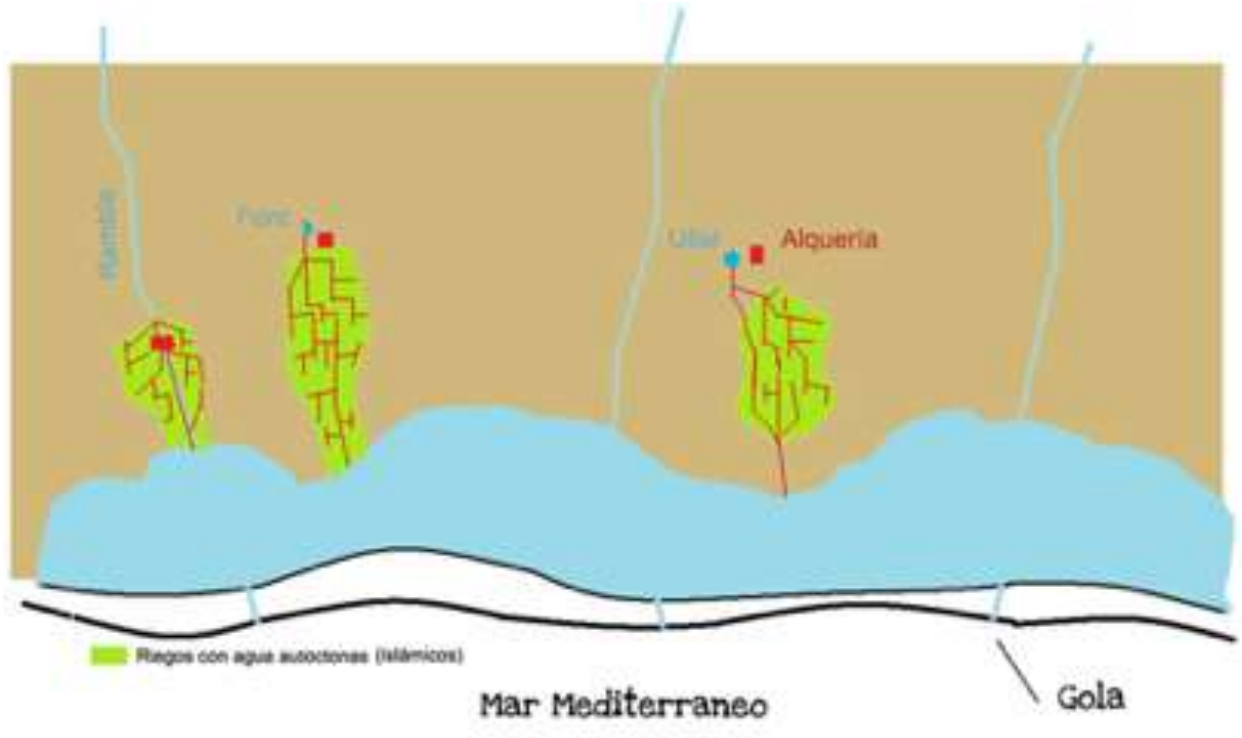


Figure 7. Irrigation begins with native water sources

The second stage of the irrigation network began at the end of the 10th century with the construction of the bypass channel of the waters of the *Turia* River for the irrigation of the spaces in which the growing human settlements provoked the crisis of the exclusive use of the native water resources. A channel designed and built in all its extension and that by means of successive derivations would make the water arrive in a continuous and proportional way to each one of the *Alqueries*.

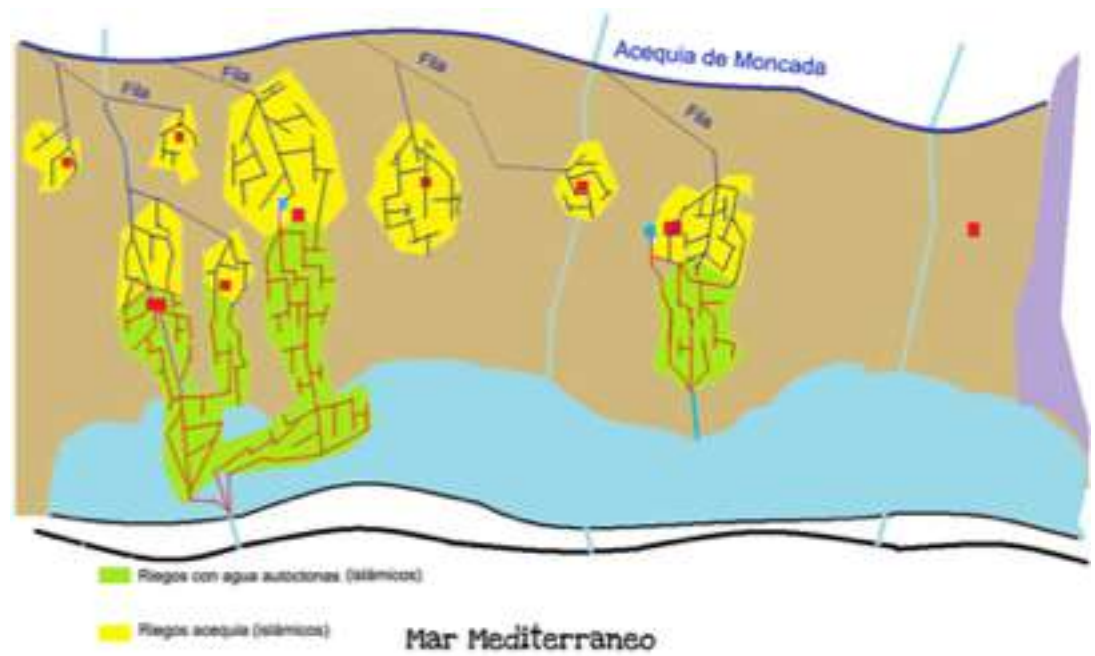


Figure 8. First irrigated areas from the river surrounding settlements

The third stage, definitive until now, starts from the thirteenth century after the process of military conquest, colonization and feudalization by the Catalan-Aragonese Christian crown that will choose to continue with the social option of irrigated agriculture. The space is restructured with a concentration of residential areas that decreased in number and increased in size. In addition, the irrigation network was expanded seeking the irrigation of all the space that the technical conditions of the time allowed. The proportional Islamic model was gradually replaced by another based on the permanent allocation of water to the plot and equal rights to regular water use. The result of the new occupation process was the creation of a space with full right to the use of water from the *Turia*, the Jovedat, and some spaces external to the system linked to the use of indigenous water resources and the use of leftovers that are known as Extremal. Both spaces, Jovedat and Extremal, have been expanding over time. The Jovedat was centrally managed by unanimously recognized institutions, the irrigation communities. The Extremal (the extremes) were self-managed or with the exclusive municipal management. In the case of the *Real Acequia de Moncada*, already entering the 20th century, a process of assimilation of the Extremal spaces by the *Real Acequia de Moncada* and the complete equalization of the right to use the water of the *Turia* river began. The process was favored by the consensus among the local elites that would benefit from the equalization of the right to use water.

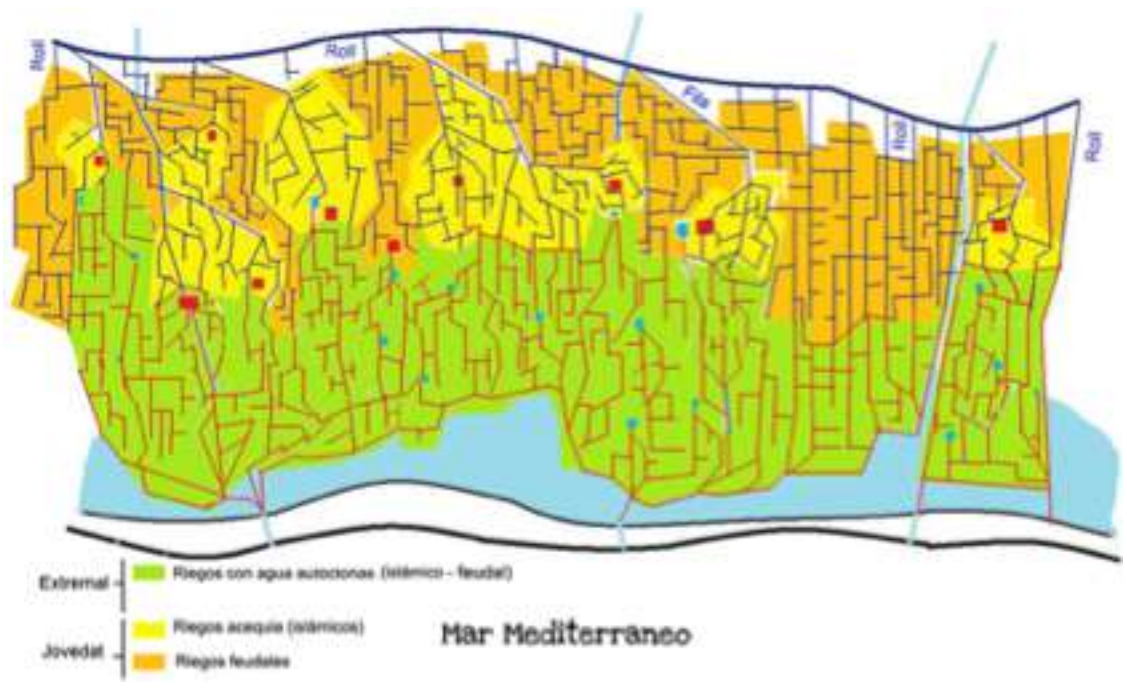


Figure 9. Irrigation expands in 13th century

"One of the outstanding features is the *Horta*'s historical structure, with a dense network of water channels, a system of rural roads, and traditional buildings like the alquerias or the barracas".

Two large agricultural sub-spaces were evidenced. On the one hand, the large continuous plot, with its irrigation network connected to the large channel that transports water from River *Turia* and with a well-defined institutional organization. It is called the Jovedat de *Moncada*. On the other, a discontinuous set of groups of plots, whose irrigation network was originally fed with native resources from the natural or artificial outcrop of groundwater and that after a process that was partly of hydraulic transformation and partly, and above all, of institutional transformation, the Extremal concluded, already in contemporary times, for being integrated into the great institutional system of the *Real Acequia de Moncada* (RAM). Adhered to the Extremal and being part of it, there is another large set of plots with a water use, a distribution network and a different agricultural landscape, the Marjal, near the coast, which was finally occupied by crops, especially rice.

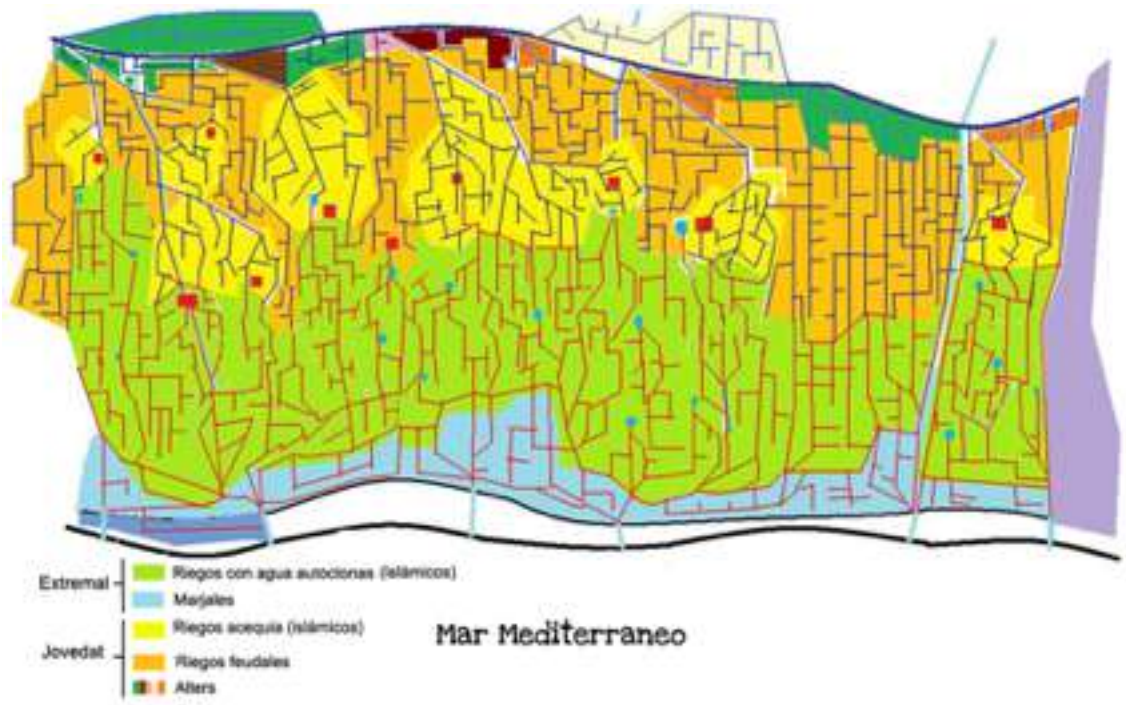


Figure 10. Final occupation of the irrigated space

A SELF- GOVERNED IRRIGATION SYSTEM

One of the outstanding features is the *Horta*'s **historical structure**, with a dense network of water channels, a system of rural roads, and traditional buildings like the *alquerias* or the *barracas*. The superposition of this system with a changing agricultural landscape and a solidary governance of water distribution, defined a singular mix: a continuous and harmonious landscape, a changing landscape that varies with the cycles of nature producing a spectacular patchwork of colours and textures, and especially, a cultural landscape where the presence of people is constant and necessary. The scale of the *Horta* is the scale of people, and its details reveal an intense interaction between human beings and the environment.

It is worth highlighting that the irrigation system is regulated by local institutions governed by users. The Valencian irrigation communities root in Arabic practices and have been adapted to different historical contexts. Ancient institutions were established not by authorities but by users themselves, although there is disagreement on the extent that royal or the more centralised authorities could have interfered in the communities' functioning. Organizational aspects, norms and sanctions evolved over time and passed onto next generations. In the *Horta* of

"In the 13th century, in establishing the special legal code for the region, historically known as *Els Furs*, King Jaume I further ensured that inhabitants of the city and Kingdom of *València* could maintain control of their water and rivers."

València, the historical and symbolic value of the Water Court (Tribunal de les Aigües) is remarkable and has been granted a UNESCO immaterial heritage status (UNESCO; CASTILLO RUIZ & MARTÍNEZ-YÁÑEZ 2014).

In the 13th century, in establishing the special legal code for the region, historically known as *Els Furs*, King Jaume I further ensured that inhabitants of the city and Kingdom of *València* could maintain control of their water and rivers. The feudal monarchy preferred to delegate water management to local organizations, since these entities proved to be competent in deactivating the enormous conflict-causing potential of the irrigation system, showing great ability to distribute an irregular river flow in a rather fair and equitable way. Professor THOMAS GLICK (1970, 1988) categorised the Valencian *Horta* as a model of decentralization and non-bureaucratic local control, with *Acequias* functioning as autonomous institutions governed by the collective will of the users, which was materialized through positive participating mechanisms:

[...] management of the irrigation system was decentralized and cellular [...]. The main reason behind the community government was consensual authority [...]. Intervention by high authorities was mainly political. Big investments were not made [...], but even when they were, they were not aimed at centralizing their control. They acted as associates to the traditional cellular authority of the irrigators, and not as their substitution (1988: 30-31, 93, 106, 133-135).

The Communities of the *Acequias* are governed by old ordinances that have been transmitted lively by the Arabs and then, already written, were preserved until the beginning of the 18th century, when they achieved the ratification by King Felipe V. The rules provide a simple and realistic distribution of a common flow. But at the same time they impose the precise authority at difficult times when, due to water scarcity, the common good of the irrigators ommunities is in danger. Within each ditch, when there is enough water, irrigation is done in turns ("*turnos*"). In times of drought, the trustees or irrigators' representatives have the authority to distribute the water according to criteria that allow the damages to be equitable and that have been transmitted generation after generation. This is a historical legacy that remains in place in current times.

When the reservoirs did not exist, the cycles of large avenues with the terrifying shortages in the droughts, produced dramatic contrasts to the irrigators; not only because of the dangers of flooding that ravaged their fields, but mainly more frequently because of the lack of water for irrigation in the extremely dry years. Especially since in those moments when there was very little flow of water through the rivers, there was a need of an equitable distribution of water among the various ditches. Hence the wonderful creation of the variable volumetric unit called «FILA» (in English "row") which was established in the oldest irrigation systems in Spain, both in the *Turia* river in Valencia, as well as in many other rivers in Granada, in Murcia, in Játiva , Orihuela, Elche (see Box 2).

The consensus reached by water users' groups in specific climate contexts (unequal aridity and irregularity of the river flow that feeds *Acequias* in a limited geographical area) was strengthened by the fact that water is managed in the GIAHS site through decentralized, non-bureaucratic organizations, which have a particularly high degree of stability (PERIS-ALBENTOSA, 2015). In fact, **what makes the *Horta* irrigation system globally important is that it provides an interesting foundation for solutions to modern problems (HUDSON &**

"The Valencian capital is in the middle of an alluvial plain that extends on both sides of the final stretch of the River *Turia*"

GONZALES 2013). The emphasis on community control and ownership is especially significant in light of the data that suggests that community involvement is a direct pathway to success for water systems. HUDSON & GONZALES observe the water governance as a way that can allow people across the world facing the worst consequences of water shortages to exercise agency solving their local problems in ways that answer their direct needs and procure resilience.

Given the Sustainable Development Goals, in particular Goal 2 (Zero Hunger) and Goal 6 (Water and Sanitation), and the challenges posed by the need for climate change adaptation (a future with water scarce resource) and mitigation (the quest for a sustainable water use) the irrigation systems in the GIAHS **"support the idea that common resource management can be an effective "third way" between privatization and top-down state control"** (HUDSON & GONZALES 2013 making reference to Elinor's Ostrom work *Governing the Commons*). The institutions designed in Valencian *Acequias* regulate water usage consisting of peasant collectives organized into autonomous irrigation communities, with a high customary component, which in Ostrom's view, ensures social stability. The key for WAU in the region lies in the high degree of freedom acknowledged by political powers for water users (PERIS-ALBENTOSA, 2015).

Box 2. The Fila

The 'FILA' is a variable measure of water. It is never a fixed volume like the liter or cubic meter, but variable in proportion to the total flow that the river carries.

When in the *Turia* river the waters reach the place where the *Acequias* de la *Horta* de Valencia start one after the other, it was established from time immemorial that all the river flow, whether abundant or insufficient, was always distributed in 138 equal parts called «FILAS». Therefore, as we say, the FILA is one hundred thirty eight part of the total flow of water that flows through the *Turia* River.

Awarding a certain number of Rows to each *Acequia*, the irrigators know that they will always have available flow; abundant if the river carries a lot of water, and then they will be called "thick rows"; or scarce if the river, affected by drought in the estuary, has a very low flow, and then they will be called "thin rows". But each *Acequia* will always have its determined number of FILAS, and in this way no one can fight with another *Acequia* because it uses more water than it can correspond, leaving those that are located below without irrigation flow.

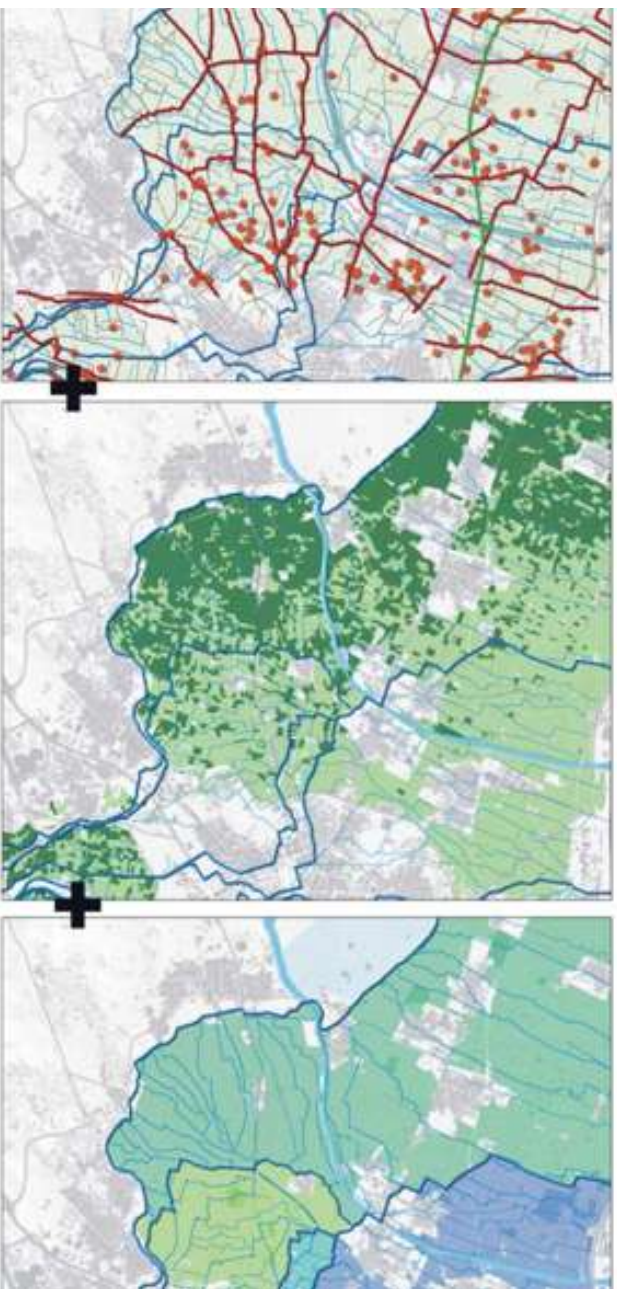
THE STRUCTURAL ELEMENTS REMAIN, THE AGRICULTURAL LANDSCAPE EVOLVES

As a landscape of irrigation, the *Horta* has an antiquity of around 1200 years since its origins go back to the installation of the Islamic tribal groups that began to arrive to the Iberian Peninsula throughout the 8th century around the yet small Roman-Visigothic episcopal city of Valentia. GUINOT (2005, 2008, 2012) provides a detailed picture on how L'*Horta* de *València* was configured and how evolved along the centuries.

Although it has been argued in the past about the Roman origins of this agricultural space, it was actually the Muslim peasants who created the first *Horta* de *València*, those who designed and built their first hydraulic systems, probably the Rovella irrigation ditch, perhaps that of Favara, together with those of Petra, Rambla and Alirós, and they also founded the first settlements. During the following centuries until the Christian conquest of the 13th century, the population, economic and social growth of Al-Andalus (the Islamic Spain) led to the expansion of the primitive *Hortas* with new hydraulic systems and human settlements[5].

GUINOT underlines that the agricultural landscape based on citrus and vegetables as in current times was not so dominant in earlier L'*Horta*'s times. During the low-medieval period L'*Horta* was characterized by the cultivation of cereals, mainly wheat and rye, and of the vineyard, while the vegetables and fruit trees occupied small plots or the margins of the fields and ditches. From the end of the 15th century, the Valencian capital became an important silk manufacturing center (*vellut* or velvet in English), and the demand for raw material provoked an important change in the landscape. The mulberry trees spread throughout the 16th century usually on the margins of the *Acequias* and the plots, but it also extended to large fields completely dedicated to the trees. In the second half of the eighteenth century the crisis in the silk industry provoked the progressive disappearance of this culture - nowadays still typical of

Figure 11. Elements of the system: historical structure, agriculture, water management



urban gardens- and in the last decades of the 18th century this landscape was reopened visually. The cereals maintained their traditional presence and, with the demographic growth throughout the nineteenth century the polyculture of vegetables for a growing urban market was increasing. The rice culture, which had already made its presence at certain times of the low-medieval period and had remained in the areas closest to the *Albufera* during the Modern era, was spreading more clearly to the periphery of the historical *Horta*.

This landscape of open fields from the late eighteenth century and until the early twentieth gradually turned to be closed with the progressive presence of orange trees. **GUINOT notes that it is not easy to answer the simple question of what singularity of L'*Horta* is**. There are some basic staples that have formed part of the system during centuries, such as rice, oranges and some vegetables. But the essence of the system is the maintanence of a network of ditches that has allowed irrigated Mediterranean cultures. Some crops have been changing throughout the centuries and all of them, according to their moment, have been traditional, so **we have to identify the relevant feature that characterizes the singularity of this cultural landscape. The answer, according to GUINOT, is in its spatial morphology. The Valencian "Huertas" are physically constructed in a concrete way, based on the conjunction of a series of structural variables that frame how and why this territory has adapted to great social changes. Over the centuries, such structural morphological elements are those that model the singularity of this landscape.**

Professor Guinot quotes several structural aspects that define the nature of the *Horta* landscape: an original orography, an extended hydraulic system, a varied set of human settlements, a network of roads coherent with the irrigation system and organised mosaic of terraces (GUINOT, 2008).

Original orography. The Valencian capital is in the middle of an alluvial plain that extends on both sides of the final stretch of the River *Turia*. It is crossed towards the sea by several ravines parallel to the river: the Carraixet to the north and Torrent-Picanya-Catarroja to the south are the largest. These are real barriers that marked historically the area irrigated by almost all the ditches of the *Tribunal de las Aguas*. A separate case was and is that of the Real *Acequia* de Montcada, which has proportionally most of its irrigation north of the ravine Carraixet, so that the most of the Northern part of the *Horta* is vertebrated by some another ravine in direction West-East. But if these barriers delimit large irrigation areas, it is the microrelief that influences the layout of the ditches, roads and plots. The paleo-ravines are the small local depressions that channel rainwater, especially torrential fall. There are dozens and dozens of paleo-ravines that scatter throughout the Valencian *Horta*, very often hidden by urban growth, turned into paths (els camins fondos), or routed superficially in the form of drainage ditches.

Hydraulic facilities. They consist of the major irrigation ditches that irrigate it with their respective irrigation zones. A large deal of geographical studies on this heritage has supplied detailed inventories of the main construction elements that make them up and sufficient arguments to achieve in many cases their individual cultural protection.

Population settlements. There has been as much settlement concentrated in towns as dispersed settlements in isolated houses or barracks. The word alqueria has had a different meaning according to the historical period that we analyse. The forms of settlement, the number of villages, farms and houses in the *Horta* de Valencia have not always been the same and, therefore, we must consider their location and distribution in each historical period.

Roads. Their layout frequently represents a clear axis of vertebration of this landscape. The roads are axes that help us understand where the ditches were built because, for reasons of water circulation, they pass through the highest areas of the surrounding fields while it is common that part of these roads are located on the areas a little deeper (and hence the name of camí fondo that they have in enough populations). There was an alternation in the design of ditches and roads, which in turn has to do with the first element that we have explained: the original microrelief of the *Horta* space.

Irrigated fields. The plots, to a greater or lesser extent, are organized in flat plots with their corresponding margin or bench. The need to water requires that the slope of the plot is between specific levels so that water enters at one end and drainage on the other, and this without eroding it. That is the essence of the gravity irrigation that allows to flow the water down across the whole network.

"The need to water requires that the slope of the plot is between specific levels so that water enters at one end and drainage on the other, and this without eroding it. That is the essence of the gravity irrigation that allows to flow the water down across the whole network."

Therefore, at the moment of beginning the construction of the first irrigated spaces of *l'Horta*, and in its progressive expansion over the centuries, it was necessary to build these flat plots that over time, the market of land and inheritance have been subdividing, usually separated only by a small margin. **Some of these plots may have been moved or modified, but in general have remained stable for centuries**. There are some areas in the *Horta* de Valencia where groups of forms of regular traces, even orthogonal, are preserved from the more rigid boundaries of ditches and roads, and tend to, whenever possible, to show measurements of surface of 6, 9, 12, 15, 18 etc. *fanecades*, the tipical measure of surface in the region. Physically it is still possible today to identify agricultural areas of *l'Horta* that correspond to the distribution of the land that was made in the thirteenth century by Jaume I, which contrast with other blocks of terraces characterized by their formal irregularity in their limits that are believed to come from the Andalusi or Islamic period prior to the 13th century.

To the previous elements suggested by Guinot, we add the integration of agriculture and fisheries in a peri-urban space that includes the *Albufera* lagoon, which is justified in a previous section of this proposal.

Figure 12. Albufera Natural Park
Source: http://albufera.valencia.es

Figure 13. Traditional ships at *Albufera* channels
Source: http://www.historiasdemiciudad.com/

LA *ALBUFERA* AND ITS CONNECTION WITH THE IRRIGATION SYSTEM

L'*Albufera* de *València* is one of the most unique, fragile and valuable ecosystems in Spain, and even the European Union. It consists of a freshwater lagoon of 2,800 ha. The *Albufera* lagoon is surrounded by 18 Km^2 of marshlands mainly devoted to rice crops and orchards, scattered country houses and coast line resorts, conforming a stunningly beautiful landscape, under human pressure. The marshland, the lagoon and the sandy dunes that detach the lagoon from the Mediterranean Sea were awarded the category of Natural Park by the Valencian Autonomous Government by decree 89/1986. Since 1990 this Natural Park has been included among the "internationallly important wetlands" record established by the Ramsar agreement dated February 1971. It was also recognized as a special area for bird protection (ZEPA) since 1991. The set of small subterranean water springs or "ullals" had been protected by decree 96/1995 that gave green light to the "Natural resources management plan" of La *Albufera* hydrographical basin. A more detailed explanation in English on the *Albufera* de *València* can be found in the following document:

Click here for further information:
http://Albufera.valencia.es/sites/default/files/Audio-guia-Emglish.pdf

A short video, produced by the Natural Park, can provide a better picture of the nature of the lagoon, its bioidiversity, and pressures.

Click here for further information:
https://www.youtube.com/watch?v=_nfRVlKWvSU

"Historically, la *Albufera* has been receiving water that was left from the irrigation channels of Favara and Oro (coming from the *Turia* river and part of the historical *Horta*). We ackwnowledge that the irrigation development in the 18th and 19th centuries diversify the water sources and increased the incoming surface water."

The connection between upstream water flows and the lake is clear. Five natural streams flow into La *Albufera* lagoon: Poyo-Torrent-Massanassa Gully, Picassent – Beniparrell Gully, Hondo – Tramusser Gully, Berenguera Gully and Agua - Alginet Gully. Before the expansion of the irrigation in the surrounding shores the surface waters flowing to the lagoon were scarce. The rivers *Turia* and Jucar, which were originating the system, did not contribute on an steady basis to its hydric balance, because they only flew into the lagoon in case of flood. The expansion of irrigation in the *València* región after the 18th century, from *Turia* river, Jucar river, *Acequia* Real and Sueca and Cullera main irrigation channels derived to the lagoon a high amount of fresh water which before flew into the sea, a tendency that has been increasing in the last years. The sea connection of L'*Albufera* has been controlled by human beings in the last centuries throughout the building of artificial channels called "golas". up to the three which are existing nowadays (Perelló, Perellonet and Pujol Nou). *Albufera* is a cultural landscape whose current shape was given by irrigation flows that kept water fresh and suitable for rice culture.

Fishing has been developing in the area since prehistory, being the most important activity until the end of the sixteenth century with the decrease in actors dedicated to the fishing activity against the expansion of the cultivation of rice, which intensified in 19th century.

While the *Albufera* lagoon has not traditionally been included in the historical *Horta*, we propose to include this ecosystem in the proposed GIAHS. There are four reasons that justify this suggestion:

1. Historically, la *Albufera* has been receiving water that was left from the irrigation channels of Favara and Oro (coming from the *Turia* river and part of the historical *Horta*). We ackwnowledge that the irrigation development in the 18th and 19th centuries diversify the water sources and increased the incoming surface water. The *Acequia* Real del Jucar, a channel built in the last 18th century, not only facilitated the transformation of unirrigated land in the sorrrounding districts but also allowed to extend Favara and Francos and Marjales irrigation channels, located in the *Horta* itself, towards the completing the connection, as it is shown in Figure 14. Consequently, there is a space of connection between the historical *Horta* and the lagoon's ecosystem.

2. The *Horta*'s Territorial Action Plan's most southern landscape unit includes a rice area which links the historical *Horta* with the lagoon. The *Acequias* that structure this landscape unit (*Acequias* de Francos y Marjales and *Acequia* Favara or more to the South, some irrigation ditches depending on the *Acequia* Real del Júcar) conform a space of rice monoculture, which offers high visual quality. Given the more modern expansion of irrigated rice area surrounding the Western and Southern areas neighbouring the *Albufera* laggon, we restricted the GIAHS to the territory of the Natural Park which strictily belongs to the City of Valencia.

3. Artisanal fishing has been traditional in the *Albufera* lagoon (El Palmar community, which belongs to the City of Valencia). This activity has always been connected with the *València* city history. Actually, if *Albufera* is something more than a natural landscape but a living ecosystem is because of the traditional fishing, which cannot be isolated from the rest of the peri-urban food system.

"At the end of the day water and its interaction with human livehoods is present in all parts of the GIAHS site, including irrigation systems, fishing activities and the whole landscape."

4. Environmental conservation policies require a holistic approach that considers the Historical *Horta* and the *Albufera* lagoon as interrelated subsystems. This integration is consistent with: a) the choice by the City of Valencia of including both the Historical *Horta* activities and the fishfing activities of El Palmar community within the City Food Strategy; b) The fact that preserving the Natural Park critically depends on the water quality of the incoming irrigation channels, and; c) The opportunity of the City to link the Historical *Horta* and the Natural Park through green belts that will enhance the peri-urban landscape in future planning.

At the end of the day, Everywhere along the GIAHS site this water landscape and its management is determinant for inhabitants around the Albufera.

Figure 14. Southern landscape unit of the Territorial Action Plan, which is part of and connects the Historical *Horta* to the *Albufera* Natural Park.

Figure 15. Southern ditches connecting the Historical *Horta* to the *Albufera* Natural Park.

Figure 16. Southern part of the Historical *Horta* connecting to the *Albufera* Natural Park.

THE GIAHS SITE AND ITS FIVE CRITERIA

In the next pages, the elements for considering the site as a GIAHS site are presented and discussed.

First, the existence of this irrigation network sustains *l'Horta*, an extensive and live peri-urban irrigated landscape that provides diverse and healthy products through 6,000 family agricultural farms (including 100 fishers). The existence of the Albufera in its actual form, as a lake that contributes to agriculture and fisheries, depend on the existence of the sorrounding traditional irrigated areas.

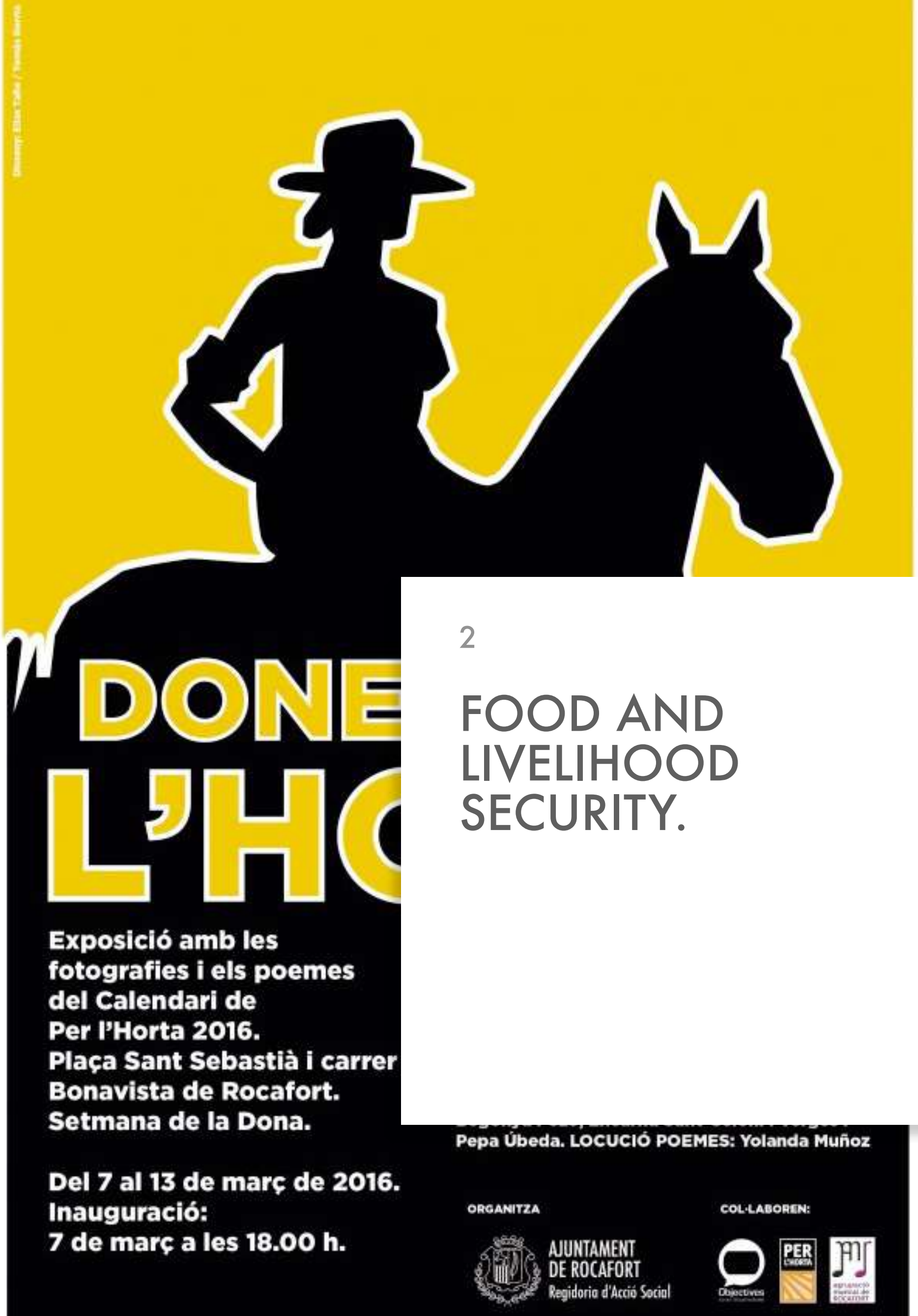
Second, the agricultural heritage reflects a culture of adaptation to the climate conditions, since Islamic times, with a wide range of agricultural varieties, some of them very traditional of Valencia region, including not only a mixture of fruit and vegetables (some of them adapted after 1492), but also, rice as a basic component of the Paella and tiger nuts, a component of a beverage unique in the World: the xufa's orxata as well as a large number threaten species.

Third, a local knowledge system has been able to manage water linked to historical infrastructures and rules. Water management is a core component of the farm communities' life style and vision.

Fourth, a cultural heritage and a system of values with a live institutionality reflected in the Water Court, the *Real Acequia de Montcada* and the traditional rural and water infrastructure, which during one millennium has been preserved. All this related to one way of looking life where solidarity, farming and a positive and open attitude have been shaped by traditional collective water management uses.

Five, the Valencian, irrigated landscape has been refered to as one of the most relevant *Hortas* remaining in Europe. All these elements are developed in the following pages.

FOOD AND LIVELIHOOD SECURITY.



MAIN FEATURES

L'Horta meets perfectly the food and nutrition security dimensions defined by FAO: availability, access, utilization and stability. Its agricultural capacity is supported by two structural conditions: water availability and edaphic potential (fertile soils), with up to three harvests per year. 80% of the cultivated area is devoted to fresh fruit and vegetable crops, which are fundamental to improving the nutrition of the population and enabling the Mediterranean Diet. Around 4,000 hectares are occupied by fresh vegetables grown in the open air with a substantial production of onions, artichokes, pumpkins and lettuce, among other crops. Citrus fruits and tiger nuts are significant in the Northern part 2,000 hectares of rice are cultivated in the South, interacting with the *Albufera* natural park.

L'Horta is made up of 6,000 small agricultural holdings sized between 0.5 and 1 hectares and thousands of farmland plots. Note that historical unit to measure surface is called "fanecada" (12 fanecades = 1 hectare, which indicates the ownership is very much divided in the region). The products obtained partly contribute to the families' own consumption but are mostly commercialized, with substantive orientation to local and municipal markets (e. g. *València* Central Market and dozens of municipal markets across L'*Horta* districts and the city of *València*, the *L'Horta a la Plaça* fair, and numerous farmers' markets at the villages). Many exchanges are carried out through producer associations and through verbal agreements (with also the involvement of small shops and restaurants). This integration between agriculture and city has been recently enhanced by the adhesion of *València* City to the Milan Urban Food Policy Pact (MUFPP) and its role as a host city of the MUPFF summit in 2017, with FAO support. Cities become active in fostering food and nutrition security and *València* wants to be an example of a new rural-urban alliance.

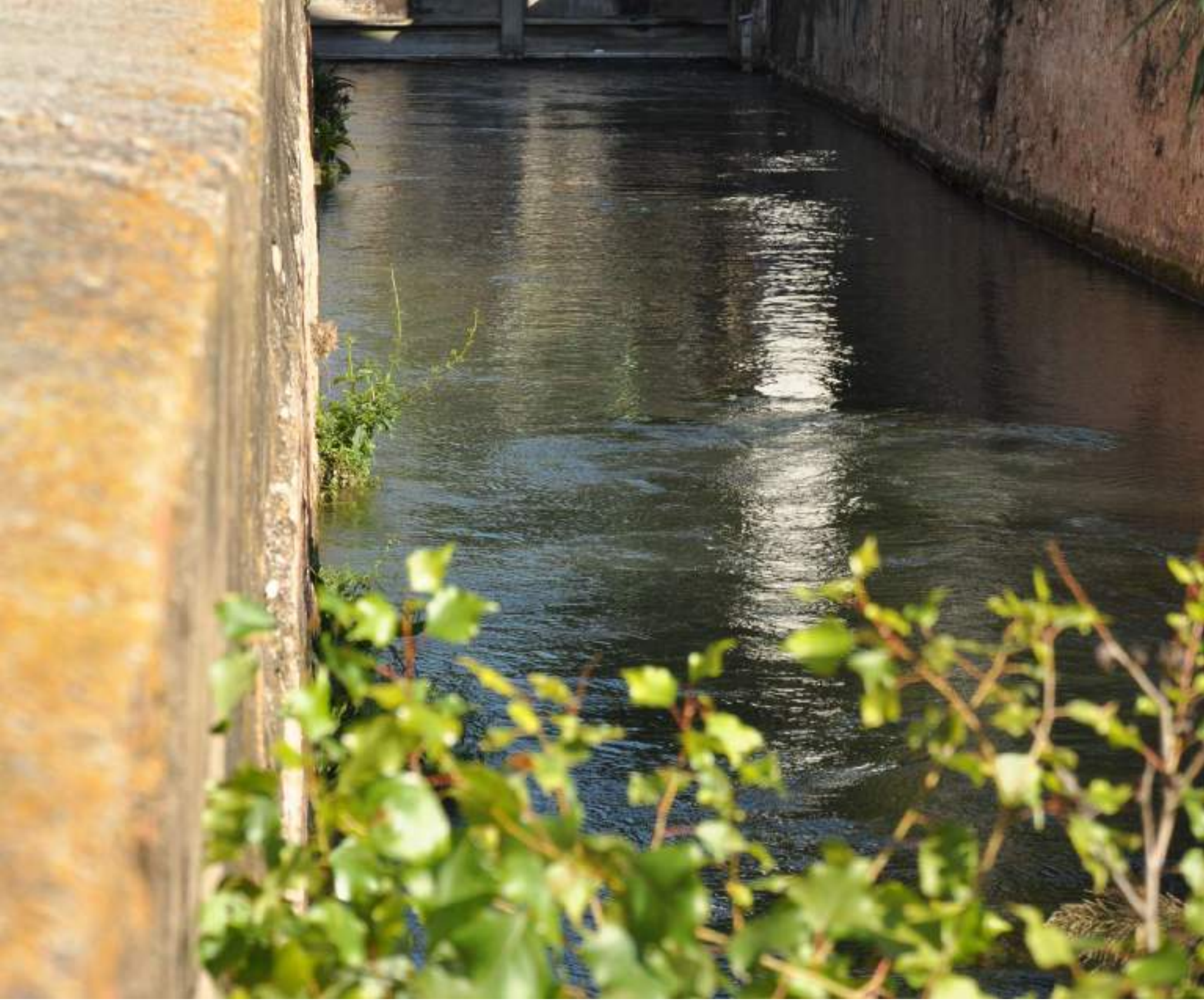
"[...] a vulnerable system, not only due to the urban pressure but also due to the lack of generational renewal of small farm-holders, with 60% of them with an age over 55."

Likewise, food and livelihood security are evidenced in several traditional activities as follows:

- Small-scale fishing and farming in the *Albufera* Natural Park, an area where the fishermen coexist with rice growers.
- Sustainable agricultural techniques: ability to exploit resources below their renewal threshold without depleting water and soil resources.
- Recycling: re-using the materials provided by secondary products of L'*Horta* for soil preservation.

It remains, however, a vulnerable system, not only due to the urban pressure but also due to the lack of generational renewal of small farm-holders, with 60% of them with an age over 55. Market pressures and the lack of development plans, with the Common Agricultural Policy support practically absent in this kind of horticultural irrigated systems, except for rice and oranges, have led to a phenomenon of abandoned farmland, which is estimated at over 1.8 thousand hectares, and is increasing the risk of land degradation.

The land use is subjected to significant pressures, not only from past urban plans but also by the lack of profitability of some traditional cultures. According to ARGGYELAN et al. (2014) the main changes between 2008 and 2013 are the decrease in the area covered by citrus fields and the increase of abandonment or areas in bad condition. The share of abandoned land increased in 40% in the aforementioned period. Some abandoned areas have been restored to irrigated crops, such as khaki, but in limited amount.



AGROCLIMATIC CONDITIONS AND WATER RESOURCE STABILITY

Food security conditions refer to a series of criteria and one very relevant is the conditions for food production. The climate of L'*Horta* is Mediterranean temperate (Csa). Here the winters are mild, which allows to obtaining three annual harvests. The average annual temperature is around 17.5 Cº being of 10 Cº the coldest months. Nevertheless, under this type of climate, the vegetation suffers water stress as a consequence of the high temperatures (30 Cº) and scarce rainfall in summer.

The average annual rainfall fluctuates between 400 and 500 mm, observing very marked maximum levels at fall. When the atmospheric situation favours depressions in high levels of the atmosphere ("cold drop" or *gota freda*) and temperatures in the Mediterranean Sea after summer favour low pressures, extraordinary torrential rains are likely. These cause intense rainfall in a few hours, which, after days, lead to overflow of the channels. Irregularity of rainfall and its torrential character are therefore relevant aspects that condition the hydrology and anthropic activities in L'*Horta*. This explains

the need to domesticate river waters for irrigation (HERMOSILLA & IRANZO). The construction of ditches or *Acequias* network, a very characteristic feature of L'*Horta*, has ensured the water supply of the fields and population settlements, which form its rural landscape.

In the flood plains of the *Turia* mainly, but also of the Carraixet to the North, and the Poyo to the South, the accumulation of holocene deposits has favored the conformation of L'*Horta*. According to HERMOSILLA & IRANZO, the availability of permanent water and the edaphic potential, with reddish-brown, fluvisole and gleisol soils, especially fertile in the case of the fluvisols, made the development of an irrigated agriculture possible.

The traditional irrigation system of L'*Horta* is mainly part of the Water Resource System of the *Turia* River. The hydrographic network of the *Horta* is organized around three main fluvial axes: the Barranc del Carraixet to the north, the *Turia* river in the center and the Torrent barranc to the south. The *Turia* ensures a stable water flow to the *Horta* throughout the year (470 hm^3/year), while the other channels are only activated during episodes of torrential rains. Other minor drains contribute to the evacuation of run-off and to the construction of the plain of flood on which L'*Horta* has been configured. It is also an area of complex relationships between surface and underground waters, with three discharge zones: Meliana-Foios, Alboraya-Cabanyal and Aldaia-Catarroja towards the *Albufera*). The leftovers of traditional irrigation feed the underground discharges. The tail flows of the ditches feed the *Albufera* on the right margin and the ecological flow of the *Turia* is maintained.

The irrigation system of La *Horta* works without short-term regulation through downstream reservoirs. Upstream, the Benagéber reservoir with a capacity of 234 hm^3 fulfils the function of seasonal and inter-anual regulation. Thanks to these infrastructures, the low urban demand (only 20% of the *Turia* resources) and the presence of wells, the risk of shortages is virtually nil for the historic irrigation of *l'Horta*.

Figure 17. Historical irrigation network
Source: Territorial Action Plan

THE IRRIGATION COMMUNITY

L`*Horta* would not exist if it were not for the people that make it up and work in it, such as farmers and family members, with varying labour time dedicated to the farm along history. Vegetable crops are more labour demanding while the growth of citrus in the later 20th century is explained by its better adaptation to part time labour.

The Territorial Action Plan for L'*Horta* promoted a study in 39 municipalities of the districts of *València*, *Horta Nord*, *Horta Sud* and *Horta* Oest with data from the last agricultural census (INE, 2009). Of 6,083 farms, 76% of them had less than 3 Has and only 5% more than 10 Has. 96% of the farms are led by family farmers (83% as landowners). It is true that the predominant model is part time farming. Farming is complemented with other employments in 2/3 of the total farms. About 20% of total *Horta* farmers employ less than ¼ of an Annual Working Unit (AWU) in their own farms. Other sources of income become relevant in the *Horta*.

According to the quoted Spanish census, the *Horta Sud*, *Horta Nord*, *Horta* Oest and *València* districts engage over 1,370 Annual working units. The table below shows economic farm data, considering representative farm models in the *València* region for the cultures present in l´Hota systems.

Farm sizes below 7 has in fruit and 3 has in vegetables are very typical of l´*Horta* but these dimensions are insufficient to employ one full time worker. Minifundism is, therefore, a major concern. However, the system shows stability in the periurban area where sources of complementary income exist.

Figure 18. *Horta* farmer with alqueria at the background
Source: Action Plan for *Horta*

	Net Value Added per Working Unit (Euros/AWU)	Working Units per Farm (AWU/Farm)	Agricultural Area per Farm (Ha)
Cereals (Rice)	28,134	1	42.9
Roots and Potatoes	28,664	1.8	11.1
Vegetables			
< 25,000 euros	32,123	0.4	1.5
> 25,000 < 50,000 euros	22,732	0.9	2.8
Fruits			
< 25,000 euros	24,467	0.7	7.4

Table 1. Economic data of representative farms in the Valencian Community.
Source: Red Contable Agraria Nacional (2017)

“Farmers who are not large landowners, but professional farmers, with cultivated surface between 3 and 7 hectares.”

It is hard to understand how most of the land is still cultivated in agricultural system, in spite of the pressures of globalization and urban growth. Resilience exists in the system by the existence of three categories of family farmers:

I. Farmers who are not large landowners, but professional farmers, with cultivated surface between 3 and 7 hectares.

II. Farmers with small surfaces cultivated on a part-time basis, sometimes with the help of “retired” labourers, and complementary income from off-farm sources.

III. Senior farmers with no other income sources. All are smallholdings, of around one hectare in disperse plots, that cultivate vegetables such as radishes, spinach, Swiss chard, young garlic, leeks, parsley, beans, artichokes, etc.

The two last categories often use the "Tira de Comptar", the farmers’ wholesale market, in a traditional way, so the trading activity provides labour to other family members.

AGRICULTURAL SPACE IN CRISIS

Today the *Horta* is constrained by a belt of communication infrastructures and is threatened by urban growth. Some authors report on the crisis of the *Horta* landscape (FRANCÉS & ROMERO 2014; ROMERO & MELO 2015) due to a combination of pressures: the real estate market; the low profitability of farms; the modernization of the irrigation system, necessary but with impacts on the hydraulic heritage; the progressive socioeconomic dissociation between citizens and L'*Horta*; and, finally, the difficulty of implementing territorial and landscape planning policies.

As a consequence of the metropolitan dynamics, especially that of the last thirty years, the landscape the *Horta* has been marginalized; or rather, increasingly urbanised. Until the approval of the *Horta* Protection Law, in 2018, this space was perceived as a reserve of land likely to be reclassified. Landowners saw in the urbanization of their plots a profitable outcome.

The absence of an agreed territorial model provoked the fragmentation and restriction of the agricultural matrix, with a social and landscape de-structuring.

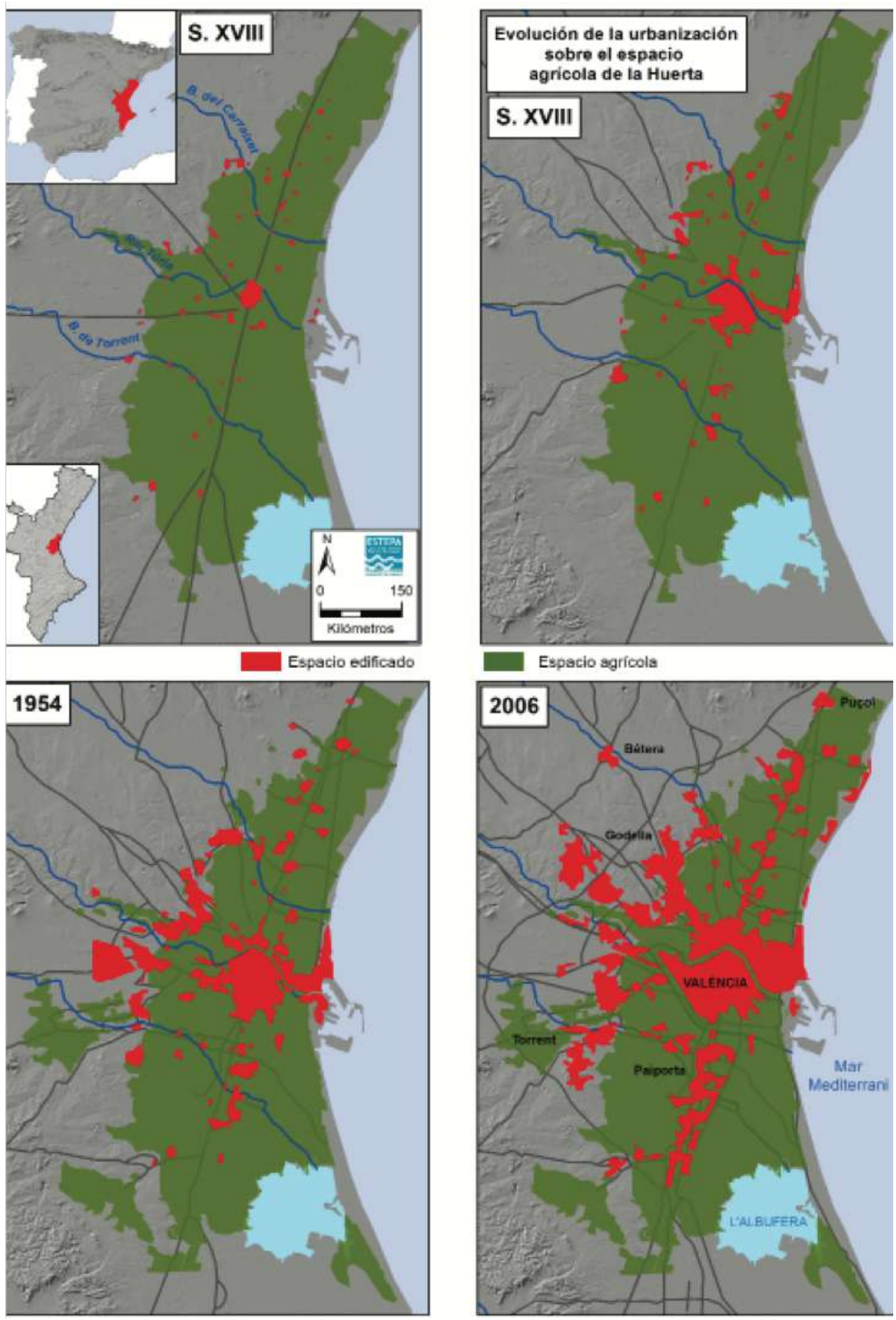


Figure 19. Historical evolution of the urban development at l'*Horta*
Source: University of *València* – ESTEPA Group (IRANZO-GARCIA, 2014)

AGRICULTURE AND FISHERIES IN THE ALBUFERA

In the *Albufera* area, 10 km south of downtown *València*, several interests coexist: agriculture, fishing and hunting, the urban planning, neighbouring villages industrial plans, the tourism pressure, recreational or conservative interests, making up a not yet solved problem. Prior to 18th century the lagoon connected with the sea by means of just one 200-m wide “gola”, allowing water flowing in both directions depending on the weather conditions. This system made possible the fishing use and yielded an important salt crop as well. The channel was opened or closed depending on the fish reproductive cycles. By then, rice production was still scant (Rosselló, 1995). Later (19th and 20th centuries) the connections between La *Albufera* and the sea began to increase. New “golas” were ditched. In addition, the number of streams flowing into La *Albufera* multiplied its number by ten in slightly more than a century. Agricultural colonisation increased during the 18th centyry and led to the expansion of the rice crops. This supposed a spectacular increase in the water intake, the reduction of the lagoon dimensions and the opening of new sea exits. One of the main worries of those who have been in charge of the lagoon management has been the control the water level needed in the rice crops.

The marshes and the rice fields in the *Albufera* Natural Reserve are the largest of the habitats comprised in this protected area. The ever-changing landscape in the *Albufera* throughout the year is largely the result of the rice-growing phases. Most of the rice field are lands that have been taken from the lagoon in a dredging process that reached its climax during the 19th century.

Fishing interests are older than agricultural interests in the *Albufera*, and at one time they were the main economic source of the area. At present, fishing activity, given

Figure 20. Fishing activities at the "Redolins" of L'*Albufera*

Figure 21. Rice farmers at the *Albufera* marshlands
Source: "Esperant al aigüa", documentary, Fundación Assut

the scarcity of fishery resources, is maintained by the fishing and exporting of llisa-mujol, due to the deterioration and loss of water quality. Only the mullet (llisa) is fished at significant volumes (125 Ton against a peak volume of 500 tons in 2002). European eel captures were significant in the midlle of 20th century reaching a peak of 120 tons in 1956. Subjected to overexploitaion, eel catches were down to 7 tons in 2017.

The available data show a significant decrease in catches of species of greater economic value, eels and seabass, increasing the catches of the less profitable species, such as llisa-mujol (mullet) and carp, because they are more resistent species of easy renewal. During the 1980s, new forms and fishing systems were used, which achieved a greater number of catches of llisa, such as "*la companya*", a shared system composed of different fishermen who grouped together achieve more catches than individually.

The commercial value of the catches in the *Albufera* was 238 thousand euros in 2015, which doubles the value of five years ago. With 74 partners in the Community of Fishermen, the average sales are 3,200 euros per vessel. In itself, fishing activity is not comparatively important, but it is part of a system with high value for recreational tourism and gastronomy.

There are many factors that have reduced species such as sea bass or eel. One of the causes has been the poor management of fishing and the lack of controls that have favored sport fishing and poaching, which due to lack of controls in the area has significantly altered the balance of fishery resources, due to the overexploitation of species in some abundant periods in the area, which due to the lack of controls to informal activities that harmed the sustainability of the fishing economy. A major issue has been the loss of water quality for fisheries, due to the pollution and bad management of the lake's water, significantly reducing the water supplies of the Júcar, and the worsening of the connection with the sea due to the formation of a sand barrier that prevent the entry of marine fish species. Agriculture, in spite of EU regulation, has also had negative effects due to the contribution of nutrients (fertilizers) and toxic products that end up degenerating the flora and fauna of the lagoon lake.

3

AGRO-BIODIVERSITY

Figure 22. The agricultural “mosaic”

"Since centuries ago, local family farms have managed to maintain the agricultural natural stock, biodiversity, and high-quality production."

THE TRADITONAL IRRIGATION SYSTEM ALLOWS CROP DIVERSITY.

Since centuries ago, local family farms have managed to maintain the agricultural natural stock, biodiversity, and high-quality production. *L'Horta* has considerably evolved over time so we can consider it as a dynamic system with changing land uses. Some varieties have been differentiating progressively coming to constitute an important bank of genetic resources that it could be useful in the not too distant future. The ecosystem of La *Horta*, even if it is anthropized ecosystem, has generated throughout its existence a heritage natural that should be preserved. Agro-biodiversity is given by a list of 50 crops, mainly fresh vegetables, although half of them are at risk of disappearance in the region. Crop diversification, with a number of local varieties, and a land structure divided into very small plots, have been key factors of resilience for the historical *Horta* landscape[6].

Interval of Occupied Hectares	Crops	
< 20	TENDER GARLIC OATS TEXTILE CANNABIS ENDIVE FIG TREE LEMON TREE	MEDLAR CUCUMBER PEAR TREE PARSLEY WHEAT CARROTS
20 - 50	AVOCADO ALFALFA EGGPLANT SWEET POTATO PLUMS FLOWERS BROAD BEAN GREEN BEAN	FODDER MAIZE CANTALOUPE TURNIP WALNUT LEEK RADISH TOMATO GRAPE
50 - 100	CHARD APRICOT ALMOND CELERY SPINACH	KIWI LIME PEACH TREE PEPPER GRAPEFRUIT
100 - 200	ZUCCHINI THISTLE CAULIFLOWER	POMEGRANATE OLIVE
200 - 500	CAROB TREE PUMPKIN TIGER NUT COL AND REPOLLO	LETTUCE ORNAMENTAL WATERMELON
500 - 1.000	ARTICHOKE KHAKI	ONION POTATOES
> 1.000	RICE MANDARINE ORANGE TREE	

Table 2. Representative crops in l'*Horta* de *València*

"Since centuries ago, local family farms have managed to maintain the agricultural natural stock, biodiversity, and high-quality production."

L'Horta has some crops that are unique or at least enjoy conditions that are hardly found in other parts of Europe. It is worth mentioning the tiger nut (*cyperus esculentus*), called Xufa in the region, which is not sold directly to the public but is used as a basis for making the traditional - and emblematic - drink *"Orxata"*, from the Northern *Horta.* Due to its relevance, the drink is protected by a Designation of Origin, which controls quality during the production process: planting, washing, drying and selection.

In the *Southern Horta*, near the lake, local rice varieties, centuries old, are cultivated. As examples of local rice varieties, we can mention two: *Senia* is characterised by its creamy texture; and *Bomba* is well known for his tight and loose grain with a great culinary value, and also protected by Designation of Origin. Both varieties are grown in the surroundings of the *Albufera* natural park. The Valencian rice is the main ingredient for the *Paella Valenciana*. Without the historical irrigation network and the role of *Albufera* fresh water resources, the Valencian rice dishes would have not been possible. Likewise, the *Albufera* lake hosts a wide variety of aquaculture products (such as the blue crab and the local eel that is a main ingredient of the typical dish "*All-i-pebre*").

Box 3. Recipe: Paella valenciana (ingredients 4 people)

- 400 grams of Bomba Rice
- 1 Kg. Of chopped chicken
- 500 grams of chopped rabbit
- 200 grams of green beans
- 100 grams of fresh "garrofó" (Phaseolus lunatus)
- 100 grams of chopped tomato
- 6 table spoons olive oil
- A few strands of saffron
- Ground red paprika
- A sprig of rosemary
- Salt

- Pour the oil over the "paella" (in fact, the Valencian people name the special pan as "paella") and light the fire. Once the oil is hot, add the rabbit and chicken and sauté until they turn a golden color. Remember to turn the pieces of meat to make them uniformly. Then, take the vegetables and redo them. Now pour the chapped tomato and fry it in the same way, stirring constantly.

- Now it's the paprika's turn. Add it and remove it just a moment, then you have to pour the water to the rivets of the paella to avoid burning.

- Add saffron, rosemary and salt. Once the water breaks to a boil, let it boil for 5 minutes with live fire. Then, lower over medium heat and let it cook for 20-30 minutes.

- Increase the heat and add the rice. The traditional way of putting it is by making a cross in the boiling water and spreading it evenly across the surface of the container. Take advantage now to taste the salt.

- Keep the heat strong for about 10 minutes and reduce the heat by half for a similar time until the rice is at its cooking point.

Source: La Fallera. https//www.lafallera.es/recetas/paella-valenciana/

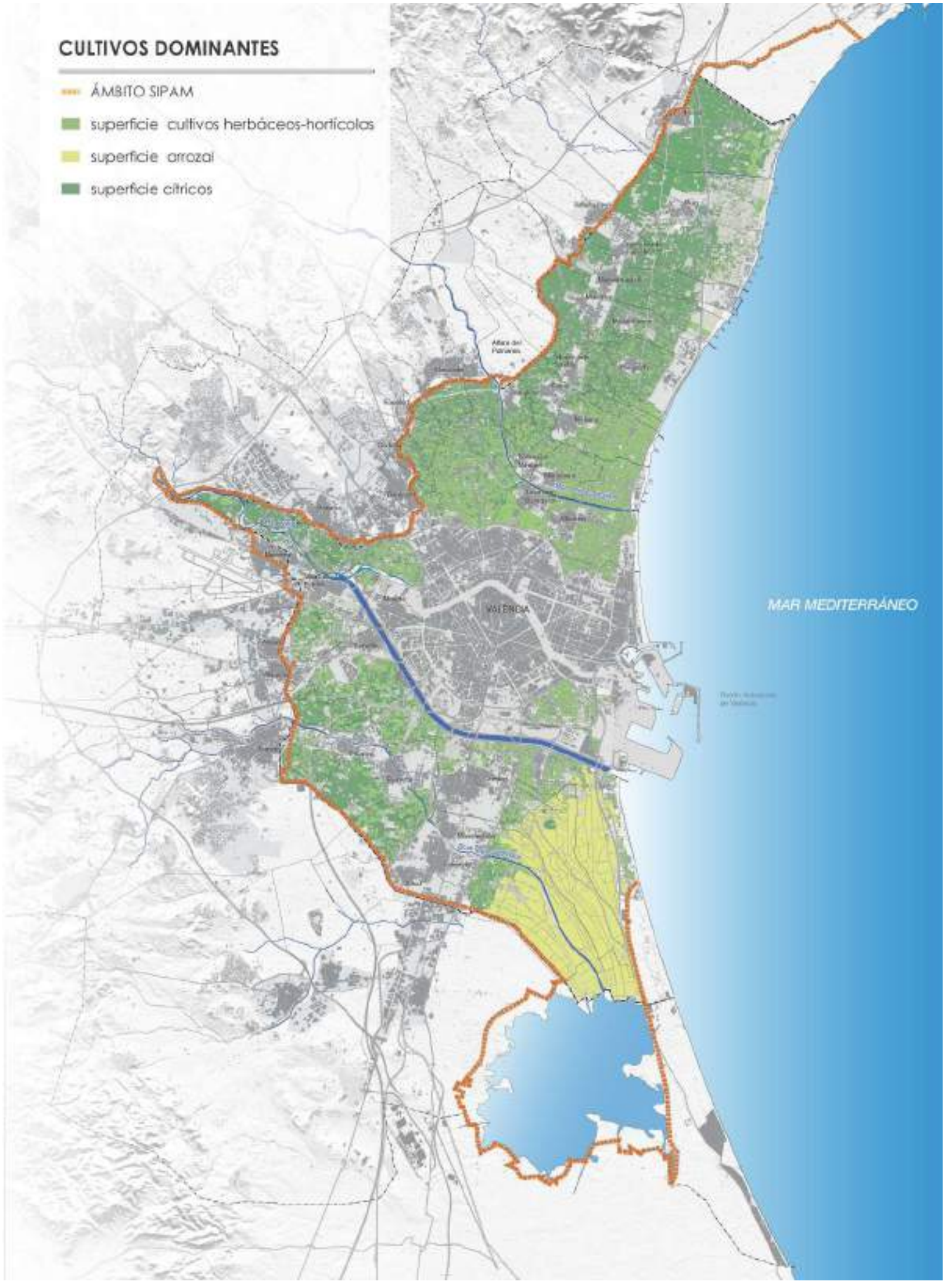


Figure 23. Land use in *Horta*
Source: Territorial Action Plan for L'*Horta*

In the Northern strip of the GIAHS site, citrus fruits such as oranges (navel and white) and tangerines (satsuma, clementines and hybrids) are produced and also enjoy a Geographical Indication (GI) label, given their high quality and variety.

Agro-biodiversity is supported by local projects as the informal exchange of seeds promoted by local fairs and associations, such as *Llavors d'ací* ("Seeds from here").

Local research institutions also collaborate to the preservation of the genetic stock of local varieties, as in the case of the Genebank of Universitat Politècnica de *València*, see box.

Figure 24. Xufa (tiger nut) processing for Orxata (on the left). All-i-pebre, an eel based dish (on the right)

Figure 25. Xufa in the left and upper right. Rice in the lower right

Figure 26. Seed exchange fair on the left. Flowers' varieties (upper right). Genebank (lower right).

Box 4. Conserving Agrodiversity

In the early 80's, collecting activities of plant genetic resources of vegetable species began in the Universitat Politècnica de *València*, which resulted in the establishment of the current Genebank. Over 15000 accessions of vegetable species are currently being preserved, including Spanish local cultivars and wild species. In the late 90s, the Institute for Conservation & Improvement of Valencian Agrodiversity (COMAV) was created.

Traditional varieties represent the major source of variation in the cultivated species. COMAV is focused in the analysis of these traditional genetic resources from a holistic perspective in order to promote their use in research and the recovery of their cultivation and on-farm conservation.

Currently, in the Genebank there are 6,267 entries of traditional varieties of different species. Particularly noteworthy is the collection of tomato entries, which is one of the most complete in the world, both in cultivated tomato and in related wild species. Traditional tomato is at risk of disappearance at the Historical *Horta*. One of the activities developed in the COMAV is the characterization of the collected materials. COMAV has classified the entries into five groups of varieties of Valencian tomato which deserve to be preserved: type "Valencian", type "Muchamiel", type "Pimiento", type "de Penjar" and a fifth group with tomatoes of varied morphology and yellow skin, (which gives red color to the fruit) or transparent (that gives pink color to the fruit), of culture and very localized use.

Source: https://www.comav.upv.es/index.php

Figure 27. Local tomato varieties on the left Agricultural mosaic (upper right). Tancat de la Pipa, biodiversity sorrounded by rice crops (lower right).

LOCAL ADAPTATION OF EXOTIC VARIETIES

Vegetable crops have a significant participation in agriculture in the area, which edaphic conditions and climatic factors have favoured, since the settlement of the tribal Islamic groups in the eighth century. MAROTO (1994) p.202-203 provides a list and description of the variety of crops that have characterised the Valencian *Horta*.

After 1492, there was an exchange of plant material, with the introduction of new American species in Spain, which although initially suffered unequal acceptance, nowadays constitute a large part of the horticultural production of the *Horta*. During all this time the farmers have been developing ecotypes adapted to local conditions and selecting varieties. It is not, therefore, surprising that after centuries of selection the *Horta* has an impressive heritage made up of traditional or local varieties of many crops, mostly characterized by their excellent quality. This effort was highlighted by Antonio José Cavanilles (1792-1794) in his descriptions of the vegetable garden of *València*[7]:

> "*The immense population and wealth of the enclosure that we are going to examine depends on the Turia, and perhaps more on the way in which the waters are used there, and of the in-telligence, perseverance and indefatigable ardor with which the soil is cultivated (...) The ground of these gardens never rests, the harvests happen without interruption, for this reason, and because the soil is not very fertile, the farmers are seen in a continuous movement (...)*"

Among the traditional varieties at *l'Horta* we underline some originated from species of Asian or American origin. These have recently described in a Catalogue of Traditional Varieties.

(see http://www.agroambient.gva.es/es/web/desarrollo-rural/banc-de-llavors). We below underline some of the most relevant in l'*Horta* area that are at certain risk of disappearance, but that are well known by *Horta*'s farming community and can be found in some local markets:

Solanaceae	
Capsicum annuum L	Pimentó quatre morros
	Pimentó valencià
Lycopersicon esculentum Mill.	Tomaca del pebre
	Tomaca de pera
	Tomaca quarentena
	Tomaca valenciana blanca
	Tomaca valenciana masclet
Fabaceae	
Phaseolus lunatus L.	Garrofó pintat
Phaseolus vulgaris L.	Bajoca de ferradura
	Bajoca mantega
	Bajoca roget
Pisum sativum L. subsp. sativum var. sativum	Pésol de trencar
Vicia faba L.	Fava de Bétera
Arachis hypogaea L.	Cacau del collaret
	Cucurbitaceae
Cucurbita moschata Duchesne	Carabassa de cacahuet
Cucurbita pepo L.	Carabasseta blanca
Citrullus lanatus (Thunb.) Matsum & Nakai	Meló d'Alger sang de bou
	Melona
Cruciferae	
Raphanus sativus L	Rave roig
Liliaceae	Ceba bavosa
Allium cepa L. Liliàcies	Ceba de gra
Asteraceae	
Lactuca sativa L.	*Encisam "orella de burro"*
Umbelliferae	
Daucus carota subsp. sativus (Hoffm.)	Safanòria morada

Table 3. List of traditional varieties of vegetables at l'*Horta*

Some of these varieties are complementary but essential ingredients of the paella, the local dish. One example is Garrofó pintat (*Phaseolus lunatus* L.), also called bajocó, fesol de la peladilla or bean of Lima, is a legume very characteristic and loved by Valencians. In fact, it is difficult to find outside Valencian lands. The grains are unmistakable, flat and quite large, and varieties Valencians are stained with red or purple - very or little, though stained -, unlike the foreign varieties, which are wholly white. Essential bean in the Valencian paella are Bajoca mantega, Bajoca roget or the Bajoca de Ferradura. This is green bean without pigmentation which has a characteristic curvature that, as the name says, remembers a horseshoe.

Figure 28. Garrofó at the top and Bajoca de ferradura at the bottom, two core ingredients of the typical Valencian paella.

BIODIVERSITY LINKED TO THE IRRIGATED SYSTEM[8]

Variety of natural and farming traditions create unique landscapes that but provide living conditions for many plants and animals (See Annexes II and III). Biodiversity very much dependent on agricultural activities related with the diversity of crop varieties. Maintaining adequate farming practices is key to biodiversity conservation. On the other hand, abandonment is considered detrimental to biodiversity. Small farm size usually entails the consolidation of fields boundary, such as hedges and small trees, structures for feeding, nesting and shelter against predators. Farmland birds are too indicative of overall biodiversity. In the area of *Horta*, we

"The diverse habitats found in the *Albufera* de Vaència favour the presence of a large number of flora and fauna: dunes, beaches, the forest, the lake, dune slacks and rice fields. Birds feed on invertebrates and water plant seeds found in the large marshland and rice areas, as well as freshwater and seawater fish."

find sites hosting natural diversity of habitats subject to different forms of protection. South of l'*Horta* de *València* is the "*Albufera* Natural Park. Paddy field area is located within the Park.

North of l'*Horta* de *València*, the wetlands "Rafalell i Vistabella" and "Marjal dels Moros" are found. Both are protected wetlands included in the Ramsar Convention. *Albufera* is also a wetland. The three areas are included in Nature 2000. These ecosystems located into or in the immediate vicinity and bordering of agricultural land. The structural composition and dynamics of these ecosystems can´t be understood as a result of interdependencies with the surrounding agricultural systems. In all cases, irrigation returns are relevant for wetlands. The agricultural environment intervenes in biological flows, allowing the species movement through the connecting elements, such as trails, enclaves and hedges. The canals and drainage system, and irrigation canals form a waterway system in some cases with abundant marsh vegetation that act as ecological corridors, linking together different spaces. A lot of species use marsh vegetation in canals for feeding, nesting and shelter. The ratio between the surface of protected areas and the area under crops is 14,33% according to MARQUEZ-PEREZ & SEGURA (2014).

Regional administration make every year an annual inventory of birds related to agriculture. In these inventories there are many bird groups (rallidos, ducks, waders, terns, etc.) but also fish fauna among which include eel (Anguilla anguilla), mullet (Mugil cephalus) and especially the fartet (Aphanius iberus), amphibians as samaruc, and vertebrates.

AGRO-BIODIVERSITY UNDER RISK

In the *Horta*, in year 2013 over 70 per cent of the surface of arable crops was represented by 7 staple crops. The which are possible due to the irrigation system cultures are onion (13%), tiger nuts (13%), artichoke (10%) and lettuce (9%). Crops whose representation of the total is below 2% (surface less than 100 hectares) are 36 out of 50 crops. At a risk of disappearance in L'*Horta* (with a total area less than 50 hectares) are 31 of the 50 crops, more than 60%. In this "black list" there are some traditional crops of the *Horta* like the tomato, the carrot, the cucumber, the corn, the zucchini, the peanut or peppers.

In 2014, ARGYELAN et al. published a land use map which reflects the cultural diversity in the Historical *Horta* and monitors the dynamics of land use between 2008 and 2013. The picture in 2013 is that within a total area of study of 11,370 hectares of non urbanized nature, 3,935 correspond to fresh vegetables, 2,818 to citrus, 1,791 to rice, and 352 to wetlands, nursery and palm trees, with other areas being mainly abandoned or occupied by artificial surfaces including asphalted areas and infraestructures. As the main agricultural uses, rather than monoculture, the problem is the land abandonment, which reached 1,778 hectares.

A number of horticultural plants, although absolutely marginal, maintain a large botanical interest for the selection that the *Horta*'s farming communities have made over the centuries but they are at risk of dissapearance because they have no value in the current markets. Examples are: "alficós" (Cucumis flexuosus), pumpkin of San Roque (Lagenaria siceraria), garrofó (Phaseolus lunatus), moniato (Ipomoea batatas), panis (Setaria italica), guindo (Prunus cera-

“In the last years flora diversity has decreased because of the rise of pollution and the building construction along the coast line. Flora biodiversity is now reduced to the presence of riparian in channels irrigation ditches and the lagoon shores: common reed, common cattail, yellow iris, and bulrush.”

sus) or licorice (Glycyrriza glabra) or peanut (Arachis hipogea), associated with our popular gastronomy.

Currently, walking through the *Horta's* fields, we still find many representatives of a flora that coexists with crops and roadsides (LAGUNA and FOS, 2004). Many of these species, considered very often under the name of weeds, have been kept and even boosted in L'*Horta* for their food, medicinal, agricultural or ornamental use. As Laguna and Fos report, there are many examples, but as evidence of their cultural significance and their possibilities for use in the near future, we quote some. The lletsons, better known in the region as llicsons, give name to a group of herbaceous species of the genus Sonchus -S. asper (lletsó punxós, “cerraja común”), S. oleraceus (lletsó fi, "cerraja", "lechecino"), S. tenerrimus (lletsó de cingle, "cerraja de pared") - very frequent and widely spread in crops and rural environments, and even go into the cities, inhabiting gardens, orchards of native trees and wastelands, or taking advantage of small holes in sidewalks and walls.

The presence of trees and bushes not linked to main production of the farm holdings is also characteristic in this peri-urban landscape. The functions of these trees are several, from the use of its fruits or other parts from the tree, to ornamental use going through the simple use of his shadow. This vegetation remains usually relegated to roads, edges of *Acequias*, slopes, and next to constructions like farms and mills. Some of the main species are: the fig tree (Ficus carica L.), the mulberry (Morus alba, Morus nigra), the palm tree (Phoenix sp.), The Aleppo pine (Pinus halepensis) and the stone pine (Pinus pinea), the olive tree (Olea europea), the laurel (Laurus nobilis), etc.

RICE AREAS, LAKE AND MARSHES AS DIVERSE HABITATS[9]

The diverse habitats found in the *Albufera* de *València* favour the presence of a large number of flora and fauna: dunes, beaches, the forest, the lake, dune slacks and rice fields. Recall that the very existence of the irrigation network allowed the formation of fresh water reservoirs, that facilitated the dissemination of a rich flora and fauna. Birds fed on invertebrates and water plant seeds found in the large marshland and rice areas, as well as freshwater and seawater fish. It is a vulnerable food chain, endangered by water pollution and growing human activity in the área. Some bird groups use the wetlands on their migratory routes throughout the year, including ducks, herons, seagulls, terns and shorebirds. Many of these are classed as rare or endangered species, both in Europe and Spain. In the *Albufera* de *València*, more than 800 species of plants can be found, many of which are classified as rare, endemic or endangered species. Moreover, this area is home to diverse animal groups such as insects, molluscs, crustaceans, amphibians, reptiles, fish and mammals, making up a mosaic of unquestionable beauty.

Native fish fauna is composed mainly by sea mullet (Mugil cephallus), sharpnose mullet (Liza aurata), carps, silverside fish and pumpkinseed sunfish. The lagoon fauna (both fish and benthic) have undergone pressures throughout the years. Eel and bass have shown sharp decreases, while others are now extinct, such as the endemic “samaruc” *València* hispanica

"In the last years flora diversity has decreased because of the rise of pollution and the building construction along the coast line."

and "fartet" Aphanius iberus. Other fishes as the loach and the chub are possibly restricted to some channel areas. The fish diversity that existed in the lake is reduced due to eutrophication, overexploitation, pollution and the introduction of invasive species such as the American crab, the sun perch, the carpin (American perch) and now the blue crab, hampered the existence or permanence of native species.

Some 250 bird species find shelter in the park and around 100 of them also reproduce there. The most numerous group during Winter are the anatidae, ranging from 40,000 to 60,000 individuals. Worth mentioning is the redcrested pochard (Netta rufina), which attains about 17.000 individuals. Other common anatidae are the mallard (Anas platyrhynchos), the pochard (Aythya ferina) and the shoveler (Anas clypeata). Smaller number of individuals are pintails (Anas acuta), wigeons (Anas Penelope) and teals (Anas crecca). Ardeidae, such as grey herons (Ardea cinerea) little egrets (Egretta garzetta) and cattle egrets (Bubulcus ibis), are common during the winter and during nestling time attract attention due to the high number of nests in the area (more than 2500). Significantly, the nestling species in the area of La *Albufera* rank among those in the "List of Wetlands of International Importance" following the numerical criteria issued by Ramsar for several bird species, according to Valencian Ornitology Society data (2005).

Several endemic species among the invertebrates are now considered extinct: Dugastella valentina and Palaemonetes zariquieyi (known as "gambetes") and the bivalvia Unio turtoni valentinus ("petxinot"), which can only be found in protected areas (Dugastella valentina and Palaemonetes zariquieyi) and possibly in some irrigation ditches (Unio turtoni valentinus) (SÁNCHEZ, 1991). In the last years flora diversity has decreased because of the rise of pollution and the building construction along the coast line. Flora biodiversity is now reduced to the presence of riparian in channels irrigation ditches and the lagoon shores: common reed, common cattail, yellow iris, and bulrush. The surface of the lagoon occupied by macrophytes has drastically reduced the former abundance of Myriophyllum, Chara, Ceratophyllum, Potamogeton and Nymphaea alba. Ranunculus aquatilis grows only in rice crops during the flooding period (SÁNCHEZ, 1991).

The filter function of the rice fields should also be highlighted, since the waters passing through the fields are filtered and together the ullals or springs constitute authentic genetic reservoirs with endemic species of great ecological value. At present the contaminated state of the *Acequias* has led to the disappearance of many underwater species.

Figure 29. European eel (anguilla anguilla) on the left. Mullet (llisa, Mugil cephalus) on the right.

4

LOCAL AND TRADITIONAL KNOWLEDGE SYSTEMS.

GENERAL OVERVIEW

L'Horta has an equitable water distribution network for irrigation with deep historical roots, mainly focusing on water irrigation. Thanks to this, a resilient water system has been built and provides a buffer against unexpected climate events such as floods or droughts, which are frequent in the Mediterranean agro climatic environment.

This water system is composed by the *Acequia Real de Moncada*, the *Canal del Turia* ("*Turia* Canal") and all the hydraulic channels or *acequies* managed by the *Tribunal de las Aguas* (Rovella, Favara, Mislata-Xirivella, Quart-Benàger-Faitanar, Tormos, Rascanya and Mestalla), all them designed for a gravity-fed irrigation method. The *Albufera* lake is a cultural landscape which benefits from the water flowing from irrigated areas. Without irrigation, the *Albufera* would not be as it is.

The *Real Acequia de Moncada* - the large irrigation canal in *València* located in *L'Horta Nord* - is, today, the last great material vestige of the different irrigation systems established by Muslims more than a thousand years ago, and which symbolize the secular domestication of water, through the creation of a great diversity of rural landscapes linked to irrigation. Landscapes that are still alive and in use, and retain many of their past traces, not only on land and water, but also in the memory and social customs of their people. The *Real Acequia de Moncada* is also a "Water User Association" that owns an important water concession of the *Turia* River and manages its supply for the irrigation of more than five thousand hectares of *L'Horta*.

Traditional knowledge has been transmitted generation after generation. The water distribution system for centuries has been transmitted in oral and written rules to provide stability to the irrigation network. Public sector, academia and social movements (GIOBELLINA 2012) are collecting traditional knowledge and generating synergies

"L'Horta is one of the most well-known farmer-managed irrigation systems. In this area water management has conditioned the development of the existing landscape since ancient times, and as a result a complex system of channels dating back to Muslim times is still used for gravity irrigation."

around spaces like the *Observatori Ciutadà de l'Horta*, *Ecosaberes, Urbanlabs* and the platform *Ecollaures-SPG*, a web of culture and agriculture information.

Finally, ancient practices are not only connected to production, but to gastronomy as well. Examples given are the typical *salazones* and preserved food, paellas and beverages. Even local traditions such as the *esmorçar* ("Valencian breakfast") become occasions for informal meetings, verbal agreements and shared spaces for local knowledge transmission.

THE IRRIGATION SYSTEM. DESCRIPTION

An ancient technology

L'*Horta* is one of the most well-known farmer-managed irrigation systems. In this area water management has conditioned the development of the existing landscape since ancient times, and as a result a complex system of channels dating back to Muslim times is still used for gravity irrigation. Their main water source is the *Turia* River. Besides, in some areas they also use collective wells. The cultural landscape resulting from this type of irrigation system, characterized by sustainability, has not only survived for centuries but has continued to exist to date. Its maintenance is dependent on the transmission and application of a specific cosmology, which is closely linked to knowledge of the natural environment (UNESCO, HUDSON & GONZALES, 2013).

Irrigation is a technical development that has allowed the management of scarce water, necessary for agricultural activity. The design of the complex irrigation system, with its order and hierarchies, is at the base of the territorial organization of L'*Horta*. *Acequias* and braces act as the arteries and capillaries of L'*Horta*, transporting water and conditioning the structure of the plot, crops and human settlements. L'*Horta* is, therefore, a landscape built mainly from the water management of the *Turia* River, but also from the Júcar River, from springs and from groundwater.

In the Middle-Age, the Muslims contributed with two valuable elements to the configuration of the Mediterranean agricultural system: unknown plants from Asia and knowledge on hydraulics. Vegetables and fruit trees from tropical areas needed water, which in summer is scarce in Mediterranean regions. The Muslims developed systems for capturing, transporting and distributing water from rivers and springs close to the human settlements and to the surrounding agricultural fields.

The transmission of the techniques of control and management of the waters has progressively shaped the landscape of L'*Horta*. According to IRANZO (2014), there are three technical factors that articulate this hydraulic space: availability of water thanks to the *Turia* river flows; the location of the cultivated land (alluvial plain); and the gradient between the two settings.

Structural base

Eight main mother ditches give rise to the entire network of ditches and minor channels, which make up the irrigation system. The construction of the ditches was not carried out si-

"The Muslims built the eight mother *Acequias* that capture the waters of the *Turia* river. Eight are also the diversion dams (*Assutes*) that were built on the bed of the *Turia*."

multaneously. The progressive consolidation of the irrigation network lasted for centuries (GLICK, 1988). *L'Horta* has been built gradually from the *acequies* closest to the city (*Acequia* de Rovella) to those that irrigate the most distant spaces (*Acequia* de *Moncada*).

The Muslims built the eight mother *Acequias* that capture the waters of the *Turia* river. Eight are also the diversion dams (*Assutes*) that were built on the bed of the *Turia*. Ten if we count the dam of *l'Acequia* de l'Or, built in the 19th century, and the Cassola dam, which was built in the second half of the 20th century and replaces several of the historic dams (Favara, Rascanya, Rovella and l'Or), after the construction of the new *Turia* river bed in the sixties. The nearest dam to the city was the channel of Rovella, now replaced by that of the Cassola, which was located about two and a half kilometers from the old part of the city. The farest dam is the *Moncada* canal, about 13 kilometers from the city. Irrigation ditches start from the *Assut*es, four of them from the right bank of the river (Quart ditch, Mislata ditch, Favara ditch and Rovella ditch) and other four from the left (*Moncada* ditch, Tormos ditch, Mestalla ditch and *Acequia* de Rascanya). The route of the ditches opens in a fan from the dams following the maximum level; and from it, by means of *partidors* or *llengües* (structures of water derivation) secondary channels or perpendicular bracers split forming a structure in the form of a comb. The excess water from the ditches that circulate at higher elevations is collected and exploited by the ditches that circulate at lower elevations. In this way, the entire system maintains an intricate and delicate unit. We also consider part of the system other adjacent lands that take water from the Júcar River, from sources and wells. Hence, according to HERMOSILLA (2007), the irrigation of L'*Horta* can be zoned, depending on the origin of the water, in the following areas:

- Irrigation from the main fluvial axes. From the *Turia* River come the seven ditches of the *Tribunal de las Aguas*, the *Acequia* de *Moncada* and the *Acequia* de *l'Or* (also called the Irrigation Channel of the *Turia* River), which irrigate most of the surface. While the southern end (Albal) plots are irrigated with the northernmost stretch of the *Acequia Real del Júcar*.

- Traditional irrigation by elevation, whose origin we found at the end of the 19th century and the beginning of the 20th. These are peripheral spaces to *l'Horta* historical, irrigated from the water captured by wells, engines and water wheels.

- Franks, marshes and extremes' irrigation. They are spaces where the waters were taken from the leftovers of the major systems.

Institutional base and rules

The Water Court (*Tribunal de las Aguas*) is an institution that, in addition to providing justice, allows the *representatives or sindics* of the seven irrigation ditches to make joint decisions and coordinate with the other large irrigation ditch of L'*Horta*, the *Real Acequia de Moncada*, which does not belong to the Tribunal. Farmers using the irrigation ditches are grouped in Water User's Associations (WUA), which in the case of l'*Horta* system are shown in Figure 30. The WUA have ordinances (rules and regulations of their own) through which they try to solve the issues that arise between the different users. Farmers belonging to the irrigated area of a WUA share a collective water right. In addition, during droughts, there have also been scarcity arrangements among different WUAs. When the available flow of the *Turia* River

is reduced, the WUAs will start to irrigate in alternation instead of simultaneously. Usually, water will be derived one week to the Real *Acequia* de Montcada and the following week to the remaining WUAs, grouped in the *Tribunal de las Aguas*. By doing so, they make available a higher flow to irrigate, but for a lower amount of time, which is preferred by them due to the system's constraints.

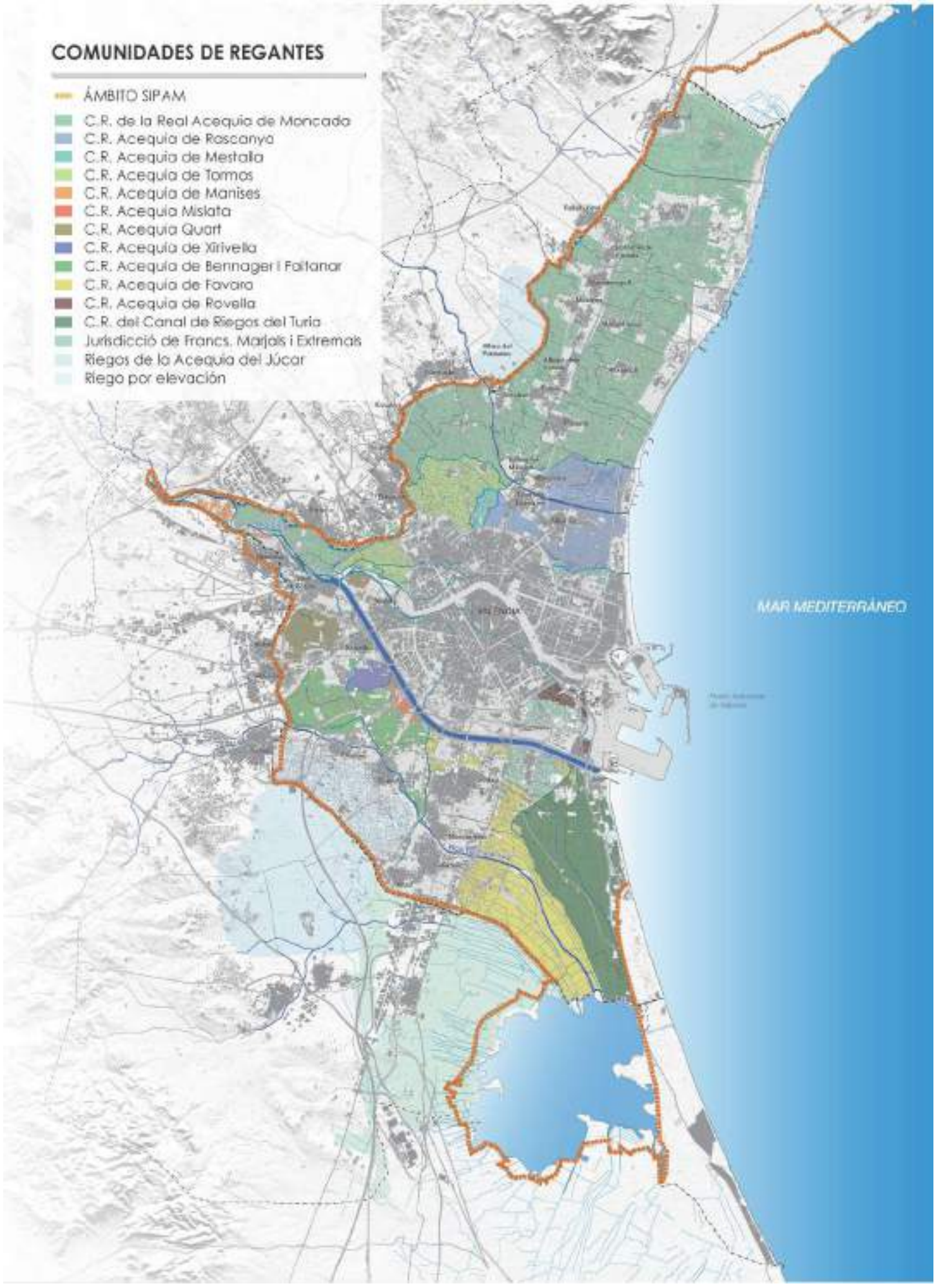


Figure 30. Territories covered by l'*Horta*'s Water User Associations

The *Real Acequia de Moncada* is the largest WUA in L'*Horta*. The *Acequia* covers approximately 5,200 ha and includes more than 10,000 users, even outside the strict limits of the Historical *Horta*. The main channel has a length of 33 km, and secondary channels divide the irrigated area in sub-sectors for water distribution. The WUA has a governing board, elected by farmers, and also water *guards*, workers of the WUA, in charge of following up irrigation and deriving water to different channels and sectors.

The "turno" system

In practice, water is distributed among farmers according to customary rules. Water is shared by applying a contiguous order of irrigation from top-to-bottom of the system. Once water is available at the head of the system, irrigation starts field by field and channel by channel until tail-enders have finished irrigation (See Annex I for a more detailed descriptive of the water distribution system). This system is known as *turno*, and an irrigation cycle usually lasts one week. Therefore, unless there is scarcity farmers can irrigate weekly and the order of irrigation is also maintained in case of scarcity. By doing so, when water availability decreases, the irrigation cycle gets extended in time. When a contiguous order of irrigation is applied, irrigation concentrates in a sector. By doing so, farmers can monitor whether or not the existing rules

Figure 31. Irrigating at Meliana

are followed by other farmers. Both a sense of equity and transparency on sharing scarcity is important to avoid free-riding and conflict.

The imprint of the Muslim agronomical corpus in the design of channel networks is reflected by the use of the fila, a flow measuring unit for water sharing and distribution, and in the use of the *Egyptian elbow* as pattern for gauging the width of embankments for the main canals, as archaeologically proved in *Valèncía* (see Box 4).

The preparation of arable land for traditional irrigation, as well as the building and maintenance of the canal web and of the pre-industrial artifacts which physically vertebrate L'*Horta* cultural landscape, rest on a very varied repertoire of craft knowledge (See Annex I for a description of the surface irrigation system "riego manta"). Irrigating farmers are custodians of a subtle corpus of very wide and rich hydraulic-agronomic skills and knowledge, whose practical application allows them to use available water in accordance with the quality of the soil and of the type of crop that is being produced. The remaining jobs connected with the traditional irrigation system also preserve ancient, unique crafts, as is the case with the specialist makers of the wide array of tools used by farmers –from plow and hoe to the hook used for lifting the boards that regulate channel flows-, the experts involved in the construction of the watering network's physical infrastructure and connected devices – mills, waterwheels, weirs, embankments, stop-boards, flow dividers, floodgates, canals, azarbes and so on -, and those charged with watching over the maintenance and adequate performance of those artifacts and the watering system itself – lookouts, surveyors, channel cleaners, turn-setting agents, watering specialists, millers, gear maintenance specialists and others. All these craftsmen, who usually learn and hand down the job, father to children, by word of mouth, are necessary for the preservation of the system which supports the irrigators' communities.

SYSTEM'S STABILITY

The fundamental operational procedures of the communities of irrigators are those destined to situations of ordinary rains, whereas, for cases of extraordinary droughts or abundance of water modifications of the previous ones are used. The operational rules are well described in the book by MAAS and ANDERSON (2010). The authors describe three regimes for operating procedures, abundance, mitjanya (middle regime) and great need. Depending on the situation decreed, various distribution systems were articulated - usually in rounds or "turnos", well adjusted to deal with the situations of drainage efficiently and without altering the proportional equality between irrigators. The irrigators of the Valencian *Horta*, according to the authors did not attach much importance to efficiency in their selection of operating procedures. The distribution systems developed for wastewater situations such as the "double" of water or rotations between main armbands exhibited efficiency, but mainly pursued objectives of justice and equality among users.

According to introductory study to the Spanish edition of the quoted book by Thomas Glick and Carles Sanchis Ibor, according to Maass the search for efficiency is manifested in the jealous protection of water rights, through the historic limitation of the irrigable area or traditional disputes with other users of the basin. This is an essential contribution to the preservation of water as a common good.

The defence of historical rights is still today a sign of the high degree of local control achieved by these irrigation entities. In fact, despite the fact that the surface of some of these ditches, such as those of Mestalla, Rovella or Mislata, have been reduced by more than 70%, the irrigators maintain the same concesional rights as several decades ago. Thanks to this, the irrigators have achieved a substantial improvement in their supply guarantees and a notable reduction in the conditions caused by the drains. As a result of the increase in water availability, the waiting time between shifts has been significantly reduced in the ditches most affected by urbanization, making possible, in some sectors, up to a couple of weekly irrigations if the farmer considers it appropriate. However, the ancient rules are preserved as a precious legacy and the principles of equality and conflict control are in this new context, easier to preserve, due to the abundance of the resource.

In fact, at present, the abundance of water and the disappearance of important sectors of the garden have significantly reduced conflicts and the historic Court has significantly reduced the number of annual sentences. This situation must be interpreted on the one hand, as a success of the organization, which has managed to satisfy the purposes for which it was created, but on the other hand, we must not forget that the superficial decline represents a serious risk for the survival of the garden and of its institutions. The future preservation of this irrigation will depend largely on the results of the *Horta* Protection Law, recently passed by the regional Parliament. This project aims to establish different levels of protection of the *Horta*no soil, while ensu-

ring the compatibility of activities in the traditional agricultural space and the valorization of the garden and its landscape, placing the dignification of agricultural activity as one of its first objectives.

Box 5. Esperant l'aigua (Awaiting for the water)
Esperant l'aigua (*Awaiting for the water*) is a documentary project by Miguel Ángel Baixauli and Fundació Assut focused on the territory, landscape and culture of La *Horta* de *València* and, in general, on all the complex system of irrigation and marshes that extends through this coastal plain, including L'*Albufera* and the Ribera del Xúquer. In this pilot episode, some farmers are awaiting the water arrival to their fields. In the main time, a piece of their daily life is shared with us. Daily lives belonging to a threatened world that is full of sensitive wealth and knowledge. It is directed by Miguel Ángel Baixauli and produced by by Ignasi Mangue (Fundació Assut / Artxiviu de *l'Horta*). **Click here for further information:** https://artxiviu.org/en/awaiting-for-the-water-2012/ Another video ilustrating how the gravity irrigation is carried out in the Valencian netowrk can be found at https://www.youtube.com/watch?v=mpseS4VoKlo
In a Comunidad de Regantes (WUA) the right to irrigation is collective and shared among many irrigators. Therefore, the objectives of good management are to ensure that farmers respect established norms and optimize the use of water. Irrigation involves technical knowledge and social 'finesse'. The coordination between neighbours for the distribution of water has always been a core element of the system. Part of this coordination draws on education on the rules and good practices of irrigation that are transmitted from parents to children: it is necessary to prepare the stops, to get the water flow, to ask for the turn and to wait for the water. To maximize the use of water, irrigation has many preparation tasks: preparing the field for irrigation, making ridges, knowing how to make use of tools, stops and gates. A good irrigator must know the exact moment to close the floodgates so that the water reaches the end of the field without having excess water, because although this may occur in some cases, there is a prohibition to drain to the drainage network. The set of controls are applied more strictly in situations of severe drought or scarcity, since availability depends on the rest of irrigators can supply water their crops. More information on the irrigation system can be found in the web page http://www.paisatgesculturals-rsm.org.

Figure 32. The water distribution as the core element of the system
Source: "Esperant al aigüa" (documentary with English subtitles)

Figure 33. Riego "a manta" (flood irrigation). From the ditch to the field.
Source: Real *Acequia* de Montcada.

Operating rules

Climate regime		
Low water period (Mitjania)	**Severe drought (necessitat gran)**	**Water abundance**
- Proportional water distribution agreed by voting - System of tandas (days of irrigation to allocate water within each ditch's network - "*Agua de gracia*" or principle of solidarity when extreme need is detected in some farms	- "Doblar el agua", which is the folding or alternation principle to be applied between left-side and right-side ditches - "Tandas" are agreed between *Horta* and upper village of the *Turia* basin. - "*Tandas*" are agreed between the Montcada ditch and downstream ditches	- No water restrictions are agreed. Turnos or irrigation turns maintain within most ditches with lower waiting periods between irrigation rounds.
- Basic principal: each irrigator uses the available water in proportion to th		

Ordinary regime

Under ordinary low water periods (mitjania) the ditches can only extract from the river the proportion that corresponds to them. The ditches only obtain water through their main intakes and arrange their gates so that they only derive fixed proportions of the river flow. Once the application of the regime is approved by vote, the trustees of the three lower channels meet at a place in the river downstream of the *Assut* de *Moncada*, where they assess the river flow. Then they open the gates of the ditches depending on the estimated flow. The gates of the last two ditches - Rovella and Rascanya are open completely, thus dividing the water that remains

in the river after the others have taken their part. This process of dividing river waters is known as *reparticiones de agua* "water distributions."

The water is subsequently divided and subdivided into numerous ditches by means of proportional partitions (llengües), which are permanent structures without gates installed in the channels. With the help of this control devices, typical of *l'Horts*, more than 30 fields in the same irrigable area can be fed at the same time and the water in the ditch, whatever its volume, is automatically divided into fixed proportions, assigned to the sectors irrigated by different bracers.

The ditches are usually divided into three sectors. Thus, for example, the branches supplied by the first sector of a ditch are irrigated on Mondays and Tuesdays, those from the second sector do so on Wednesdays and Thursdays, and those from the tail sector on Fridays and Saturdays. The time allocated to each sector is - approximately - proportional to the irrigable surface. These *tandas* or days of irrigation are especially important in large ditches, because without them the water - even being abundant - would not reach the tail of the irrigation system with sufficient flow to reach all the derivations

Box 6. Tanda

Each property has reserved a time to water in each period; but the water distributed in that time will vary in each batch according to the flow that runs through the ditch at the time. The time allocated to each property is usually based on the size of the farm. If a farmer does not use water in his assigned time, the water is available for the following irrigators.

A more general principle, also reflected in the ordinances, is that all irrigators have an obligation to provide assistance to those with the greatest needs. The transferred water is known as *agua de gracia* “water of grace”.

Exceptional droughts

During the exceptional droughts, the Valencian irrigators put in place ingenious devices to allow the communities of irrigators to continue their distribution of water according to a basic principle of l'*Horta*: that the water reaches the irrigator in proportion to the surface owned, a criteria that can be modified by the water requirements of their crops, defined by the irrigator and supervised by the *Acequia* officers.

When the trustees of the seven ditches declare the regime of *necessitat gran*, three additional measures are adopted. The first one allows to optimize the efficiency of the water available downstream of the *Assut* de *Moncada*. The ditches of the right and left bank alternate the water intake, watering each margin of the river for two consecutive days. This provision, known as *doblar el agua* “foldering the water”, does not increase the proportion that each one of them takes from the river and allows maintaining the endowment of each ditch by cutting the supply period by half. Before the water doubles, the trustees toss a coin into the air to determine which ditches - left or right margin - will receive the water during the first two days.

Once the trustees have *doblado* "folded" the river, a second measure is launched, aimed at increasing the volume of water available in the seven ditches of the city. Since the fourteenth century, during droughts, Valencia has had the right to limit water withdrawals from certain irrigation communities located upstream of the garden, the so-called *Pueblos Castillo* “castle towns” (Pedralba, Vilamarxant, Riba-roja de Túria, La Pobla de Vallbona and Benaguasil.). Under this procedure, called “tandeo”, the castle villages open their floodgates for 4 days, during which l'*Horta* only receives, as usual, the flow that exceeds these *Assut*es. But these villages must close their floodgates for the next four days, so that *Horta* receives all the water from the river. This limitation in the upper derivations was initially imposed for historical and geographical reasons. The gardens of the castle villages developed and expanded later than those of Valencia and the position of their shots in the river ensures them privileged access to water at all times.

"In most cases, irrigators continue to follow each arm's turn, but the wait between one irrigation and another is shortened (between seven and twelve days.)"

The third measure is designed to redistribute water between the first canal, *Moncada*, and the four tail canals - Rovella, Rascanya, Favara and Mestalla -, the most affected by the s*Horta*ge. This norm, also old, called "*tablones de Moncada*", stipulates that on Mondays and Tuesdays of each week, *Moncada* lets in a quarter or half of its water, depending on the severity of the drought. For this purpose, water is measured at the *Moncada* intake and the part corresponding to the city ditches returns to the river through a spillway, falling downstream of the first three ditches of the city, deprived of the use of this water. Since there is no fixed criterion to determine when *Moncada* yields half or a quarter of its waters, and as *Moncada* is not represented in the committee of trustees that decides the execution of this procedure, the application of this standard has resulted in numerous disputes between the representatives of *Moncada* and the ditches of Valencia. These were resolved in the past by the provincial authorities, but currently, as in the case of the Castle Towns, the decision is the responsibility of the general authority of the Jucar Basin.

Abundance of water

When water is abundant in most of the channels, all ditches and virtually all irrigators use water when they need it. And whenever the lands entitled to irrigation enjoy excess water, fields without full rights can be watered. However, even in times of abundance (*abundancia*), the distribution network may not be able to supply all the irrigators at the same time. In such a case, some method of distribution or organization of irrigation is necessary, adjusted to the mechanics - more precisely to the hydraulics - of the distribution network. Therefore, in some channels the *turnos* and *tandas* between usual braces during the low water periods also take place when there is plenty of water, while in others the procedure is applied with less rigor.

In most cases, irrigators continue to follow each arm's turn, but the wait between one irrigation and another is shortened (between seven and twelve days.) Thus, the operating procedures for periods of water abundance can be complex, but this should not overshadow the main characteristic of water distribution in such a situation: irrigators drink as much water as they want and practically when they want it.

An important aspect is the frequency with which each ditch uses the procedures associated with each of these three regimes. Before 1950 there was a slight dryness or a seasonal drought every year, and some or all of these operating procedures were put in place in several WUAs. But river regulation and the reduction of cultivated area associated with urbanization have drastically reduced the adoption of such measures. Nevertheless they are kept written and could be applied occasionally in the future.

THE ADVANTAGES OF GRAVITY IRRIGATION

With surface irrigation in l'*Horta* context (reg a manta), it is intended to create a reservoir of water available for the plant in cultivated areas close to the coastal line. Water is absorbed by the root system and nutrients that are natural or incorporated by the farmer (fertilizers, manures transformed into humus , etc.) are dissolved. A part of the water incorporated with irrigation will percolate to deeper layers (Figure 34), beyond where it is usable by the plant, feeding

"Surface irrigation in the area has been the only way to provide water to the irrigated plots until the central years of the 20th century."

the surface water table and eventually the deep water table. These waters will perform the double function of being a long-term reservoir, and allow in the future their extraction by wells, or their outcrop in fountains and ullals, while creating a strong screen of fresh water that will help to avoid the processes of marine intrusion and salinization of the underground aquifer.

Surface irrigation in the area has been the only way to provide water to the irrigated plots until the central years of the 20th century. Surface irrigation, in its various forms, continues to be used in most irrigated areas, especially in historical irrigated areas in Valencia.

Beyond constituting a cultural asset and an identifying sign for the communities that practice it, surface irrigation brings a whole series of benefits:

- Improves environmental quality. The increase in environmental humidity has positive effects on the climate, arid or semi-arid, in the places where it is practiced.

- It provides substantial volumes of fresh water, from remote places, to the land, which in part will be added to those of the water table.

- It constitutes a solid barrier against marine intrusion processes.

- The water in the soil promotes the mobilization of all the mineral and organic resources it has to be used by crops.

- The channels, the use of water, the access roads to the plots, maintain a high biodiversity.

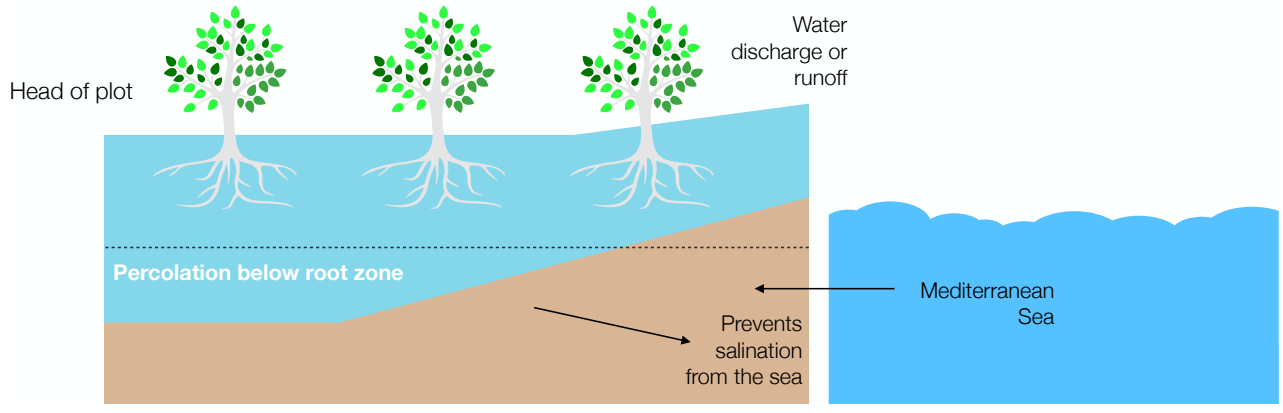


Figure 34. Water percolation: water filters and protects plants from salinization

HYDRAULIC ARCHITECTURE

Hydraulic architectures cannot be studied outside their immediate surroundings, which are the hydraulic structures par excellence: the ditches, which are the backbone of the irrigation system. Among the diversity of elements we highlight the structures for the distribution of water, such as the *Assut*es, the starters (partidores), the llenguës or spill-overs, and the mills in their different variants: flour mills, fullers (batanes) and paper mills.

A complete catalogue of the hydraulic heritage in L'*Horta*, with 396 records, including pictures, can be found in HERMOSILLA (2007):

Click here for further information:
https://dialnet.unirioja.es/servlet/libro?codigo=571021

Figure 35. Assut and almenara of the Mestalla ditch. (GUINOT & SELMA, 2005)

Figure 36. Llengües del Raig in *Acequia* de Tormos (GUINOT & SELMA, 2005)

Nowadays we can count on a diversity of traditional milling facilities, although most of them have stopped providing the service for which they were built, moving on to other uses or, simply, in disuse. The documentation of some of these mills can be found in the following links:

- MOLINO DEL TELL. BARRIO SAN MARCELINO. *València*

Click here for further information:
http://www.valencia.es/ayuntamiento/Infociudad_accesible.nsf/vDocumentosWebListado/4041DF0FA389ADBAC12576C40037E07D?OpenDocument&lang=1

- MOLINO DEL SOL. CAMPANAR

"Many agricultural instruments are versions of the same basic object adapted to different operations or to be used in specific crops."

Click here for further information:
http://www.valencia.es/revisionpgou/catalogo/rural/Feb2013/FICHAS%20COMPLEMENTARIAS/SUR/DISTRITO%204/04(SUR_EPH).01-MOLI%20SOL_firmado.pdf

▸ MOLINO DE FARINÓS. BENIMACLET

Rehabilitation project and change of use of A. Farinós. Student: Jose Manuel Piles Mondara

Click here for further information: http://hdl.handle.net/10251/59046

▸ MOLINO DE LLOBERA. CAMPANAR

Rehabilitation project. Student: David Clemente Ramírez

Click here for further information: http://hdl.handle.net/10251/98456

Figure 37. Molino de Llobera. Campanar. Source: Catálogo de Bienes y Espacios Protegidos.

Figure 38. Molino de *Moncada*. Petecero. Source: Catálogo de Bienes y Espacios Protegidos.

Figure 39. Molino del Tell. *València*. Source: Catálogo de Bienes y Espacios Protegidos.

“There are agricultural tools that have been the same for millennia. They are simple forms, so perfectly designed for their function and so well adapted to the human movement that are very difficult to improve.”

AGRICULTURAL TOOLS AND WORKS[10]

MARCO RUBIO (2014) interviews farmers in la *Horta* who highlight the value of mutual assistance in the field and the value of the joint work that served to promote the common welfare, the talk, the laugh and also the solidarity. "A tornallom" is an expression that is heard a lot in the Valencian countryside and perfectly summarizes the collaboration among people in rural areas. The translation into Spanish can help understand "to return (torna) the back (the llom)".

There are agricultural tools that have been the same for millennia. They are simple forms, so perfectly designed for their function and so well adapted to the human movement that are very difficult to improve. A sickle (*corbella or falç*) or an Iberian or Roman hoe (*aixada*) are no different from those that are produced and used nowadays.

Many agricultural instruments are versions of the same basic object adapted to different operations or to be used in specific crops. Thus, for example, the flat machine (*entauladora*), event in the most basic forms (see figure 40), is used to smooth the earth from the fields. It can incorporate sharp nails to break the surface crust of the soil and cuts the weeds (*entauladora de claus*). In the marshes some oblique shears are incorporated to produce fine clay and plant rice (*draga*).

Figure 40. “Entaulant”, traditional work for the tiger nut culture.
Source http://monorxata.com/

Land work is more sophisticated than it seems (see figure 41). Making grooves (*fer solcs*) with an almost mathematical geometry, grafting (*empeltar*), plowing between grooves (*llaurar entre solcs*), planting in regular spaces or in dice (*al dau*), removing shoots (*desullar*) or prepa-

ring plants (*fer el planter*) are good examples of the professional specialization. In the the crop fields and wetlands, before seeding or planting, it is necessary to do a whole series of operations to prepare the fields: level them to facilitate irrigation, work with the landfill (*xaruga*) to regenerate the soil, banish, pass *entauladora de claus*, clean and repair the ditches.

Agriculture has also been subject to technological change and mechanization where the tractor as a representative symbol of modernization. However, we are also witnessing new technical approaches, such as the expansion of organic farming or the biological fight against pests.

Traditional agriculture could not be understood without the participation of animal labour. ponies (*aques*), rocines (*matxos*), mules, donkeys and oxen. Even nowadays it is not strange to see them to transport the products or to help do the heaviest jobs, such as pulling, stitching, extracting water or smoothing the soil. The animal has been a valuable tool for farmers. One proof is that they had and have their own name, like people. Interesting videos (in Valencian language) illustrating how horses are getting ready and work can be found in:

Click here for further information: https://www.youtube.com/watch?v=Lo4dzpJHlZ4

https://www.youtube.com/watch?v=0-QqtiZrS3k

Figure 41. Tradicional agricultual tools in Catarroja with different type of flat machines (entaluadores) and ploughs (focats) (Fernando Bellón, Agroicultura - Perinquiets)

Figure 42. Festivity of Sant Antoni Abad in El Puig. Every 17 Juanary in most villages in L'Horta

A whole set of objects associated with these animals were necessary so that they could pull the car the *carro or the tartan* (figures 42 and 43) el *colleró*, el *capçó*, *els ramals*, el *sellom*, el *correjot*, la *barriguera de carro*, la *barriguera de tirants*, *les retranques* o el *forcaset* (to join the plow)

Figure 43. A tartana in Picanya Source: http://federaciovalencianasantantoni.blogspot.com

Figure 44. Traditional ploughing in *L'Horta*

In Valencian fields, and in more recent times, it has been common to styling with the *forcat*, a plow pulled by an animal (figure 44). In the active part, the one that enters the land, several grilles and complements are coupled to make different types of tillage. The name comes from the shape of the rudders (forked) and usually refers to the whole, but also behind snagging sometimes plow mouldboard (*xarugues*), hoarder (*cavallonadores*) or leashes (*tragelles*). With the change of grate (*rella*) and the placement of complements, the plow (*l'arada*) adopts different functions:

- till without turning the earth. Punch (*punxó*)
- make wide grooves. Harpoon (*arpó*)
- work deeply. Triangular grating (*rella*)

Figure 45. Prepared field with ridges in Borbotó (*Horta Nord*)

- weeding weeds in the watering equipment. Grid tied or binadora (*rella d'ales o magencadora*)

- make ridges or caballones (Figure 45).

- Flattening tabs (*postetes de cavallonar*)

- Separate the earth. Fins and earflaps (*aletes and orelleres*)

- Weeding Blade (*tallant*)

5

CULTURES, VALUE SYSTEM AND SOCIAL ORGANIZATIONS.

CULTURES, VALUE SYSTEM AND SOCIAL ORGANIZATIONS

L'*Horta* de *València* influences local culture and living institutions. We will refer to only few expressions that justify the singularity of the GIAHS. Among the core examples; the Water Court, the Real *Acequia* de Montcada, the Valencian language and the *Albufera*'s institutions.

The *Tribunal de las Aguas* (*Water Court*) is the oldest institution of justice in Europe, declared Intangible Cultural Heritage by UNESCO in 2009. This ancient court has the authority over all the *Acequias* and is responsible for enacting and enforcing their traditional rules for distributing water. During each weekly session the court decides on the irrigation water use and solve the disagreements between farmers. The historical irrigation system is the physical and actual consequence of the customary system of water distribution.

Lastly local fairs, music, arts and literature are also representative of the love of Valencian people for their own culture.

We suggest to view the following video produced by the Spanish TV with the Italian chief Roberto Capone (in Spanish). Taking the gastronomy as an excuse, the video provides a happy picture of the local culture of l'*Horta* and L'*Albufera*.

Click here for further information:
http://www.rtve.es/alacarta/videos/las-rutas-capone/rutas-capone-valencia/4460678/

“The jurisdiction of this court has been respected until the Spanish Constitution of 1978. It is recognized by the Statute of Valencian Autonomy and by other international organizations such as UNESCO.”

THE WATER COURT

The Water Court of the fertile valley of *València* (see http://www.tribunaldelasaguas.org/en/) is one of the oldest institutions of justice in Europe. Although there were legal precedents to solve conflicts in water management since the Roman era, the Court inherited an institution dated in Islamic times and, quite possibly, in the times of the Caliphate of Cordoba. The institution was preserved after the conquest of *València* by King James I of Aragon. It is a model of justice that has stood the test of time over the centuries. The jurisdiction of this court has been respected until the Spanish Constitution of 1978. It is recognized by the Statute of Valencian Autonomy and by other international organizations such as UNESCO.

With the scarcity of water for irrigation in the *Horta* and the fertility of the area, the system works through a complex system of mother diches or "*acequies*", with their arms and branches: "Sequiols" and "sequiolets" that take the river water *Turia*. Here the concept of *fila* ("row") was born, which is a measurement based not on a fixed volume of water but on a variable basis based on the river's flow. The Water Court is formed by eight syndics or representatives that are democratically elected by the members of the irrigation communities of Quart, Benàger-Faitanar, Tormos, Mislata, Mestalla, Favara, Rascanya and Rovella. These are the irrigation canals or channels that take their waters from the *Turia* River.

The President and the Vicepresident are elected for a period of two years among the body of trustees or síndicos. The deputy members can replace the síndics in their functions, and also chosen by the communities of irrigators. When the President belongs to a ditch on the left bank of the river, the Vice President must belong to a ditch on the right bank and vice versa. The President must refrain from leading the trial or pronouncing a verdict when the party denounced belongs to a WAU on the same river bank as the President. In addition, the trustee of the community of irrigators to which the denounced party belongs must abstain from voting a verdict, and must confine himself to answering questions from the President or Vice President. The Court, acting as an executive body, is concerned with an equitable distribution of water among the communities of irrigators and defends its common interests vis-à-vis third parties.

The Water Court of *València* holds sessions every Thursday at noon, at the Apostles’ Gate of the *València* Cathedral. Its jurisdiction is restricted to Quart, Benàger-Faitanar, Tormos, Mislata, Mestalla, Favara, Rascanya, Rovella and Xirivella irrigators’ communities: 3,471 hectares spreading over the municipalities of *València*, Paterna, Burjassot, Godella, Tavernes Blanques, Alboraia, Almàssera, Manises, Quart de Poblet, Aldaia, Alaquàs, Torrent, Picanya, Mislata, Xirivella, Paiporta, Benetússer, Sedaví, Alfafar, Lloc Nou de la Corona, Massanassa, Catarroja and Albal.

In addition to the Water Court, there is the Real *Acequia* de Montcada, which depends on its own Court. Both the Water Court and the Real *Acequia* help water users to resolve their internal conflicts in a self-governing manner. The Water Court, together with the Council of Good Men of Murcia (also recognized by UNESCO), are the only traditional and customary courts recognized by the Spanish legal system, which in practice means a special legal status, so that their decisions can not be appealed before the ordinary courts.

"Several local and international organizations (for example, UNESCO) admit that the Court contributes to intercultural dialogue and promotes sustainable development by promoting self-managed and democratic community models or by respecting the wisdom of high-level farmers."

Figure 46. Water court session on the left. Thomas Glick, medievalist, who published Irrigation and Society in Medieval *València*. Cambridge, Mass., Harvard University Press, 1970.

For the irrigation communities, the Water Court guarantees the continuity of the community water management, the defense of the communal interests of the irrigators and the compliance with the traditional water regulations. The Court controls, sanctions and guarantees the common benefits over individual interests, administering and distributing water as a limited common good. The Real *Acequia* and the Court of the Waters fulfill a cultural function, preserve the identity of *Horta* and the cohesion of the community. The traditional black loose-fitting blouse worn by the judges symbolizes authority.

Several local and international organizations (for example, UNESCO) admit that the Court contributes to intercultural dialogue and promotes sustainable development by promoting self-managed and democratic community models or by respecting the wisdom of high-level farmers.

REAL ACEQUIA DE MONCADA

The Royal Canal of *Moncada* (RAM, *Real Acequia de Moncada*) supplies the largest irrigated area in the *Horta* de *València*. From its magnificent weir on the River *Turia*, to the Marjal dels Moros marshes, this irrigation canal flows through 33 km in parallel to the coastline, towards the north, and dominates a strip of 5,200 hectares of fertile lands, cultivated by more than 10,000 farmers.

The channel was built during the Andalusí period, over a large area where irrigation only had been put into practice in some fields scattered throughout the littoral, using springs and swallow open-air wells. The arrival of the water from the *Turia* river fueled the transformation of the dry rain-fed areas, but did not alter the small groundwater irrigated areas and the coastal marshes. This created a territorial division of the water rights in the system, between the jovedat, the lands provided with water from the *Turia* River, and the extremals, lands supplied with groundwater and return flows from the jovedat. This division was maintained until the 20th century.

When the King Jaume I conquered these lands and founded the Christian Kingdom of *València*, he segregated this irrigation channel from the rest of the *Horta* de *València*, and incorporated the irrigation system and lands to the Royal Heritage. This decision bestowed the title of Royal to the channel and set the institution apart from the Tribunal de les Aigües jurisdic-

“The channel is governed by a community of irrigators, whose sovereign organ is a governing board formed by the delegates elected by all the farmers in each of the 19 irrigation sectors. The community has its own water court to solve conflicts among farmers.”

tion. During the late medieval period, the Crown stimulated the expansion of irrigation on the remaining rain-fed areas, to consolidate the lands and settle new Christian colonists. The last stage of construction of the irrigated area took place in the 18th and 19th century, when the highest lands of the system, beside the main channel, were finally transformed. As a result of this historical process, the irrigation network treasures numerous valuable hydraulic devices, such as the water divider (llengües) of El Puig i Puçol or the variegated ensemble of 30 mills, some of which were the basis for a pioneer industrialization of the region.

Today, the structure of the irrigation system reflects these stages of construction, and a morphological analysis of the channels still allow to distinguish the original extremal area –connected to springs--, the jovedat lands developed during the Islamic period –with a dendritic pattern— and the jovedat built by the feudal colonists –with an orthogonal structure. However, when the *Turia* river was regulated by dams, by the middle of the 20th century, the water rights were unified, and all the farmers in the service area currently hold the same right to use water. Therefore, the channels system preserves an inestimable hydraulic heritage that is a palimpsest of different water cultures, but has evolved to achieve a better social fairness in the water allocation procedures.

The channel is governed by a community of irrigators, whose sovereign organ is a governing board formed by the delegates elected by all the farmers in each of the 19 irrigation sectors. The community has its own water court to solve conflicts among farmers. Water is distributed among farmers according to customary rules. It is shared by applying a contiguous order of irrigation from top-to-bottom of the system. Once water is available at the head of the system, irrigation starts field by field and channel by channel until tail-enders have finished irrigation, this system is known as turno, and an irrigation cycle usually lasts one week. Therefore, unless there is scarcity farmers can irrigate weeky. The order of irrigation is also maintained in case of scarcity. By doing so, when water availability decreases, the irrigation cycle gets extended in time. When a contiguous order of irrigation is applied, irrigation concentrates in a sector. By doing so, farmers can monitor whether or not the existing rules are followed by other farmers. Both a sense of equity and transparency on sharing scarcity is important to avoid free-riding and conflict.

Beyond the agricultural functions, the design of the irrigation systems plays a major role in flood control and natural corridor. The design of the drainage canals reproduce the structure of ravines that existed prior to the agricultural transformation of this plain, which facilitate the evacuation of water after torrential rains and connects the inner and coastal ecosystems.

"The human processes developed around the *Albufera* are responsible for the territorial organization, settlements and current infrastructures."

INSTITUTIONS AT THE *ALBUFERA* DE *VALÈNCIA*

The water management model in the *Albufera* is illustrated by two entities that embody certain tension between the historical activities linked to La *Albufera*: fishing and agriculture. On one hand, the "Comú de Pescadores de la ciudad de *València*", based in the Community of El Palmar, located at the lagoon's shore, put forward the fishing activity as a natural resouce. On the other hand, the "Junta de Desagüe" which took over competences on the water system management and up to the present day, still controls the "golas" or gates that regulate water level at the wetlands.

Fishing was the most relevant productive activities in the *Albufera*. The Kings actually owned the lake but set up regulations on fisheries. In 1250, Jaume I granted licenses to fish on the lake to "any resident or inhabitant of the City or Kingdom of *València*" in exchange for one fifth of the fish caught. In 1857, fishers in El Palmar were officially authorised as self-governed association. The Community of El Palmar was granted a reduction in the fishing fee by the Royal Treasury, from one fifth down to one tenth of the catch.

Nowadays, the Community of El Palmar is governed by a committee that meets every year with three commissions and on various dates. The Chapter Commission Meeting, held on the first Sunday in July, is in charge of reviewing or modifying the regulations and electing offices. The following Sunday, the "Redolins" Commission Meeting deals with the most important activity: raffling off the fishing permits for the *Albufera*, known as "redolins". The next Sunday the Accounting Commission meets.

Membership in the Community of El Palmar is an inherited right. The right to hold a "redolí" (fishing permit) can also be transferred by donation or sale. However, only relatives can substitute the buyer or donor.

At present, the Community of El Palmar has approximately 400 members, and about one hundred of them remain active. They continue to devote themselves to the traditional fishing of eels and the flathead mullet. At their fish market, each day they sell the mullets fished using traditional methods and eels from fish farms or caught on the lake.

Fishing has influenced *Albufera*'s uses and customs, their adaptation to the environment, their identification with Valencian society, their organizational structures, cultural values, language and symbols. The fishing made possible the exploitation of the fish resources, in an artisanal and unique, thus creating an exceptionality in the definition of professional fisheries in Spain, since the lake is considered continental waters.

The human processes developed around the *Albufera* are responsible for the territorial organization, settlements and current infrastructures. There are two types of settlements: concentrated and dispersed populations. Dispersed settlements are the result of the professional activity of the inhabitants of the wetlands, such as rice farmers, being responsible for symbolic images: alqueries, barraques, and engines, break the horizontality of the marsh. The concentrated populations are the result of fishers' families who started residing there during the working days. The most characteristic case of the area is the current population of El Palmar, whose formation was due to the settlement of fishermen from the Russafa area. The Palmar was a hamlet, in the jurisdiction of Russafa, consisting of about 5 houses and 100 barra-

“Speaking Valencian was not well considered until democracy was reinstalled in Spain in the late 70s.”

ques. These properties belonged to 111 fishermen, who fished in the lake. The buildings served as shelter during the fishing season, although their original residences were in Russafa. The most common type of dwelling in El Palmar was the "barraca". El Palmar was still an island well into the 1930's, when three bridges were built, connecting it with the highway towards *València*.

The entire life of El Palmar revolves around fishing in the *Albufera*: fishing nets, the local boats called “albuferencs”, the fish market, the wharfs, and not least the Community of El Palmar. In fact, until fairly recently, fishing was almost exclusively the only way to make a living in this village. Nowadays, El Palmar is still a typical village of the *Albufera*, although tourism and hospitality have taken over from fishing as its main economic activity.

The expansion of the rice culture in the area has led to the creation of organizations or communities to jointly manage water, creating a structure of irrigation through the creation of ditches and engines, which are responsible for transporting and providing water to agricultural areas, necessary for cultivation. Due to the *Acequias* network for water supply, the *Albufera* Drain Board (Junta de Desagüe) was formally created in 1862: It is an organization composed of large landowners with the City major as the president.

THE LANGUAGE

Speaking Valencian was not well considered until democracy was reinstalled in Spain in the late 70s. The Valencian, a core language of the farming community in the *Horta*, was identified as the language of poor people, without academic training, a popular language. Situation changed and young people are receiving education in Valencian language, which keeps very alive in the proposed GIAHS.

There are many expressions and words that belong to the agricultural world that lose a significant part of their meaning if they are translated into another language. The disappearance of certain crops and tasks associated with them provoke a crisis of those words that name and describe them. But still many expressions remain and interesting projects have focused on recovering part of that agricultural vocabulary that has emerged in the many interviews that have been recovered by Assut Foundation.

The following documentary, produced by Assut Foundation (subtitled in English), is the result of a participatory experience with a group of inhabitants from Godella, in the *Horta Nord*. Reading Vicent Andrés Estellés (1924-1993) poems is the starting point for the participants to share testimonies about them own lives and them environment, emerging words about the past, present and future of them lifestyle. At *Poemes a l’Horta* a discussion can be found about what poetry images are bringing to the audience, creating an oral memory film document. Also can be found a real ownership of the cultivated speech by the popular speech, poems words are coming back to the land were they emerged once. It is the second episode of the documentary series *Esperant l’aigua*. Directed by Miguel Ángel Baixauli. Produced by Guillermo Palau and Mar Ortega (Fundació Assut / Artxiviu de *l’Horta*).

Click here for further information: https://artxiviu.org/en/poems-to-orchard-2014/

"*L'Horta* is a peri-urban system, which allows farmers and fishermen to have a direct contact with *València*'s city market."

LA TIRA DE COMPTAR

L'Horta is a peri-urban system, which allows farmers and fishermen to have a direct contact with *València*'s city market. This facilitated the creation of spaces like *La Tira de Comptar,* a farmer wholesale market that is testimony of the history and traditions that persisted from the 12th century and thanks to their constant innovation has maintained its value over time. Currently, 1300 farmers take part in *La Tira de Comptar,* selling their products in the largest wholesale market in *València* city (*MercaValència*)[11].

Founded in times of Arab domination and made official in 1238 by King James I, the Tira de Comptar (Counting Row) has guaranteed the supply of fresh produce in the city, the right of farmers to take part in the market of fruits and vegetables, as well as regulated their particular activity. Historically, it has known different locations until its definitive establishment in the dependencies of Merca*València*, from 1981.

Figure 47. La "Tira de Comptar" a farmers' wholesale market

The denomination 'Tira de Comptar' or counting row, comes from the times of the Taifa of Balansiya: the magistrate that governed the commerce (that received the name of Muhtasib, and was in charge of controlling the weights and measures, the policy of prices and the supply of products). He arranged the farmers in a row, side by side, and the sale implied the counting the pieces that were offered. So, farmers used to say: "I'm going to the Tira (Row)" when they went to sell to the market. After the Christian conquest, King Jaume I endorsed it in his Furs (domestic constitutions) and consolidated both the institution and the figure of the magistrate, although its name was changed to Almotacén or Mostaçafia. It counted on a lieutenant and four weighers, and depended directly on the *València* City Council. The relevance of the Mostaçafia was such that the King Pere the Ceremonious did not hesitate to replicate it both in Mallorca and in Barcelona. In 1707, the Decrees of Nueva Planta of King Felipe V abolished the Furs of the Kingdom of *València* and eliminated the Mostaçafia, but they did

"The Tira de Comptar is, therefore, the shortest and direct marketing channel of fruit and vegetables: the day following of his harvest, the fruits and vegetables from *L'Horta* are already available for his purchase in the small commerce and in 14 municipal markets of the city."

not manage to finish it completely: its social prestige and economic importance was of such level that it was maintained in a customary manner by the farmers themselves, perpetuating the Tira de Comptar to our days.

Today, the Tira's warehouse covers an area of 6,000 m^2 in which a total of 1,300 farmers (around 300 per session) market the products they grow and harvest themselves, between 30,000 and 40,000 tons of fruit and vegetables. Although the municipal regulations of 1981 and its amendment of 2004 stipulated that only the farmers of the Vega de *València* (*Horta*s *Sud* and *Nord*) can form part of it, there are also participants of bordering regions, such as the Ribera del Xúquer, the Camp de Túria and, even, the Serrans.

What distinguishes the operation of this marketing system from what is done in other wholesale warehouses is that there are no traders or wholesalers here. Each farmer is the one in charge of carrying out the sale of the products grown in his or her garden. Their clients are usually retailers, shopkeepers and city restaurants. **The volume of what is sold there represents 30% of the entire fruit and vegetable product sold in Mercavalencia (Valencia wholesal market), which makes the Tira de Comptar one of the most important direct marketing institutions for garden products in Spain.**

The Tira de Comptar is, therefore, the shortest and direct marketing channel of fruit and vegetables. By having preserved its space in Valencia Food Warehouse, fruits and vegetables from *l'Horta* are already available in the local greengrocer's and in 14 municipal markets of the city.

Figure 48. Direct sales by farmers at the Tira de Comptar of València
A video showing a normal day in the Tira de Comptar:
https://www.youtube.com/watch?v=CDqJ5E-2EQQ

"Community-supported agriculture projects are emerging with multiple initiatives that recognize the management of agricultural lands as a public common good."

COMMUNITY-SUPPORTED AGRICULTURE

Due its social meaning, civil society has organized and created movements that promote urban and peri-urban gardening in neighbourhoods. Community-supported agriculture projects are emerging with multiple initiatives that recognize the management of agricultural lands as a public common good. Around this we can find a large number of associations and two types of major platforms: *Per l'Horta*, a social movement, focused in recover the landscapes of *L'Horta*; and City Council institutions, such as the *Consell Agrari of València,* which is a representation entity of local farmers, and the Food Council, joining all agents interested in nutrition, health and non-commercial aspects of the food system.

Figure 49. Advertisement of farmers' market at *València*

"[...] *Per l'Horta*, a social movement, focused in recover the landscapes of *L'Horta*; and City Council institutions, such as the *Consell Agrari of València,* which is a representation entity of local farmers, and the Food Council, joining all agents interested in nutrition, health and non-commercial aspects of the food system."

Figure 50. Farmers' market at Godella

Figure 51. Gardening for self-consumption is an emerging activity in some of the *Horta* neighbourhoods.

6

LANDSCAPES FEATURES.

LANDSCAPES FEATURES.

Broadly speaking, the GIAHS borders to the north with the Marjal dels Moros, to the west with the piedmont of Camp de Túria, Pla de Quart, Torrent and Picassent, to the east with the Mediterranean Sea and to the south with the rice field and marsh that surrounds the *Albufera* lagoon.

La *Horta* as a human construct has physical bases, which of course are essential in shaping its irrigated landscape. Among the explanatory factors of the configuration of *l'Horta* de *València* we have the hydrological, geomorphological, edaphic and climatic resources of the Valencian alluvial plain (CARMONA & RUIZ, 2014). L'*Horta* is located in the central sector of the "Valencian depression", in the Southeastern end of the Levantine zone of the Iberian Range. According to IRANZO-GARCIA (2014) it is a space of sedimentary character, where the neogenic materials have covered Mesozoic structures; and the late tectonics of the alpine orogeny, characterized by compressive and distensive processes that generate normal faults, gives rise to a depression in which Quaternary deposits of fluvial and deltaic types accumulate.

L'*Horta* occupies an alluvial space open to the Mediterranean Sea, which is attached to the stepped amphitheater conformed by Iberian reliefs (HERMOSILLA & IRANZO; ROSSELLÓ, 2002). **Runoff and water courses have modeled the coastal plain and even their sedimentary contributions have closed and clogged the** *Albufera* **lagoon and the coastal marshes. From west to east, the topography becomes increasingly horizontal. The Mesozoic and tertiary reliefs that act as the balcony of *l'Horta*, connect as a ramp with the plain, through an extensive glacis composed of red clays, nodules and detrital materials. On this glacis the** *Turia* **river, the Carraixet ravine, the Poyo-Torrent ravine and the Picas-**

sent ravine, Pleistocene alluvial fans have been built, at the same time fitting into their own sediments. Before reaching *l'Horta*, the *Turia* river opens a small valley and runs confined between river "terraces" or rectangular plots. Downstream from Mislata, the terraces are covered by the flood plain of the river, which extends to the coast.

The cultural landscape, largely related to the irrigation network, makes *l'Horta* different. The European Environment Agency has recognized to the *Horta de Valencia* as one of the six redoubts of Mediterranean and metropolitan horticultural fields, identifying five similar landscapes in Europe[12]. The type of landscape was defined in 1990 by Meeus et al[13]. who reported that "*On the seaside boundaries of the vast, dry Mediterranean open land, regions of intensive cultivation are found. They are intersected by irrigation ditches and are often terraced. Vegetables and fruits of all kinds are grown. These are the oases of the Mediterranean*"[14]. As an example we can mention small regions in South West Italy (Sicilly, Campania) and South East Spain (Murcia). BARBERA & CULOTTTA (2012, 2016) insert the characteristics of the *Horta* systems within a wider model of the polycultural and polyspecific Mediterranean garden's landscape, which guarantees complexity and richness (in terms of structural and biological diversity), as well as with reference to other environmental, cultural and economic functions.

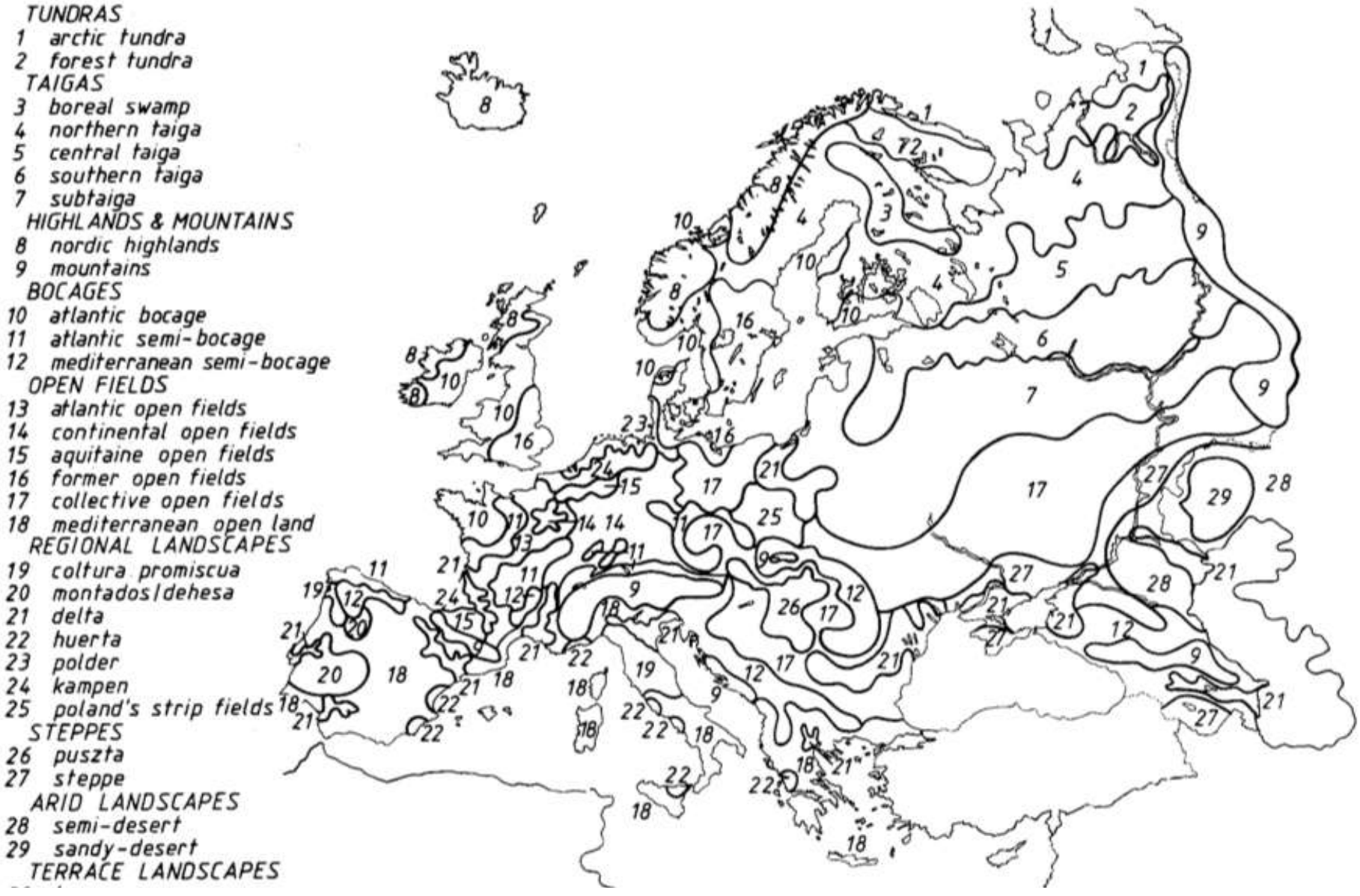


Figure. 52 Landscapes in Europe
Source: Meeus J. (1993) The major landscapes of Europe. Research and Design Studio, Arnhem. (Unpublished; 71 pages, a landscape map on scale 1: 25 000 000, illustrated with 30 landscape drawings.).

The situation of the *Horta* de *València* as a peri-urban rural area is sometimes hidden to visitors and even to the citizens of the urban area. L'*Horta* de *València* is a complex historical landscapes largely mainly due to being located in the surroundings of the largest city of the ancient kingdom of *València* and the capital of Sharq al-Andalus during the Muslim period. This proximity caused a long and fruitful interrelation between urban and rural areas, but this has also been certainly influenced by long history. The *Horta* de *València* was never just a rural space but also a peri-urban space, the *Horta* of the city of *València*, the "*cap i casal"* of the "Medieval" region, whereby mutual influences field-city over the centuries found here a special scenario for the deep interrelation between both worlds. Such interrelation remains.

L'Horta has three large geographical environments that help to define its structure. These are: the Mediterranean coast, the banks of the *Turia*, and the *Albufera*. In addition, there is the city of *València* itself, of about 800,000 inhabitants, which has become an important economic centre of the Mediterranean basin. L'*Horta* has been the result of a long lasting human interaction with the physical environment, whose origins as a *Horta* landscape are dated in the 8th century (GUINOT, 2008). The landscape character in L'*Horta* de *València* is the result of the combination of four elements: the irrigation system, the rural communication network, the settlement pattern and the agricultural patterns, which were previously explained in the section devoted to underlining the singularity of the GIAHS.

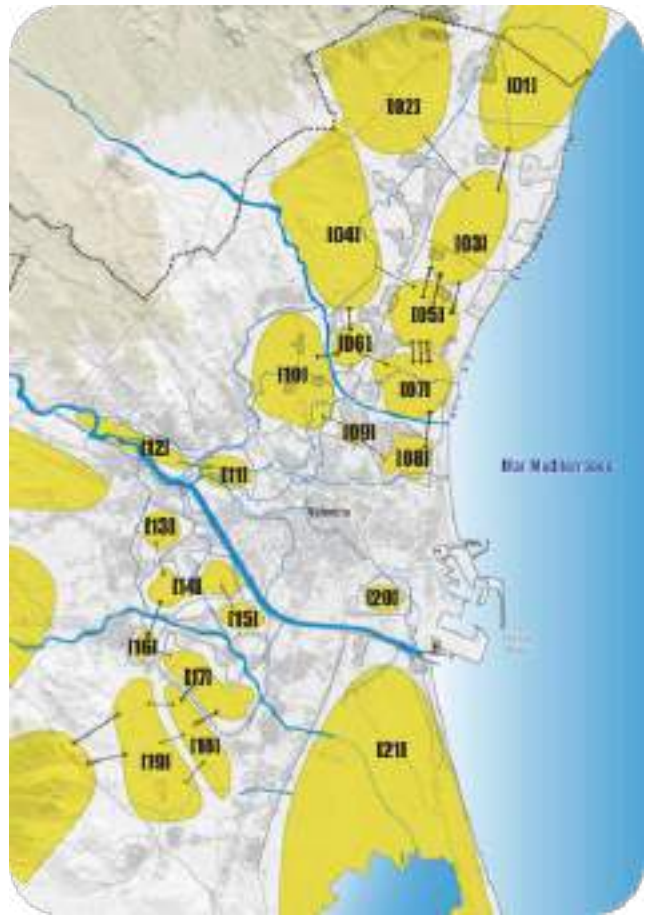
The Territorial Action Plan for *l'Horta*, drafted by the regional government, defined the most valuable landscapes using a methodology that identified visual and scenic values, ecological values, agricultural values and cultural values[15]. The detailed landscape studies can be found (in Spanish) in the Chapters 1 to 7 of the Action Plan's supporting documentation in following link:

http://www.habitatge.gva.es/es/web/planificacion-territorial-e-infraestructura-verde/segunda-participacion-publica-pat-*Horta*

Most of the landscapes in the system have been classified as having a landscape value from "high" to "maximum" (Fig. 42). Functional, ecological and visual interactions, shape the *Horta* identity. Díez Torrijos (2012) suggests that the components that shape the landscapes are arranged in blocks or cells whose preservation allows the feasibility of agricultural activity, the functionality of the connection elements (irrigation ditches and rural ways) and gives meaning to architectonic elements. The Action Plan identifies 21 Visual Units that are represented in Fig. 43.

Figure 53. Quality of landscapes (the greenest are the landscapes qualified from good quality to excellent quality)
Source: *Horta* Action Plan

Landscapes are the graphic expression of the relation between human, culture and territory. A core element of the landscape is the agricultural mosaic and the natural channels that define large areas of metropolitan market gardens, as well as interstitial agricultural spaces between the existing urban cores.



UNIDAD [01]_ Huertas de Puçol.
UNIDAD [02]_ Estribaciones de la Sierra Calderona
UNIDAD [03]_ Huertas del Puig a Massamagrell.
UNIDAD [04]_ Huertas del interior del riego de a acequia de Moncada.
UNIDAD [05]_ Huertas de Albuixech.
UNIDAD [06]_ Huertas de Vinalesa.
UNIDAD [07]_ Huertas de Meliana y Almàssera
UNIDAD [08]_ Huertas de Alboraia.
UNIDAD [09]_ Huertas del Racó de Sant Llorenç.
UNIDAD [10]_ Huertas del Arco de Moncada.
UNIDAD [11]_ Huertas de Campanar.
UNIDAD [12]_ Huertas próximas al Río Turia.
UNIDAD [13]_ Huertas de Aldaia.
UNIDAD [14]_ Huerta del sur de Xirivella.
UNIDAD [15]_ Huertas del sur de Valencia.
UNIDAD [16]_ Huertas de Torrent.
UNIDAD [17]_ Huertas de Picanya y Paiporta.
UNIDAD [18]_[19]_ Huertas de Alcàsser.
UNIDAD [20]_ Huerta de la Ermita del Fiscal.
UNIDAD [21]_ Huertas del Parque Natural de la Albufera.

Figure 54. Visual units according to the Action Plan for L'*Horta*.

The traditional urban land bordering of *l'Horta* plays a fundamental role in adding value to the rural environment. The system offers a horizontal connection between the city and the countryside (Fig. 44). The urban edge becomes in many cases a balcony from which to enjoy unique views which, in many cases, are linked to the water: the lake, the river, the ditches, the sea.

The main elements that articulate the current landscape of the *Horta* de *València* show a debate between the components of a historic garden and the new traces and uses that distance it from its ancestral rural character. These are:

- The agricultural landscape and the crops irrigated by the historic irrigation ditches, which surround the city of *València* and the municipalities of the region. The irrigation system is the most conditioning element in landscape structure (Guinot, 2008). Water is captured from *Turia* River and it is distributed by a hierarchical structure of ditches.

- The network of ditches and bracers that lead and distribute the irrigation water to the fields and towards the population centres (historical supply and sanitation).

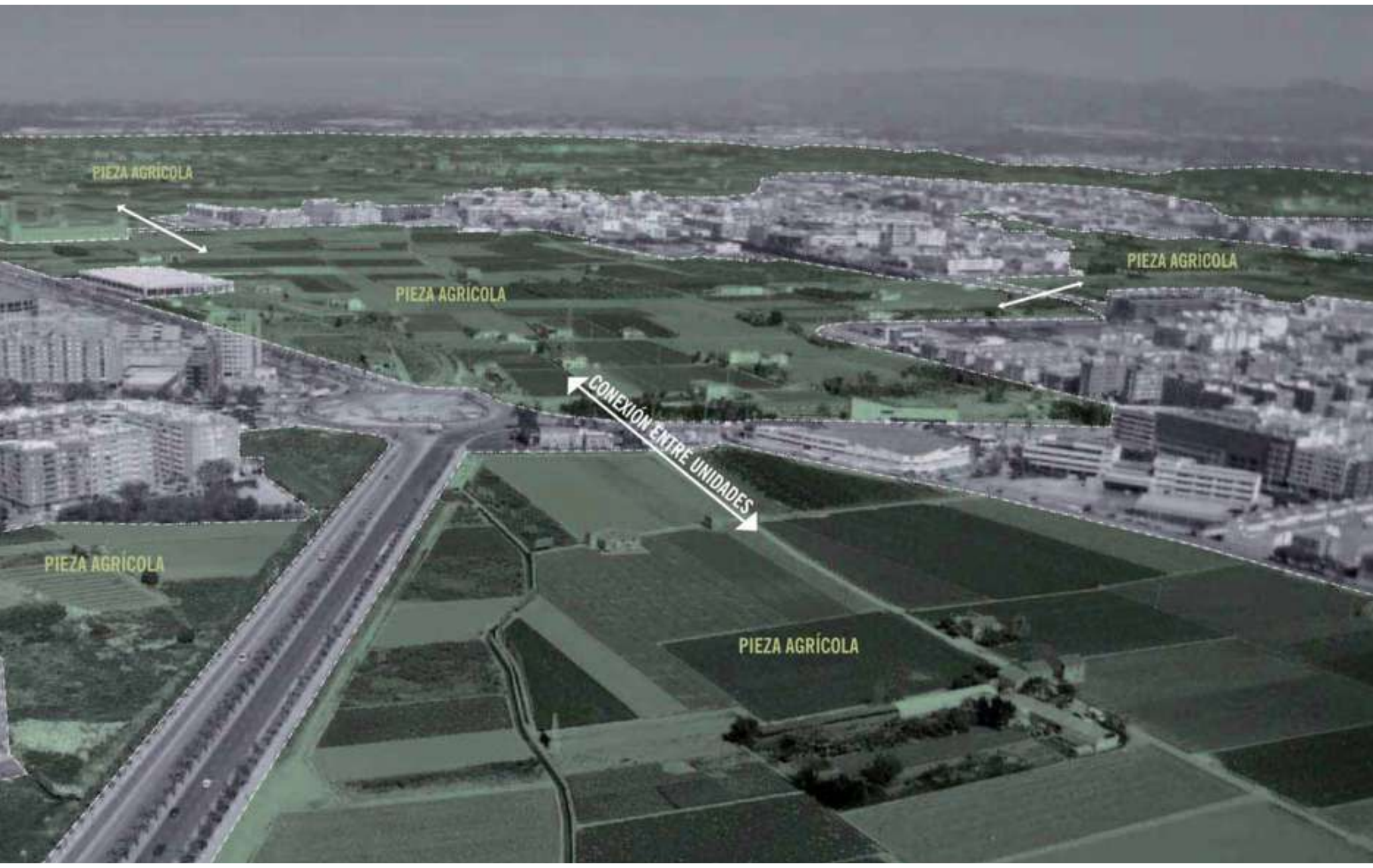


Figure 55. L'*Horta* landscapes as inherent connecting landscape elements of the Metropolitan Area.

"Each *Horta* landscape is "a piece of cultural heritage" which comprises interesting elements: rural fabric (plots, roads, patches of crops, dispersed traditional houses), hydraulic systems (irrigation dams, waterwheels, canals) and industrial archeological heritage such as mills."

- The network of rural roads that allow the displacement of farmers and citizens through the agricultural area. A hierarchical pattern connects the main urban settlements and allows access to the agricultural fields and disperse rural houses.

- Dispersed settlement and agricultural constructions, or, what is the same, a type of settlement between the urban nuclei, formed by *alquerías*, *barracas*, engines of elevation of water with its chimneys, and hydraulic mills scattered among the fields. The rural settlements are arranged in a sparse pattern. Density of rural dwellings can reach 0.5-0.7 dwellings per hectare, decreasing with the distance to *València* City.

- Concentrated settlements, formed by historical settlements that are fundamentally medieval, walled in origin and that have accompanied a larger city (*València*).

- Transport and communication infrastructures, especially the rail and metro lines, as well as the rapid roads and the unfolding of historic roads.

- The industrial and commercial areas, around the urban centers and main roads.

Each *Horta* landscape is "a piece of cultural heritage" which comprises interesting elements: rural fabric (plots, roads, patches of crops, dispersed traditional houses), hydraulic systems (irrigation dams, waterwheels, canals) and industrial archeological heritage such as mills. The *Horta*s also have natural and landscape value due to the environmental functions they perform. This relates to the wise use of resources and the development of productive and sustainable irrigation networks most of which have endured.

Regarding vegetation, despite cultural representations of the *Horta* are usually associated to horticultural crops, different crops have been grown adapting to the population needs in each historical period (DÍEZ & SANCHIS, 2007). During the medieval age, lands were dominated by wheat and vineyard with olive and fruit trees on the edges and vegetables were in small plots while mulberry tree forest covered the *Horta* by the sixteenth century. In the nineteenth century, horticultural crops became the dominant vegetation; and it was not until the second half of the twentieth century when citric trees started to expand (SANCHIS, 2013). According to the land use map developed by ARGYELAN ET AL. (2014), the most significant crops in 2013 were horticultural crops (35%) citric trees (25%) and rice (16%). Their spatial arrangement in the *Horta* is not homogeneous. Polyculture of horticultural crops characterises the vegetation in the north areas located near *València* City; citric trees mainly prevail in the north and south areas close to the external boundaries of the *Horta* and rice dominates in the south, connected to *Albufera* Natural Reserve. Natural vegetation is relict and just connected to wetland areas and watercourses, especially in the south area, which is part of *Albufera* Natural Reserve. This pattern is reflected in the work developed by The Action Plan for *l'Horta*, where twenty-four landscape areas are identified according to their historic structure, type of crop, water management and visual aspects.

A regulatory framework, Law 5/2018 (*Ley de la Horta*), has been recently established in order to define the possible uses compatible with the character of the natural value of landscapes. Besides, *L'Horta* produces positive externalities, such as carbon sequestration and air quality improvement, favours quality water supply and protects soil, that create a system with water availability and soil potential with fertile soils.

Figure 56 Main elements in *Horta* de *València*. One example: Almàssera municipality (GALIANA-GALÁN et al., 2008).

La *Horta* plays a very important environmental function; the free space of construction, with unsealed floors for the asphalt and the presence of the network of *Acequias* acted as mitigators of the avenues during the episodes of torrential rains (CARMONA & RUIZ, 2007). It also allows the circulation of the marine breezes and the regeneration of the air of the city, fixing the CO2 thanks to the vegetation; and it is, in addition to a food production function, an open matrix that acts as a green infrastructure or ecological connector, putting in contact other nearby natural spaces, such as the *Turia* riverbed or the *Albufera* de *València*, and avoiding the urban continuums (MUÑOZ, 2009).

The multiplicity of environments and new uses in the space that historically occupied L'*Horta*, makes its structure is complex and its components are diverse. Indeed, L'*Horta* today is no longer that eminently rural scenario of previous centuries. L'*Horta* today is a metropolitan space in which the agricultural matrix is threatened by the urban growth of *València* and its neighbouring municipalities (Fig. 46 and 47). What were urban cells of precise limits have broken the cell wall and are dispersed by that agricultural matrix, becoming merged with each other, fragmenting the agricultural space increasingly atomized and strangled.

Figure 57. L'*Horta* de Orriols 1982 (left side) and 2002 (right side)

Figure 58. L'*Horta* de Orriols and the urban border

"Covering an area of 2,800 hectares, the *Albufera* is home to the largest lake in Spain and one of the most important wetland areas in the Iberian Peninsula."

ALBUFERA'S LANDSCAPE

Covering an area of 2,800 hectares, the *Albufera* is home to the largest lake in Spain and one of the most important wetland areas in the Iberian Peninsula. It is surprising to find that the *Albufera*'s depth is just one metre on average. Although its water was originally saltwater, it is currently a freshwater lake, fed by the Júcar and *Turia* Rivers. It is surrounded by expanses of reed beds and vegetation typically found in freshwater habitats, forming islands in some cases, which are locally known as "matas" or thickets. This coastal lagoon originally had an area of around 30,000 hectares, which gradually decreased, mostly for use as rice paddies. In winter, when these fields are covered with water, the *Albufera* recovers a size that is similar to its original area. The lake is connected to the sea across this strip of coastline by three inlets, known as "goles". The inlets at El Pujol, El Perellonet and El Perelló regulate the lake water levels through sluice gates that make it possible to flood the rice fields when closed. Despite its origin and connection to the sea, the water in the *Albufera* is freshwater. In 1990, the *Albufera* Nature Reserve joined the Ramsar list of internationally relevant wetlands for birds. Shortly afterwards, it was included in the Natura 2000 network, which contains the most environmentally important areas in Europe. As part of this network, l'*Albufera* was designated as a Special Protection Area for Birds and as a proposed Site of Community Interest. The *Albufera* is a metropolitan natural park, a rural area with curious features that endow the area with a peculiar identity and are the emblem or image of culture.

Due to its shallowness, it had an extraordinary development of emerging aquatic plants; air photographs in the middle of 20th century show that vegetation covered the largest part of the lagoon surface. This vegetation disappeared in the so called channels or paths used by the boats to sail from port to port. Water quality in l'*Albufera* and its surroundings impaired since the 40's, and in the 70's aquatic plants had already disappeared, just remaining the reed in the shores. Main causes of this were both urban development and the industrialization of the basin and its surroundings. Nowadays it is an hypertrophic system caused by the excessive intakes of allocthonous organic material and inorganic nutrients, mainly nitrogen and phosphorus compounds (SORIA EL AL., 2002).

After the *Albufera* was declared a natural park in 1986, a series of measures were taken to minimise the negative impact of farming in the vicinity due to the burning of stubble or the conversion of natural habitats. These measures include the need to make traditional economic activities compatible with the conservation of natural eco-systems and their ecological wealth. Many of these protection measures have been dictated by the European Union and are accompanied by certain economic aid packages that constitute a highly relevant source of income for the support of the farmers.

The marshes and the rice fields go together hand in hand, as more than 14,000 hectares of the *Albufera* Nature Reserve are devoted to this crop, the only crop that is truly compatible with the conservation of this environment. The ever-changing landscape in the *Albufera* throughout the year is largely the result of the rice-growing phases. Green tones in summer, blue in winter and brown during the periods when the land is bare.

Most of the rice fields in the natural park are on lands taken from the *Albufera* over the years in the 19th and 20th centuries. *Tancat* and *Perellonà* are two local terms related to rice farming. A "tancat" is a plot of land used for rice farming that was originally part of the *Albufera*

"[...] With the construction of treatment plants and new pipelines, and improvements to existing plants, the authorities are trying to bring the lagoon water back to the quality and clarity it had prior to the 1960s."

lagoon (Figs. 60a and 60b). After purchasing or leasing a section of the lake, a "tancat" was created by demarcating the plot through the creation of a dike built up above water level. Then, more muddy earth was added, taken from a shallow area of the lake, until the area was filled in and level with the neighbouring fields. All of this arduous work was done with great effort using rowboats, hoes, grass baskets. Once the "tancat" was isolated, it was possible to control the water level inside it by using mechanical pumps, which were originally run by steam engines.

The rice growing cycle in the "tancats" begins with the "perellonà", which is the time when the sluice gates are closed on the inlets and canals where water from the *Albufera* is released to the sea (Fig. 48). By retaining and raising the water level on the lake, the "tancats" can be easily flooded. This flooding of the fields enables to avoid the germination of weeds during the growing season and controlling any possible infestations. The "perellonà" takes place between the 1st of November and the 1st of January, at which time the gates are reopened, the fields drained and the soil is worked and prepared for planting. During the "perellonà" the entire marsh is flooded, providing shelter for numerous bird species that winter here.

With the construction of treatment plants and new pipelines, and improvements to existing plants, the authorities are trying to bring the lagoon water back to the quality and clarity it had prior to the 1960s. Certain projects, however, stand out all other initiatives: the green filters. Green filters are water treatment systems using natural wetlands. The mechanism is very simple: water is made to circulate as slowly as possible through soil with vegetation. As the water filters through the vegetation, the plants feed on the organic matter carried by the water. Thus, the filter releases water, which is much cleaner and clearer.

Figure 59. Perelloná
Source: http://valenciaactua.es/*Albufera*-origenes/perellona-940x600/

"[...] Most of the rice fields in the natural park are on lands taken from the *Albufera* over the years in the 19th and 20th centuries. Tancat and Perellonà are two local terms related to rice farming. A "tancat" is a plot of land used for rice farming that was originally part of the *Albufera* lagoon (Figs. 46a and 46b)"

To the north of the *Albufera* a green filter at Tancat de la Pipa is already in operation. This filter, which can be visited by booking in advance, used to be a rice field many years ago. At present, part of its 40 hectares are given over to recirculating the water from the lake which is treated as it flows through, whereas the rest has been renaturalised and protected as an integral flora and fauna reserve. To the south of the *Albufera* there are another two green filters of similar size, in Tancat de Milia and Malvinar. These have not only been designed to recirculate water, but also to finish treating the water coming from two treatment plants, before it reaches the lagoon. Each of these systems will contribute towards improving the quality of the water in the lagoon, increasing water purity and making it possible to repopulate the *Albufera* with valuable species of aquatic plants and fish.

The spectacular landscapes at the Tancat de la Pipa can be visited at the following link:

http://tancatdelapipa.net

Figures 60a and 60b. Tancat de la Pipa
Source: http://tancatdelapipa.net

“The enormous wealth of hydraulic and architectural heritage in the system is evolving to new uses that are helping to recover farmhouses in their different forms (*barracas, alquerías, molins*, etc)”

RURAL ARCHITECTURE

The volume and quality of rural infrastructures reflect several styles corresponding to different historical periods. The enormous wealth of hydraulic and architectural heritage in the system is evolving to new uses that are helping to recover farmhouses in their different forms (*barracas, alquerías, molins*, etc)

Architectures of different nature have spread over L’*Horta* for centuries. Their autochthonous architectural elements represent a way of living characteristic of the irrigated landscape. Characteristic of these architectures is their purely rural character and their diversity along the ditch structures and roads that cross the territory. They are organic architectures that grew according to the needs of its inhabitants and generated habitats of singular richness.

A quick trip trough *Horta*’s arquitecture can be found in the following video:
https://www.youtube.com/watch?v=gweLgozajZE

L’*Horta* has been and continues to be a densely occupied territory, either through dispersed or grouped habitats. Once they were mostly farms and many of them remain as such although in more recent times we find even summer residences. The domestic architecture of L’*Horta* par excellence is the farmhouse or alqueria, although other architectures appear, no less interesting, as it is the barraca.

The alqueria is the oldest habitat of domestic settlement known in L’*Horta* (GUINOT, 2002, pp. 33-60). Alquería comes from the Arabic word "al qarya" which means "small town" and it spread throughout the territory at the same time that the Arabs invaded and occupied most of the Iberian Peninsula, among which was *València* (Balansiya, Hadiqat Al-Andalus). The model of alqueria that was established in the Valencian rural territory between the XI and XIII centuries was constituted by four or five houses, up to a maximum of twenty that formed small groups of population walled or nested by a "hisn" castle and situated, preferably in an elevation. Although the concept of alqueria as a farm has been maintained until our days, the habitat has been transformed, adapting to the new times. Thus we find that the “Muslim” farmhouses have nothing to do with the "medieval" alquerias and much less with the "modern" alquerias of the 20th century. However, all this type of architectures so different are included within its terminology.

The construction system used is based on the type of farmhouse and the historical period. Thus from the late medieval period until the mid-seventeenth century, the clay soil had been the basis of the construction of the walls of houses, using the tapial technique. Little by little, the "*rajola*" (tile) began to be used until consolidating itself in the 20th century. As for the construction of the slabs we can summarize it in the two most representative systems. The oldest consists of a framework of beams and slats with base or board of shafts or bricks. The second, more widespread from the fifteenth century, is the revolts of rajoles.

As for the layout of the spaces within the farm, whatever its format, we can distinguish two large areas, the one for housing and the one for agricultural activity itself. During the middle ages until well into the sixteenth century, in most farmhouses the living area was located on the mezzanine or first floor, leaving the ground floor for rural functions, while in modern times,

the first floor is reserved as a storage area, popularly called cambra, while the house is moved to the ground floor.

Figure 61. Islamic alqueria of Bofilla. S. XI-XIV. Dibujo de P. López. (Del Rey, 2002)

Figure 62. Alqueria de Barrinto. S. XIV-XVI. Marxalenes Fotografía de Antonio Marin Segovia

Figure 63. Alqueria del Moro. S. XV-XVI. Benicalap Catálogo de Bienes y Espacios Protegidos

Figure 64. Alqueria Puchades. Pouet de Campanar. Fotografía de Antonio Falcó

Figure 65. Alqueria del Roig del Cristo. Pouet de Campanar Fotografía de Antonio Falcó

Figure 66. Casa Nelo Chicopega, S. XX Campanar Fotografía de Antonio Tormo

Figure 67. Alqueria la Torre. Benicalap. *València*
Fotografía de Carmen Cárcel

Figure 68. Alqueria Falcó. Torrefiel. *València*.
Fotografía de Carmen Cárcel

Currently, there is significant number of farmhouses scattered by L'*Horta* and most of them belong to the modern era, although we can find, in fewer numbers, medieval farmhouses that are still standing, enjoying some of them of perfect health thanks to the protection and its rehabilitation. We can see some examples of this architecture in the following links:

- ALQUERÍA BARRINTO. MARCHALENES.

Figure 69. Barraca municipal de Alboraya.
Fotografía A. Hernández Dolç

Click here for further information: http://www.vam10.com/alqueria-barrinto.html

▸ ALQUERIA DE LLEONART. CAMPANAR

Study project and change of use. Student: José Durá Aparicio

Click here for further information: http://hdl.handle.net/10251/32577

▸ ALQUERÍA DEL XUFO. CAMPANAR

Study and intervention Project. Student: Bernat Padro Ros

Click here for further information: http://hdl.handle.net/10251/17121

▸ ALQUERÍA DE LA TORRE. BENICALAP

Study project and change of use. Student: Patricia Pérez Ceres

Click here for further information: http://hdl.handle.net/10251/86990

The barraca is also a type of native architecture very interesting for its constructive and formal characteristics. It is a primitive construction of rectangular plant characterized by its great formal rigidity, built with walls of adobe or tova, right wooden feet on which stands a wooden structure on which supports a vegetative cover of great inclination that provides that characteristic aspect Although it is not as old as the alqueria, it seems that there are evidence of its existence since the middle ages, being its period of greatest expansion during the eighteenth and early nineteenth centuries.

7

ACTION PLAN FOR THE GIAHS DYNAMIC CONSERVATION

BACKGROUND

The historical irrigation system that is proposed to be recognized as a GIAHS site provides a territory, l'*Horta*, with a structure that deserves to be maintained. Its specific action plan cannot be disentangled from other plans and laws corcerning l'*Horta* de *València*. In a sense, all current plans that specifically target l'*Horta* aim at preserving its cultural heritage and landscape.

- 2006- The regional government directly formulated a Territorial Action Plan for the Protection of *L'Horta* as an instrument to preserve the agricultural land.

- 2006- The *Tribunal de las Aguas* was declared an Official Asset of Cultural Interest by the Regional Governement[16].

- 2006- The *Assuts* of *Acequias del Tribunal de las Aguas de València* and of la *Real Acequia de Moncada* (148/2006, October 6th) were declared Official Assets of Cultural Interest by the Regional Governement[17].

- 2009- The *Tribunal de las Aguas* was recognised as an Intangible Cultural Heritage of Humanity by UNESCO. In fact, what we present here as a site is the agricultural system connected to such water governance institutions.

- 2018- The *Horta's* Law was passed by the Valencian Parliament in 2018 (Law 5/2018 of March 6, Official Dairy of Valencian Community, number 8252). The law has picked up the principles of the previous initiatives and provides *l'Horta* with an integral package of measures that preserve this space as an integrated pro-

"The Valencian government has underlined that preserving the water governing institutions depends both on the feasibility of irrigation communities and on the traditional agriculture preservation in l'*Horta* de *València*."

ductive, environmental and cultural system, whose basic element is people engaged in agriculture. We see the *Horta's* Law as the core element of a the GIAHS conservation plan.

- The Law understands the protection of *l'Horta* by applying dynamic conservation principles: "L'*Horta* cannot be protected through a museum and petrified vision of this space, but what is intended by this law, and the instruments that develop it, is to configure a living and sustainable space by a triple economic, environmental and social dimensions". The Law attaches legal force to a Territorial Action Plan (TAP) which is not a simple rural developlment plan. It is a plan specifically aimed at supporting the cultural and historical role of *l'Horta* but attempting to support its farming population. Thus, the Law also foresees a specific agricultural development plan (ADP) and includes a management institution (*Horta* Council), which will be in charge of coordinating the GIAHS site's Action Plan.

All these initiatives result in a set of measures for the irrigation system conservation. Thus, the TAP foresees strict regulations that:

- Limit land use
- Heavily restrict new constructions
- Forbids advertisement that worsens the landscape vision.
- Promotes research, extension and communication.

The Valencian government has underlined that preserving the water governing institutions depends both on the feasibility of irrigation communities and on the traditional agriculture preservation in l'*Horta* de *València*.

> *"La conservación del Tribunal de las Aguas está supeditada al mantenimiento de las comunidades de regantes, y de la práctica de la agricultura tradicional de regadío en la Huerta de Valencia, por lo que la Generalitat Valenciana, en coordinación con las entidades locales implicadas y las comunidades de regantes, arbitrará las medidas oportunas para garantizar la pervivencia de esta ancestral institución"*

Taking all these plans into consideration, we need nevertheless to define a specific action plan for the the proposed GIAHS. This tool has been defined through a participatory approach and has tried to prioritise actions according to the main site's challenges.

THE PROCESS. HOW THE GIAHS PLAN HAS BEEN ELABORATED. PARTICIPATORY APPROACH

The present GIAHS Plan benefits from the aforementioned efforts. However, we believe that the GIAHS Plan provides additional advantages to the already approved plans, by targeting measures to the *Horta's* preservation.

The GIAHS Plan, under the coordination of the *Horta* Council:

"Foresees a communication strategy to make the GIAHS visible specially in Spain and Europe but also worldwide."

1. Underlines the irrigation system by integrating in a coordinated framework the plans already approved by all the local institutions: Consell de la Generalitat (Regional Government), local councils of the metropolitan area of *València* and *Diputació* (a provincial institution that coordinates services for municipalities) and of course, *Tribunal de la Aguas* and *Real Acequia de Moncada*.

2. Foresees a communication strategy to make the GIAHS visible specially in Spain and Europe but also worldwide.

3. Includes a framework for monitoring and evaluating the existing strategies and programs already acting in the GIAHS. Please note that the collaboration with Valencian universities can play a useful role.

Participatory approach for the GIAHS plan

All the actions contained in the GIAHS plan require the commitment of the local community, including farmers, civil society and institutions.

Its formulation started with a mapping all of the stakeholders and the organization of a series of seminars and workshop, which led to:

- **Share a vision:** What is the added value that GIAHS site recognition provides to l'*Horta* development and sustainability? Why is this recognition important on international, national, regional and local levels?

- **Define an objective:** A GIAHS site, What for? How could this GIAHS Plan become an input for l'*Horta* sustainability? How it fits with the ADP and other plans in the region? When can the objective be achieved, according to the nature of the GIAHS site recognition?

- **Build coordination** so that everyone contributes to implement and to finance the GIAHS Plan, establishing synergies with the ADP.

The meetings included key experts, including agricultural organizations, involved in different processes to preserve *l'Horta* heritage. It offered the necessary elements to:

- Define an **advisory committee** to guide and ensure the alignment with the common vision.

- Appoint a **project leader** with a technical team that assumes the responsibility to prepare the GIHAS site's formal proposal.

The preparation of the GIAHS Plan followed a calendar of activities that began in February 2018 with the participation of the technical team in a Seminar carried out in the Ministry of Agriculture, Spain. During the subsequent stages **the proposal benefited from public and private stakeholders' participation and from the GIAHS Advisory Committee's suggestions.**

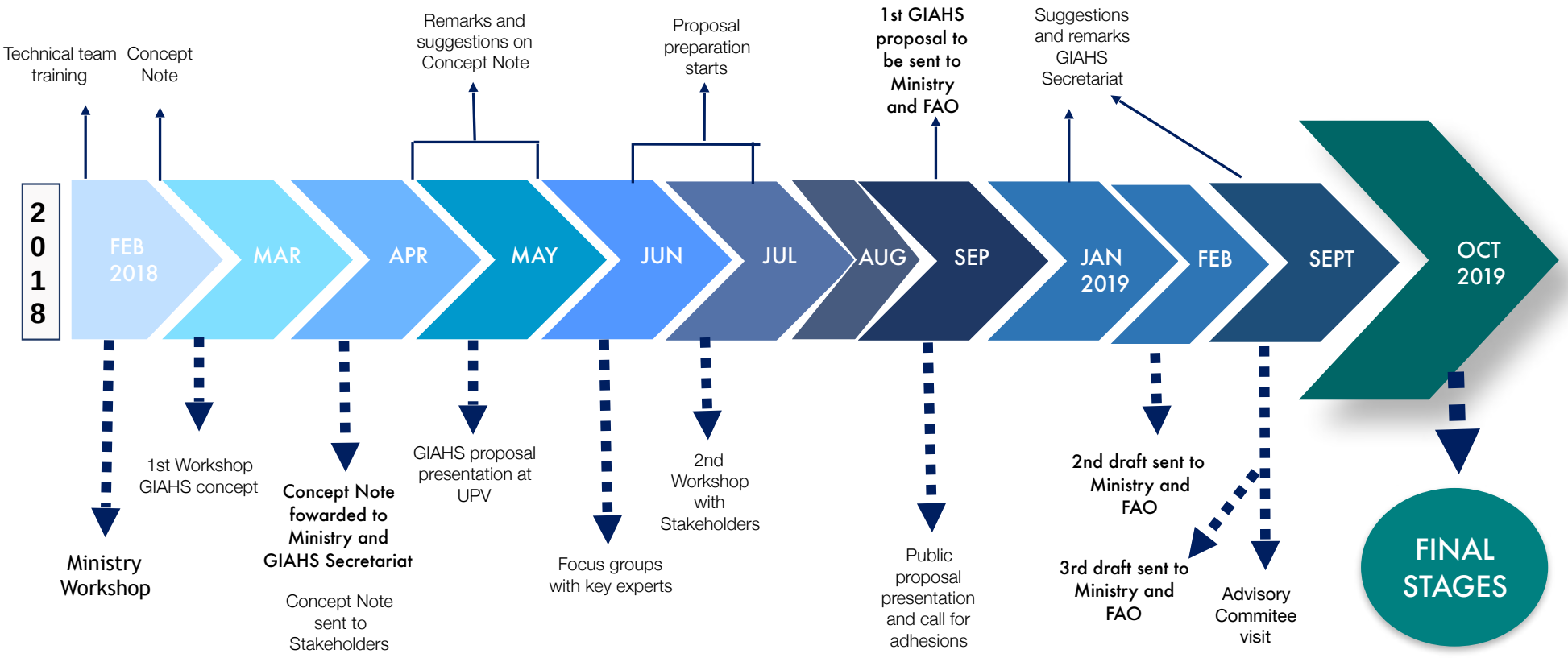


Figure 70. Preparation of the GHIAS proposal

In September 2019 the candidate site was visited by Prof. Mauro Agnoletti (University of Firenze, SAG, FAO) accompanied by Mrs. Martina Venturi (University of Firenze) as well as by Mrs Marta Cimas and Mrs Carmen González from the Ministry of Agriculture (MAPAMA, Spain). Their remarks and suggestions have provided insights into the historical and cultural singularity of a millenary irrigation system that is indeed the object of this proposal.

CHALLENGES AND POLICY OBJECTIVES

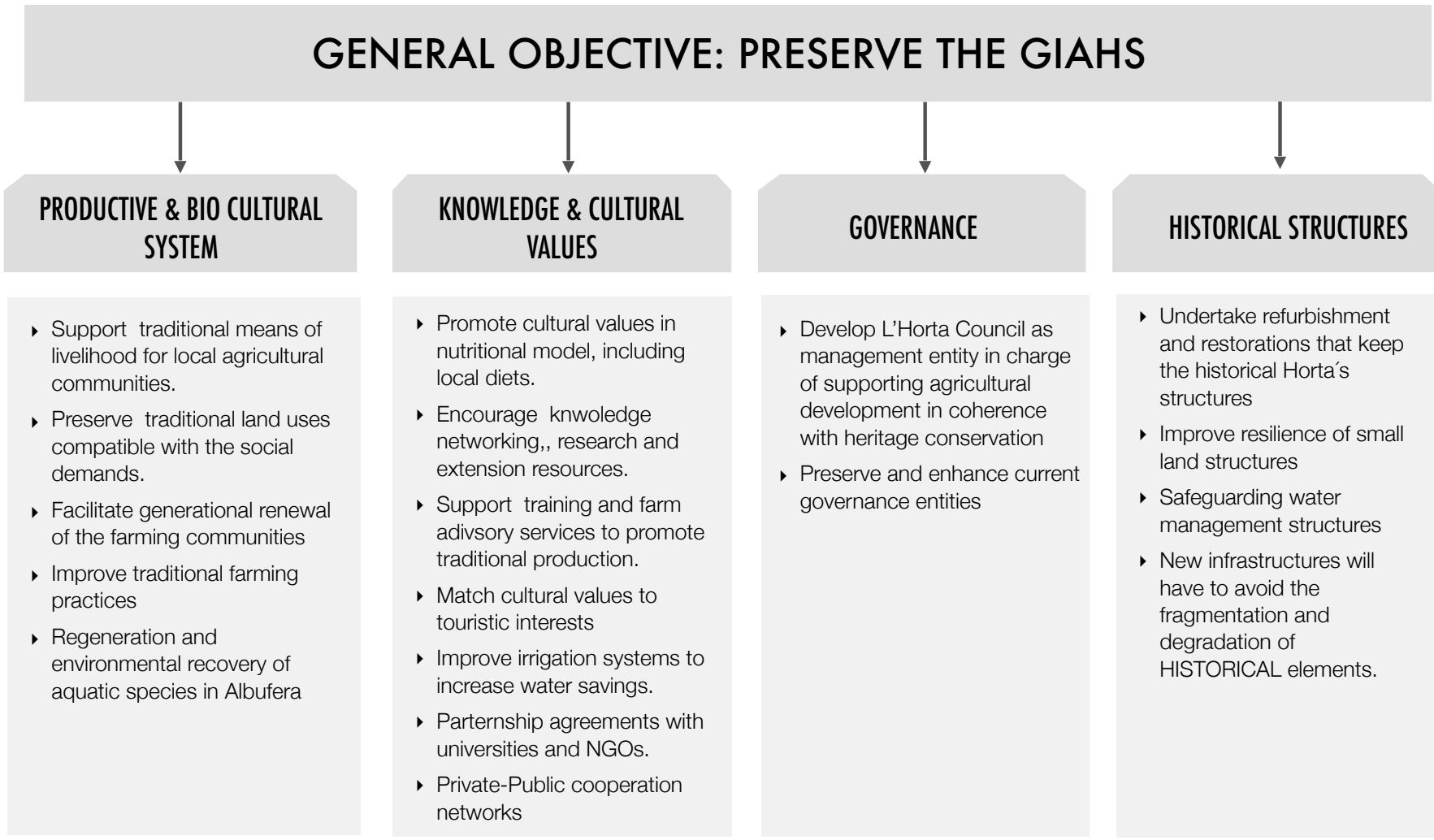
The last draft of the TAP linked to the *Horta's* law carried out a comprehensive diagnosis of the existing threats for the agricultural community in l'*Horta*'s space. We insist that the fact that l'*Horta* has a specific TAP has to be considered as a practical strategy to address the GIAHS preservation, always from a dynamic perspective. Actually, the TAP mainly targets the sustainability of the historical irrigation system, subject of this proposal.

Box 7. Main threats

- A cultural heritage in a situation of serious deterioration
- A fragmented and detached Huerta from the city
- Urban infrastructures and urban growth exert a pressure on the cultivated and cultural heritage.
- Farm expectations are very uncertain due to the lack of profitability, the growing insecurity, the lack of generational change and low incomes.
- Urban food policies are not integrated with the peri-urban local production.
- High levels of contamination of surface and groundwater (uncontrolled dumping, pesticides.
- Over-fertilization with nitrogenous fertilizers ...).
- Over-fishing in the *Albufera* lagoon.

During the elaboration of the TAP a participatory process took place. It finished in October 2017, indicating the following threats.

Accordingly, we completed this diagnosis and sumarised the GIAHS site's action policy objectives in the following figure.



POLICY ACTIONS

Every action to be undertaken in the next future fits in the principles of the *Horta's* Law approved by the Regional Government in 2018[18]. This is a capital document that stablishes the road map for the irrigation system and *l'Horta* territory.

From the Preamble, the *Horta* Law:

- underlines one of the major threats: "most of the irrigated areas from *Acequias* integrating the *Tribunal de las Aguas* […] have been reduced […] and are in danger of disappearing".

- makes the *Horta* survival conditional on "the protection recognized to *Tribunal de la Aguas*, inextricably linked to this territory […]"

Finally, the *Horta* Law defines an **Agricultural Development Plan (ADP)**, which has the purpose of achieving the sustainable development of the historical irrigated area.

In the following paragraphs we consider the specific GIAHS site's plan that foresees a number of actions to achieve the above objectives. **Note that this is only a part of the comprehensive ADP that considers more general measures aimed at improving the agricultural value chains in the peri-urban metropolitan area.**

"The l'*Horta*'s Law covers all the irrigation system, elements and network as a part of the core territory subject of its rules."

In the GIAHS plan several actions are also foreseen by local and regional authorities to preserve local species and artisanal fishing in the Albufera. On the other hand, the plan will be further extended in th next years to be considered under the future rural and fishing development strategies to be shortly formulated by the Regional Government.

Productive and BIO cultural system

The *l'Horta's* Law covers all the irrigation system, elements and network as a part of the core territory subject of its rules.

- "[…] historical irrigation areas of *Acequias* conforming *Tribunal de las Aguas*, la *Real Acequia de Moncada* [...]" – Article 3.
- "(people whose profession is developed in the *Horta* and governing entities such as *Tribunal de las Aguas*, Water Users' Associations [...]"- Article 6.
- Objectives (Article 41).
  - Promote and manage the *Horta* traditional products with an added value.
  - Guarantee the survival of some activities carried out on a traditional way (knowledge transfer is necessary).

The corresponding ADP foreseen in *l'Horta* Law includes the following actions and priorities included in the table below (1 corresponds to the highest priority).

The table also includes actions for environmental preservation of fish species at the Albufera lake foreseen in the Participatory Local Development Plan by Valencian fishing communities for the Albufera, with EU co-funding.

ACTION	RESOURCES €	PRIORITY	BY
Advisory programme to innovation initiatives in all the *Horta* Area	18.150	1	2021
Create several experimental fields for the analysis the recovered varieties	30.250	1	2021
Encourage traditional varieties	12.100	2	2020
Promote local varieties by defining sensitazion and prpmote campaigns, touristic and festival events, gastronomy events…	6.050	2	2020
Create a specific seed bank for recovering traditional varieties	12.100	2	2020
Promote good preservation practices concerning biodiversity, water quality landscape and agriculture historical heritage	18.510	1	2021
Actions for environmental recovery, aquatic biodiversity and control and elimination of invasive species; protection and regeneration of fishing species in Albufera	20.000	1	2020

As for the Albufera lake and corresponding fish preservation, the regional government is responsible for fishing in inland waters issues and release annual orders for regulating the activity, which are directly applicable in the area of the Natural Park.

Traditional fishing practices are historically protected and regulated by the Fishing Community of El Palmar. The Valencia City Council publishes detailed rules for traditional fishing. Sport fishing is only allowed with rod but it is forbidden in some Reservation Areas. This provision extends to angling in all its forms, with hook or without hook, including in particular the type of fishing for an eel without a hook called "a la molinà".

El Palmar has a Fish Research Centre (Centro de Investigación Piscícola) which supports the maintenance and monitoring of vulnerable species such as *Valencia hispanica* ("samaruc") and *Aphanius iberus* ("fartet"). Comunidad de Pescadores and Universitat Politècnica de València are partners in a project, with EU co-funding, to breed organic *Dicentrarchus labrax* (seabass) in Albufera.

Knowledge and cultural values

The *Horta's* Law considers irrigation communities as the main *Horta*'s actors in whom traditional knowledge is held (Articles 5, 6 and 8)

- "[...] all the public administrations and irrigation communities will be responsible for achieving objectives and implementing actions to guarantee the activity and the protection of the natural and cultural heritage [...] Article 5
- "[...] *El Tribunal de las Aguas*, *la Real Acequia de Moncada* and its irrigation communities [...] represent and hold the historical water management maintained nowadays guaranting its collective, democratic and self-managed attributes" – Article 8
- Objectives (Article 41)

- Undertake communication and awareness campaigns targeted to civil society underlining the heritage and its economical, cultural and environmental values.
- Collaborate with research institutions and other entities whose objectives coincide with the *Horta* Council goals.
- Promote training.

ACTION	RESOURCES €	PRIORITY	BY
Create an agriculture center to undeline the relevance of the historical methods and operating procedures as farmers/ irrigation community.	121.000	1	2022
Promote exchanging programs for traditional knowledge where the farmer and the irrigator are man actors	30.250	1	2021
Train programme in traditional and sustainable methods for the *Horta* Area.	18.150	1	2020
Define pilot land plots in which sustainable and traditional procedures, products are controlled.	18.150	2	2021
Promote the specific training on traditional varieties	18.150	2	2021
Promote campaigns to improve awareness of the historical landscape.	18.150	2	2020
Define campaigns for promoting traditional varieties, traditional water management, Denomination of Origin (rice, xufa), traditional gastronomy	18.150	1	2020
Undertake a communication plan with Media and updating Social Networks	18.150	1	2020
Schools' Programmes	18.150	1	2021
Elaborate audiovisual materials	18.150	1	2021
Dissemination of the traditional fishing culture	10.000	1	2020

"The *Horta's* Law defines in its VIth Chapter a governance model and entity, the *Horta* Council in which the *Tribunal de las Aguas*, the *Real Acequia de Moncada* should be main partners with a defined structure(Article 42)."

It is also worth noting that in 2016, the regional Government declared some activities of the Albufera of Valencia (including traditional fishing and sailing) as of Intangible Cultural Interest.

Governance

The *Horta's* Law defines in its VIth Chapter a governance model and entity, the *Horta* Council in which the *Tribunal de las Aguas*, the *Real Acequia de Moncada* should be main partners with a defined structure (Article 42). As a responsible entity, the *Horta* Couincil will (Article 41):

- Manage the ressources and mediate conflicts.
- Coordinate local initiatives.
- Ellaborate reports, plans and programs and advocate for implementing necessary actions.
- Open a space of participation of entities and stakeholders.
- Guarantee the compliance with current legislation.

Governance of the traditional fishing sector has been enhanced through the set up of a Local Development Action Group of Valencian fishing communities where Palmar's fishers belong.

"[...] The city of *València*, other municipalities in *l'Horta*, *Diputació de València* (provincial entity) and *Generalitat Valenciana* (regional government) are promoting land mediation offices."

Historical structures

The *Horta's* Law identifies cultural assets to be conserved or restored to protect the heritage. The related ADP will regulate the land use (considering the agricultural practices needed to guarantee the dynamic conservation or the irrigation system) (Articles 22 and 30).

- Objectives (Article 41).
  - Ensure the maintenance and proper functioning of the historical structures such as paths and *Acequias*.

The ADP includes the following actions, specifically addressed to the site's conservation:

ACTION	RESOURCES €	PRIORITY	BY
Provide and advise and assessment of irrigation structure adjustments: Diagnosis, plans, in collaboration with the Irrigation communities.	72.600	1	2020
Formulate specific projects to improve critical irrigation points as well as to maintain the historical *Acequias* network.	72.600	1	2022
Explore future improvements in the irrigation network (diagnosis, studies and plans).	18.150	2	2020
Setting up a team responsible for monitoring and managing the green infrastructure	60.500	1	2021

In order to strengthen this Action Plan we also consider other current activities carried out by different stakeholders contributing to the above objectives:

- Land Banks: The city of *València*, other municipalities in *l'Horta*, *Diputació de València* (provincial entity) and *Generalitat Valenciana* (regional government) are promoting land mediation offices. These create a point of connection between people who are willing to cultivate and need land and land owners that are willing to give up their land. The challenge continues as *L'Horta* Law favours procedures for faciliting the leasing of farmplots and avoid land abandonment. The regional parlamient has recently passed the Farm Structure Law (*Llei d'Estructures Agraries*) that will support the network of land banks (Xarxa de Terres) across the Valencian territory[19].

- Academy and NGOs: Guaranting the awareness and dissemination of traditional food systems and periurban territories at *València*. Two specific structures, *Cátedra Tierra Ciudadana* – UPV and *Cátedra de l'Horta*- UV include activities in their action plan[20].

- City's Food Council and Strategy. It aims at promoting cultural values that should guide changes in the food system and in the way food policies are defined[21].

EXPECTED CONTRIBUTION TO DYNAMIC CONSERVATION.

An effective and inclusive GIAHS site's Plan can be evaluated according to each of the five criteria considered for defining a GIAHS:

- Food Security and livelihoods: building capacities, promoting shorter distribution channels, providing resources, multi-actor networking, defining sensitization and awareness campaigns.

- Agro-biodiversity: conducting studies and analysis, facilitating access to innovation institutes, promoting traditional products, providing dissemination of initiatives.

- Traditional and local knowledge systems: promoting information and data systematization, conducting studies, pooling knowledge from different disciplines, articulating the irrigation heritage and touristic/cultural heritage, disseminating community-support farming initiatives.

- Culture, value systems and social organizations: promoting forums (tourism, gastronomy, art…), defining coordinated actions, promoting gender approach, strengthening irrigation communities.

- Landscapes and Seascapes: Defining an historic and cultural landscape despite touristic interestrs, promoting data systems in order to better analyse territory evolution, contributing to territory and urban planning, adding value to small scale fishing.

MONITORING

A methodology must be defined to track progress in the GIAHS plan. This methodology should include monitoring, evaluation, accountability, and learning (MEAL) and the GIAHS framework encourages to doing so. A MEAL approach allows to tracking progress, adjust, mitigate risks or simply assess the impact of the plan on the GIAHS site. Having listed critical indicators, a base line can be established from which the monitoring and reviewing process begins according to a defined schedule.

Evaluation will take place at particular points in time to complement on going monitoring activities by providing more in-depth and objective assessments of the relevance, efficiency, effectiveness, impact and sustainability of the plan.

In conclusion, the GIAHS Plan will ideally converge with the ADP but will add its own contributions from social actors beyond the Valencia regional government, including urban food strategies by local councils of the Valencia Metropolitan area, universities, foundations, farming community and other agents from the civil society.

FOOTNOTES PAGE

[1]L'*Horta* de *València* (in Valencian) or La *Horta* de Valencia (in Spanish).

[2]The term “agriculture” and its derivatives include fisheries, marine products, forestry and primary forestry products (From Paragraph 1, Article I of the FAO Constitution).

[3]See ROMERO, J., & MELO, C. (2015).

[4]House of work in L’*Horta*, made of adobes and roof of canes with two very inclined slopes.

[5]See GUINOT (2005) and GLICK (1988) quoted by PERIS-ALBENTOSA (2015). On the historical origin of the *Horta* de València see Guinot (2005).

[6]See Argyelan et al (2015)

[7]Observaciones sobre la Historia Natural, Geografía, Agricultura, población y frutos del reyno de Valencia. / Por don Antonio Josef Cavanilles, Madrid, 1795-1797.

[8]This section is based in the paper by MARQUEZ-PEREZ & SEGURA GARCÍA DEL RÍO (2014).

[9]This section draws on SORIA (2006).

[10]This section draws on MARCO-RUBIO (2014).

[11]Merca*València* web page: https://www.mercavalencia.es/

[12]See EEA (1998): The Environment in Europe. The Dobris Report, European Environment Agency and the Ministry of the Environment.

[13]MEEUS et al. (1990). See more recently COURTOT 1989; MEEUS 1995; ZIMMERMANN 2006; BARBERA & CULOTTA (2012, 2016).

[14]MEEUS (1995) identifies the following major landscapes for the Mediterranean area: Mediterranean open field, coltura promiscua , Mediterranean semibocage, Montado/Dehesa, Delta and *Horta*, Terraces and Mountains.

[15]Drafted by Carmen Cárcel, Prof. Dr. Arquitecture, Universitat Politècnica de *València*.

[16]DOGV núm. 5269 de 30.05.2006.

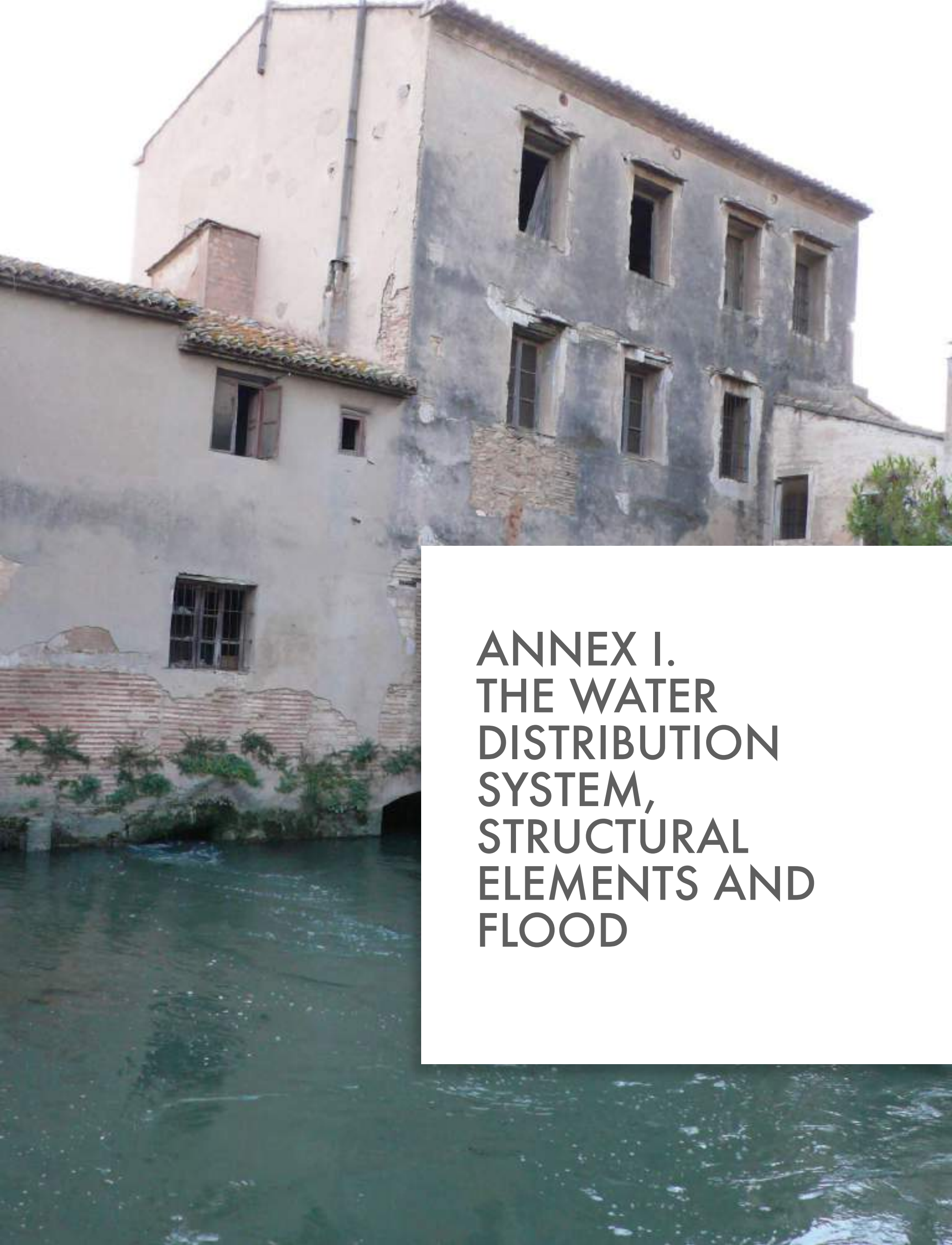
[17]BOE» núm. 309, de 27 de diciembre de 2006.

[18]LEY 5/2018, de 6 de marzo, de la Generalitat, de la Huer- ta de València. [2018/2459].

[19]See http://www.dival.es/es/medio-ambiente/content/municipios-banco-de-tierras

[20]Cátedra Tierra Ciudadana coordinating the GIAHS Proposal Dossier.

[21]See https://www.valencia.es/ayuntamiento/tablon_anuncios.nsf/0/A87A6C8648ADBA53C12580490042C4A9/$FILE/Caminando%20hacia%20un%20Consejo%20Alimentario%20en%20Valencia.pdf?OpenElement&lang=1



ANNEX I. THE WATER DISTRIBUTION SYSTEM, STRUCTURAL ELEMENTS AND FLOOD

THE WATER DISTRIBUTION SYSTEM AND FLOOD IRRIGATION

I. 1 . WATER DISTRIBUTION

The capture of the water is carried out from the weir, from which a water distribution network is developed, branching into circulation systems that end in the irrigation ditches, simple irrigators of specific fields (Figure I.1).

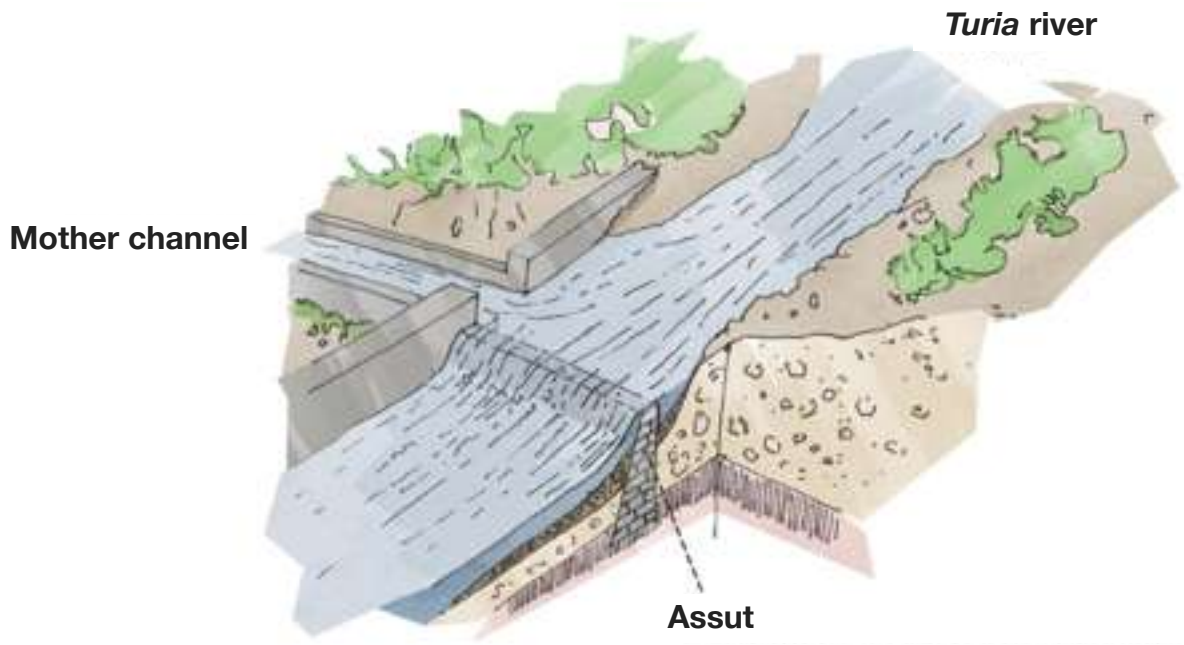


Figure I.1. The "Assut" o Weir
Source: Palazón (2016)

"The capture of the water is carried out from the weir, from which a water distribution network is developed, branching into circulation systems that end in the irrigation ditches, simple irrigators of specific fields"

The second element of this system is the circulation channel. This channel is a ditch or "*Acequia*" of great dimensions, reaching to have between six and seven meters of amplitude, excavated in the earth and with the function of driving the water to the arms (brazos) of irrigation. The layout of these channels, adapted to the contour lines, is one of the defining elements of the entire landscape and has undergone very little modifications since its medieval construction. The land plots have been forced over the centuries to adapt to these rigid lines of the landscape. The last element of this system is the water distribution for irrigation. We must differentiate between the elements that make up the distribution system, because not all have the same role. In the first place, the arms start from the mother ditch and, at a lower hierarchical level, the "filas" and "rolls" are the smaller elements that supply smaller territories. The system finally ends in the irrigators responsible for providing water to each plot. Figure I.2 illustrates the system already shown and Figure I.3 shows a and example, the "fila" or row in the municipality of Meliana, in l'*Horta Nord*, where in addition to the *Acequias* network, some points of water uptake by elevation (wells) are shown.

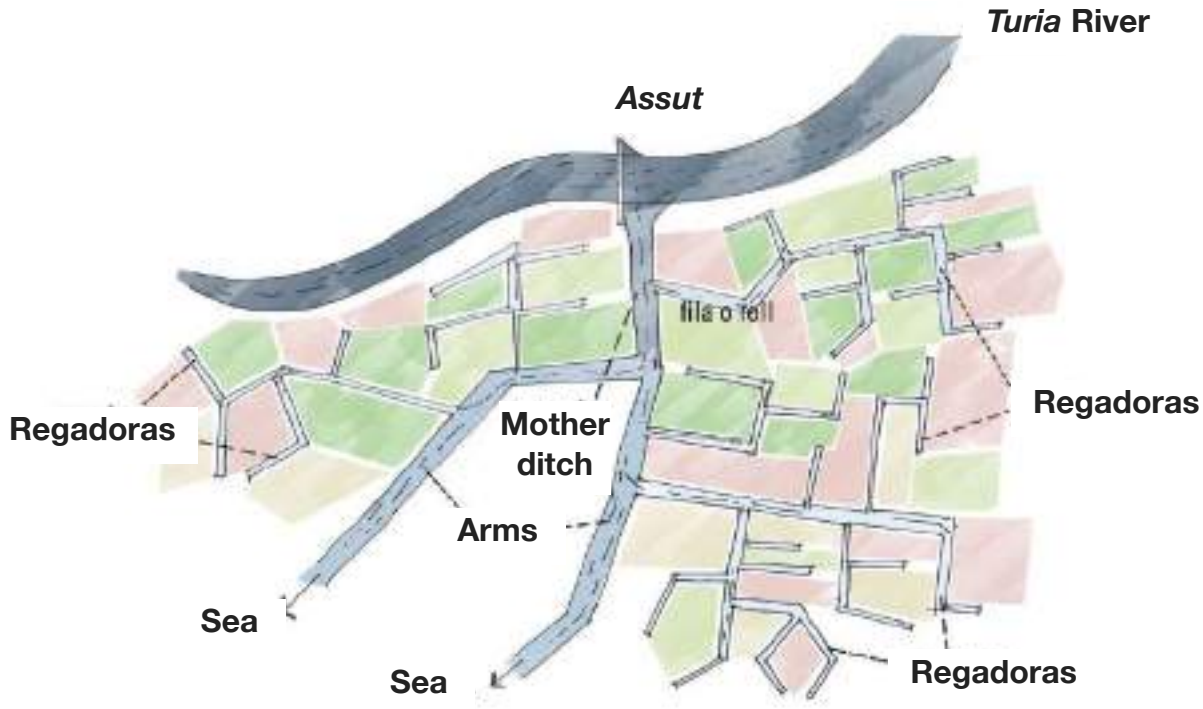


Figure I.2. Water distribution system
Soruce: Palazón (2016)

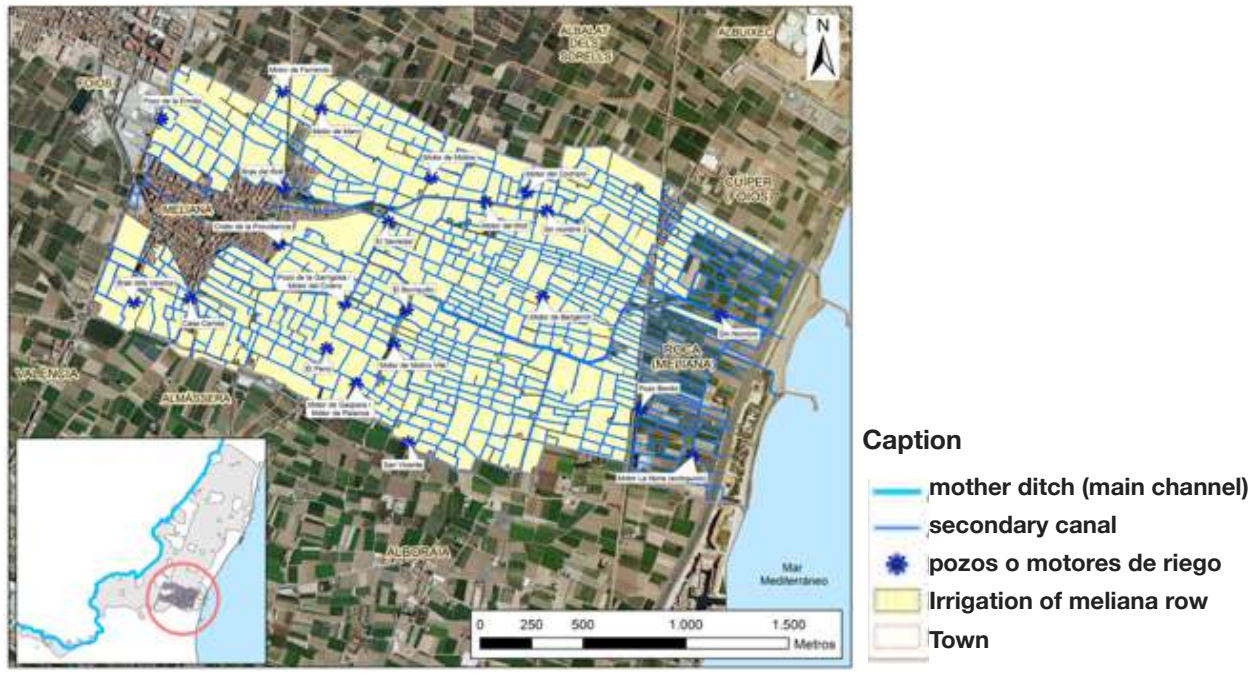


Figure I.3. Water distribution at Meliana (*Horta Nord*)
Source: Mar Violeta, Antonio Calatayud y Francisco Sanchez en http://www.paisatgesculturals-rsm.org

I. 2 SURFACE IRRIGATION ("REG A MANTA")

The water reaches each of the land plots and can be used for irrigation. The height difference between the point of capture and the point of use of the water causes water movement; thus, the irrigation system facilitates water advance with the lowest losses. To irrigate, it is necessary to dam the water in the channels by means of an obstacle (parada) that raises the height of the sheet of water until it equals that of the plot. After elevating the water height inside the irrigation channel to the level of the plot, the farmer proceeds to facilitate the water flow in the land plot. A series of openings (portells) existing in the crowning of the channel (cajero) and operated by the irrigator (paletas) will enable the introduction of water into the plot. Figure I.4 shows in practice how water enters the plot from the irrigation channel.

Figure I.4 Surface irrigation from the ditch to the land plot at Rafalell
Source: Real *Acequia* de Montcada.

The preparation of the plot for irrigation is, along with subsequent work, one of the activities that absorb more time in the activity of the irrigator. The type of crop, the dimensions and slope of the plot will require some preparation work. The target is to achieve uniform irrigation of the plot, to avoid invading with the water the adjacent plots (sorregar), to do it quickly and to avoid the surplus (dessembassar). For an adequate use of the resource, the direction of the water within the plot is achieved by subdividing the surface into smaller areas, depending on the total surface area and the number of water entries (portells). Through ridges (caballones) perpendicular to the ditch the soil is divided and independent spaces are created to be watered with sufficient water control (figures I.5 and I.6). The water will penetrate in each of the rows, at the will of the irrigator, and the surface of the field will be completely flooded for a long time (regar el guaret). The plot, to be properly irrigated ("regado a manta"), must meet a series of specific characteristics:

- Have an own irrigator that allows individualized irrigation.
- Possess a structure in the irrigator (partidor, brancà,) with grooves (galzes) to insert the pieces of wood or metal (post) that allow to dam the water (rebals).
- Overtures of connection between the irrigator and the plot (portells and paletes).
- Independence of adjacent plots that avoid flooding (sorregar).
- Slope that allows an adequate advance of the water.
- Possibility to drain the surplus, if any, of the irrigation (dessembassador)

Figure I.5. Field ready for irrigation at Borbotó. Soruce: Real *Acequia* de Montcada.

I. 3 STRUCTURAL ELEMENTS

Figure I.6. *Assut* de *Moncada*

Figure I.7. *Assut* and Partidor de la *Acequia* de *Moncada*

Figure I.8. *Acequia* de *Moncada*

Figure I.9. *Acequia* in l'*Horta Nord*.

Figure I.10. Llengües in Paiporta (l'*Horta Nord*).

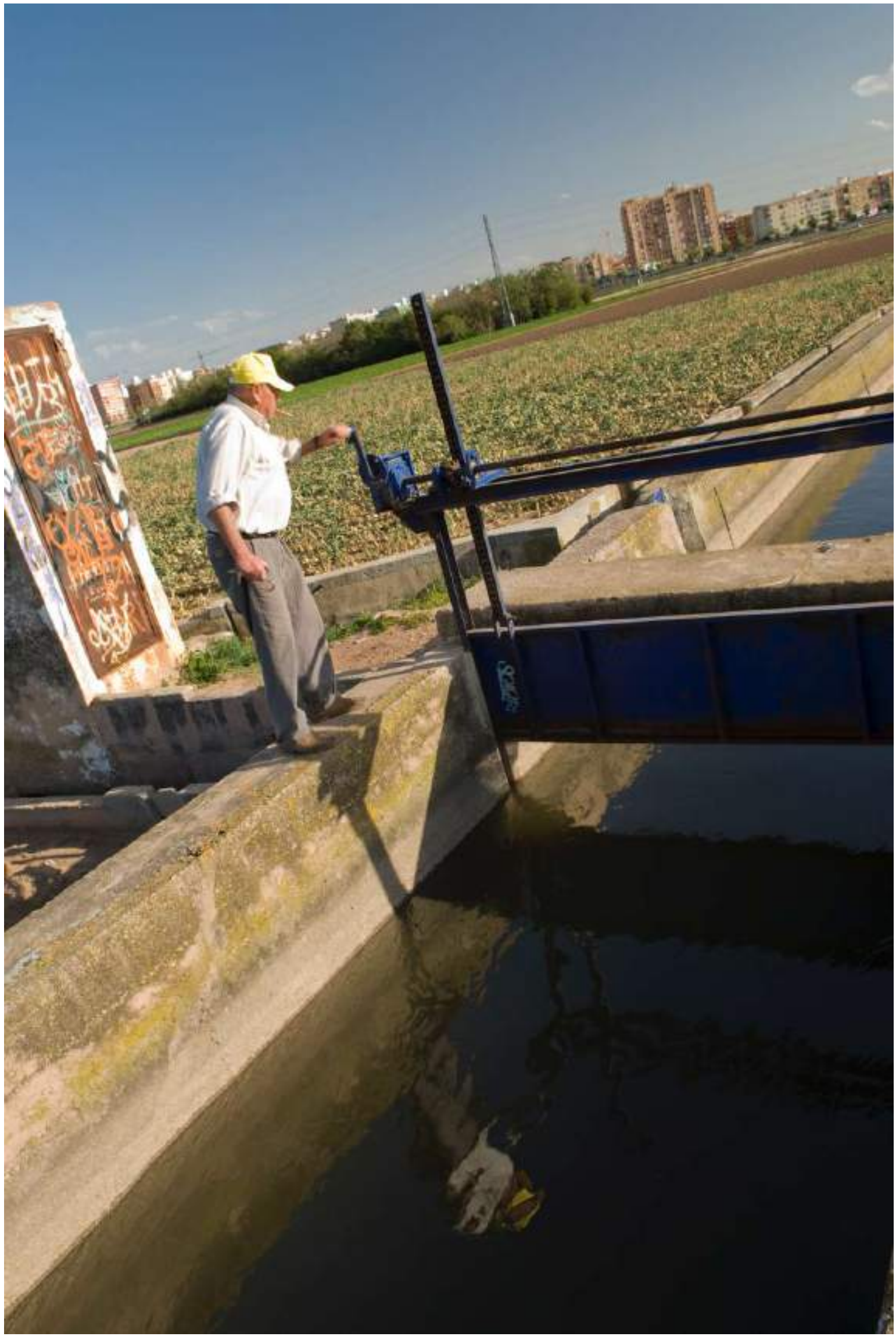


Figure I.11.
Partidor in l'*Horta Nord*.

Figure I.12.
Partidor in l'*Horta Nord*.

Figure I.13. Braçal and Reg in l'*Horta Nord*.

Figure I.14. Paleta in *Acequia* de *Moncada*.

ANNEX II.
LIST OF ANIMALS IN THE ALBUFERA NATURAL PARK

Photo taken from the website of the *Albufera* Natural Park. Generalitat Valenciana, Conselleria de Agricultura, Medio ambiente, Cambio Climático y Desarrollo Rural. página web: http://www.parquesnaturales.gva.es/es/web/pn-l-*Albufera*/flora-y-

LIST OF BIRDS

Spanish name	Scientific name
Ánade real	*Anas platyrhynchos*
Pato Colorado	*Anas cyanoptera*
Pato cuchara	*Anas clypeata*
Cerceta	*Anas crecca crecca*
Zampullín	*Tachybaptus ruficollis*
Garceta común	*Egretta garzetta*
Garcilla bueyera	*Bubulcus ibis*
Garza real	*Ardea cinérea*
Garza imperial	*Ardea purpurea*
Polla de agua o Gallineta	*Gallinula chloropus*
Focha común	*Fulica atra*
Focha cornuda	*Fulica cristata*
Cormorán grande	*Phalacrocórax carbo*
Charrán común	*Sterna hirundo*
Gaviota patiamarilla	*Larus michahellis*
Gaviota de audouin o gaviota corsa	*Larus audouinii*
Cigüeñuela	*Himantopus himantopus*
Flamenco	*Phoenicopteriformes*
Avoceta	*Recurvirostridae*
Calamón	*Porphyrio porphyrio*
Martinete	*Nycticorax nycticorax*
Chorlitejo chico	*Charadrius dubius*
Chorlitejo patinegro	*Charadrius alexandrinus*
Aguilucho lagunero	*Circus aeruginosus*
Águila calzada	*Hieraaetus pennatus*

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

LIST OF MAMMALS

Spanish name	Scientific name	Valencian name
Ratón de campo	*Apodemus sylvaticus*	Ratolí de bosc
Rata de agua	*Arvicola sapidus*	Talpó d´aigua
Musaraña gris	*Crocidura russula*	Musaranya comuna
Erizo europeo	*Erinaceus europaeus*	Eriçó comú
Gineta	*Genetta genetta*	Geneta
Garduña	*Martes foina*	Fagina
Murciélago de cueva	*Miniopterus schreibersii*	Rata penada de cova
Ratón moruno	*Mus spretus*	Ratolí mediterràni
Comadreja	*Mustela nivalis*	Mostela
Conejo común	*Oryctolagus cuniculus*	Conill
Murciélago enano	*Pipistrellus pipistrellus*	Rata penada, pipistrel.la comuna
Murciélago de Cabrera	*Pipistrellus pygmaeus*	Rata penada de Cabrera
Rata parda	*Rattus norvegicus*	Rata comuna, rata albellonera
Murciélago mediterráneo de herradura	*Rhinolophgus euryale*	Rata penada de ferradura mediterrània
Murciélago grande de herradura	*Rhinolophus ferrumequinum*	Rata penada de ferradura gran
Rata negra	*Rattus rattus*	Rata negra
Zorro rojo	*Vulpes vulpes*	Rabosa

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

AMPHIBIAN LIST

Spanish name	Scientific name	Valencian name
Sapo de espuelas	*Pelobates cultripes*	Gripau cavador, renoc cavador
Rana común	*Rana perezi*	Granota verda

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

LIST OF REPTILES

Spanish name	Scientific name	Valencian name
Lagartija colirroja	*Acanthodactylus erythrurus*	Sargantana cua-roja
Eslizón ibérico	*Chalcides bedriagai*	Lluenta
Culebra bastarda	*Malpolon monspessulanus*	Serp verda
Culebra viperina	*Natrix maura*	Serp pudenta, Serp d'aigua
Lagartija ibérica	*Podarcis hispanica*	Sargantana ibèrica
Lagartija colilarga	*Psammodromus algirus*	Sargantana cuallarga
Salamanquesa común	*Tarentola mauritanica*	Andragó

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

LIST OF FISH

Spanish name	Scientific name	Valencian name
Anguila	*Anguilla anguilla*	Anguila
Fartet	*Aphanius iberus*	Fartet
Pejerrey, Chucleto	*Atherina hepsetus Joell*	Xuclet
Pez Rojo	*Carassius auratus*	Carpí
Colmilleja	*Cobitis paludica*	Raboseta
Carpa	*Cyprinus carpio*	Carpa
Gambusia	*Gambusia holbrooki*	Gambúsia
Lubina	*Dicentrarchus labrax*	Llobarro
Perca americana	*Micropterus salmoides*	Perca americana
Mugil, mujol	*Mugil cephalus*	Llisa de cap gros
Mugil, mujol	*Mugil Ramada*	Llisa sama.
Samaruc	*Valencia hispanica.*	Samaruc

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

LIST OF ARTHROPOD INVERTEBRATES

Spanish name	Scientific name	Valencian name
Gamba gabacha	*Dugastella valentina*	Gambeta
Palaemonetes zariquieyi	*Gambeta*	Gambeta
Almeja de río, náyade	*Unio elongatus*	Petxinot

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

ANNEX III. LIST OF VEGETAL SPECIES OF L'ALBUFERA

Photo taken from the website of the *Albufera* Natural Park.Generalitat Valenciana, Conselleria de Agricultura, Medio ambiente, Cambio Climático y Desarrollo Rural. página web: http://www.parquesnaturales.gva.es/es/web/pn-l-*Albufera*/flora-y-vegetacion

LIST OF VEGETABLE SPECIES

Scientific name	Valencian name	Devesa	Marsh	Lake
Alkanna tinctoria	*Pota de colom*	X		
Ammophila arenaria	*Borró*	X		
Anthyllis cytisoides	*Botja blanca*	X		
Arthrocnemum fruticosum	*Sosa grossa*		X	
Arthrocnemum macrostachyum	*Sosa*		X	
Asparagus acutifolius	*Esparreguera borda*	X		
Asparagus officinalis	*Esparreguera*	X		
Aster tripolium subsp. pannonicus			X	
Cakile Maritima	*Rave de mar*	X		
Calystegia soldanella	*Campaneta de mar, corretjol marí*	X		
Chamaerops humilis	*Margalló*	X		
Cistus clusii	*Esteperola*	X		
Cistus salviifoliu	*Botja negra, estepa borda, estepa borrera*	X		
Cladium mariscos				X
Clematis flammula	*Vidriella*	X		
Coronilla minima subsp. clusii		X		
Crucianella maritima	*Credeueta marina*	X		
Cyperus capitatus		X		
Dianthus broteri	*Clavellinera*	X		
Dorycnium pentaphyllum	*Botja d'escombres*		X	

LIST OF VEGETABLE SPECIES

Scientific name	Valencian name	Devesa	Moss	Lake
Echinophora spinosa		X		
Elymus farctus	*Jull de platja*	X		
Ephedra distachya	*Caboteta de parot*	X		
Erica multiflora	*Bruc d'hivern*	X		
Eryngium maritimum	*Panical marí*	X		
Euphorbia paralias	*Lletera marina*	X		
Halimium halimifolium	*Estepa d'arenal*	X		
Helichrysum stoechas	*Sempreviva borda, floreta de pascua*	X		
Iris pseudacorus	*Lliri groc*			X
Iris xiphium	*Lliri blau*		X	
Juncus acutus	*Junc agut, jonc marí*		X	X
Juniperus oxycedrus subsp. Macrocarpa	*Ginebre*	X		
Kosteletzkia pentacarpos				X
Limonium dufourei			X	
Limonium vulgare			X	
Linum maritimum			X	
Lonicera implexa	*Lligabosc, xuclamel*	X		
Lotus creticus	*Herba dels conills*	X		
Lythrum salicaria	*Salicària*		X	X
Malcolmia littorea		X		
Medicago marina	*Alfalç marí, herba de la plata*	X		

LIST OF VEGETABLE SPECIES

Scientific name	Valencian name	Devesa	Moss	Lake
Myrtus communis	*Murta*	X		
Ononis natrix		X		
Osyris quadripartita	*Ginestó valencià*	X		
Othantus maritimus	*Cotonet*	X		
Pancratium maritimum	*Lliri de mar*	X		
Phragmites australis	*Canyís, senill*		X	X
Phillyrea angustifolia	*Aladern fals*	X		
Pinus halepensis	*Pi blanc*	X		
Pinus pinaster	*Pi marítim, pi pinastre*	X		
Pinus pinea	*Pi ver*	X		
Pistacia lentiscus	*Llentiscle*	X		
Polygonum maritimum		X		
Quercus coccifera	*Coscolla, coscoll*	X		
Rhamnus alaternus	*Aladern*	X		
Rhamnus oleoides subsp. angustifolia	*Arçot, espí negre*	X		
Rubia peregrina	*Rogeta*	X		
Ruscus aculeatus		X		
Schoenus nigricans	*Jonc negre*	X	X	
Scirpus holoschoenus	*Jonc de cabota*	X	X	X
Sedum sediforme	*Raïm de pastor*	X		
Smilax aspera	*Aritjol*	X		
Sporobolus pungens		X		
Tamarix sp.	*Tamarit*	X	X	X
Teucrium belion	*Timó mascle*	X		
Thalictrum maritimum			X	
Typha angustifolia	*Bova*		X	
Vinca difformis	*Vincapervinca*	X		

Source: Proyecto LIFE+ Seducción Ambiental
www.*Albufera*devalencia.com

ANNEX IV. THE SYSTEM IN MAPS

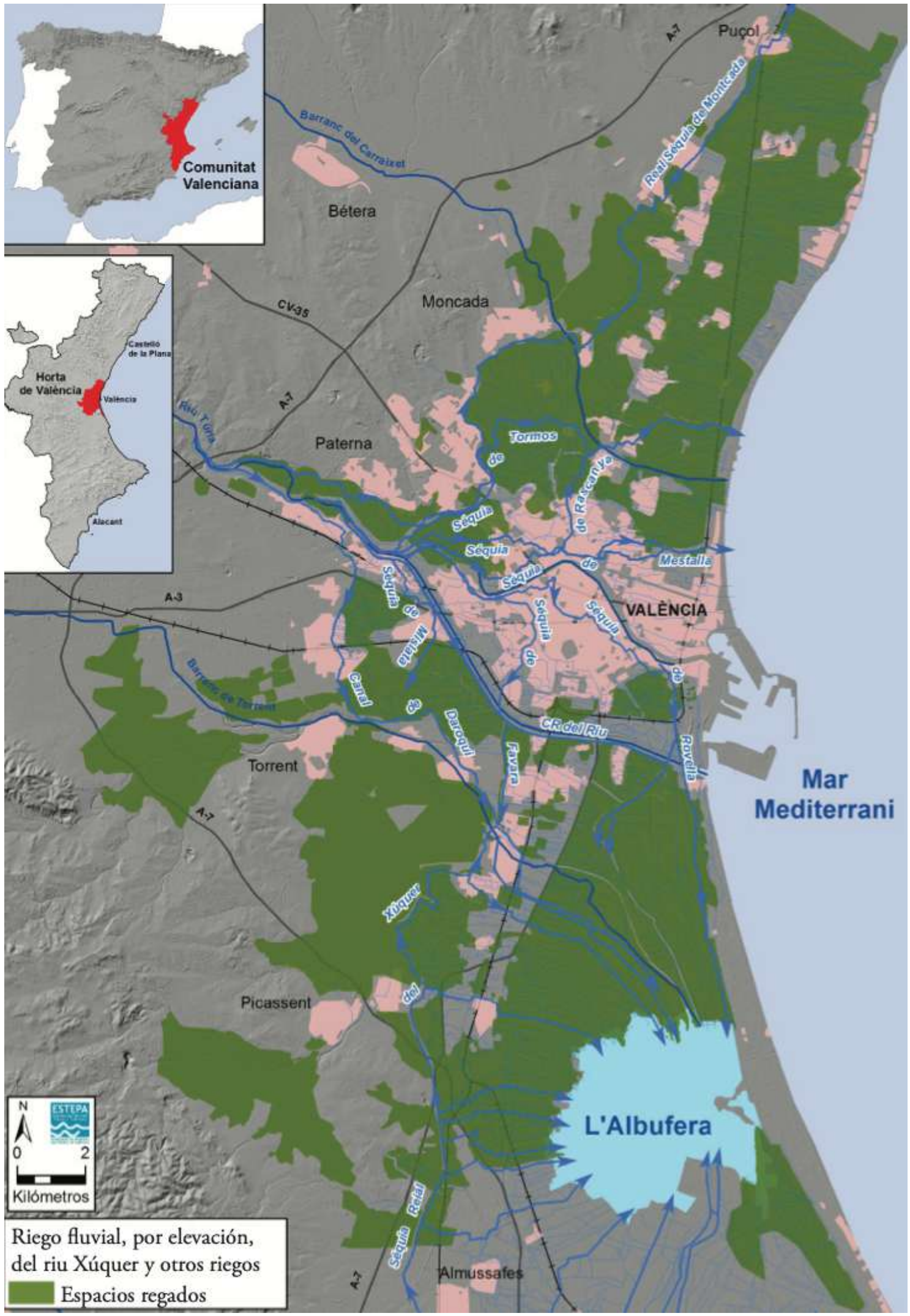


Figure IV.1 Irrigated landscapes in l'*Horta* system.
Source: IRANZO-GARCIA (2014)

Figure IV.2 Irrigation network.

Source: Territorial Action Plan

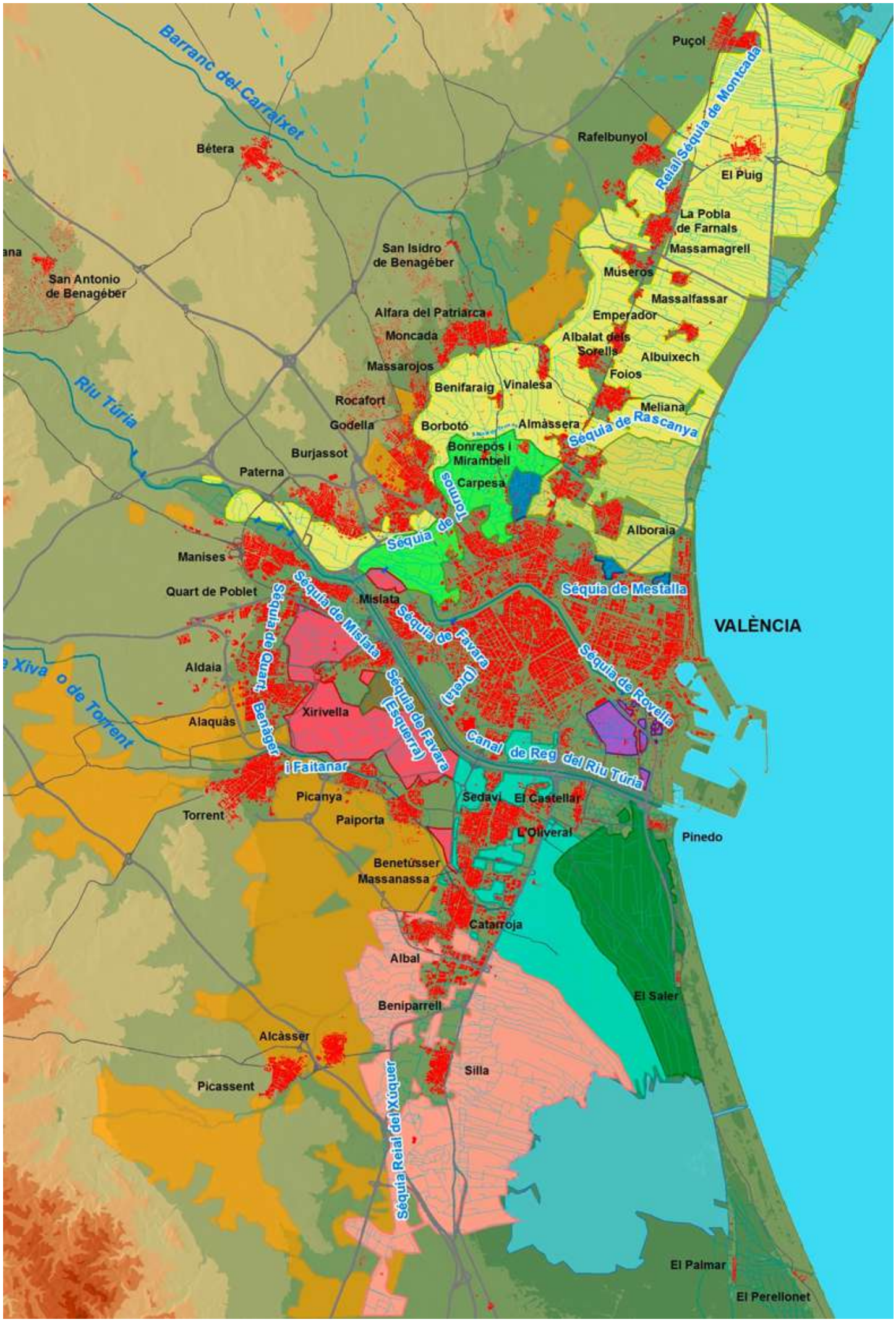


Figure IV.3. Water users' associations.
Source: IRANZO-GARCIA (2014)

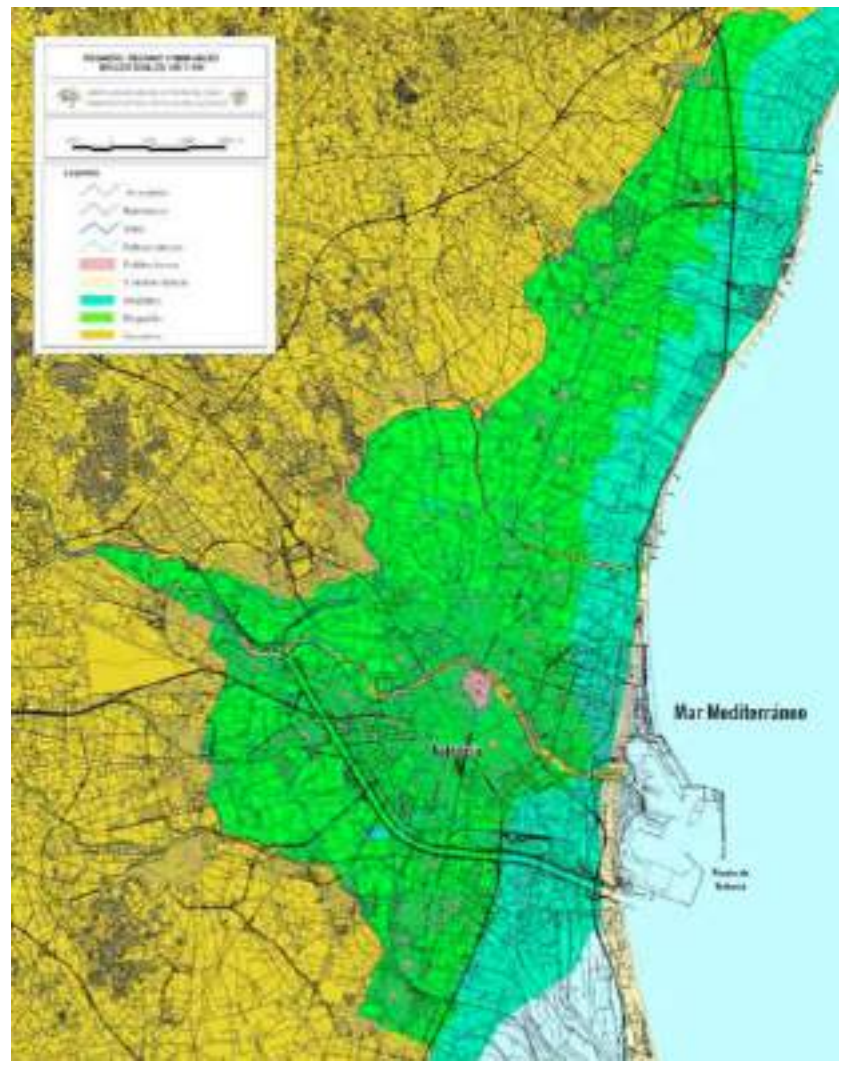


Figure IV.4. Irrigated area at the Islamic period

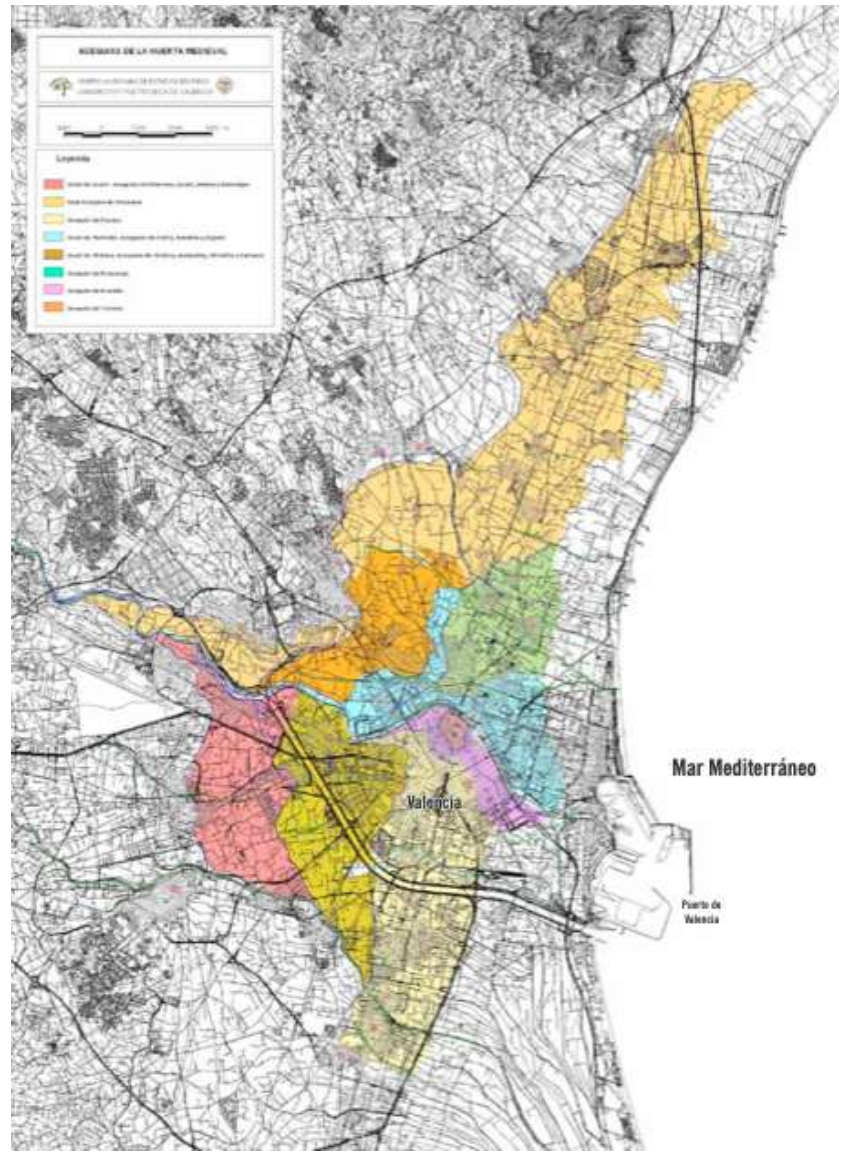


Figure IV.5. Irrigation communities under the early Christian rulemedieval period

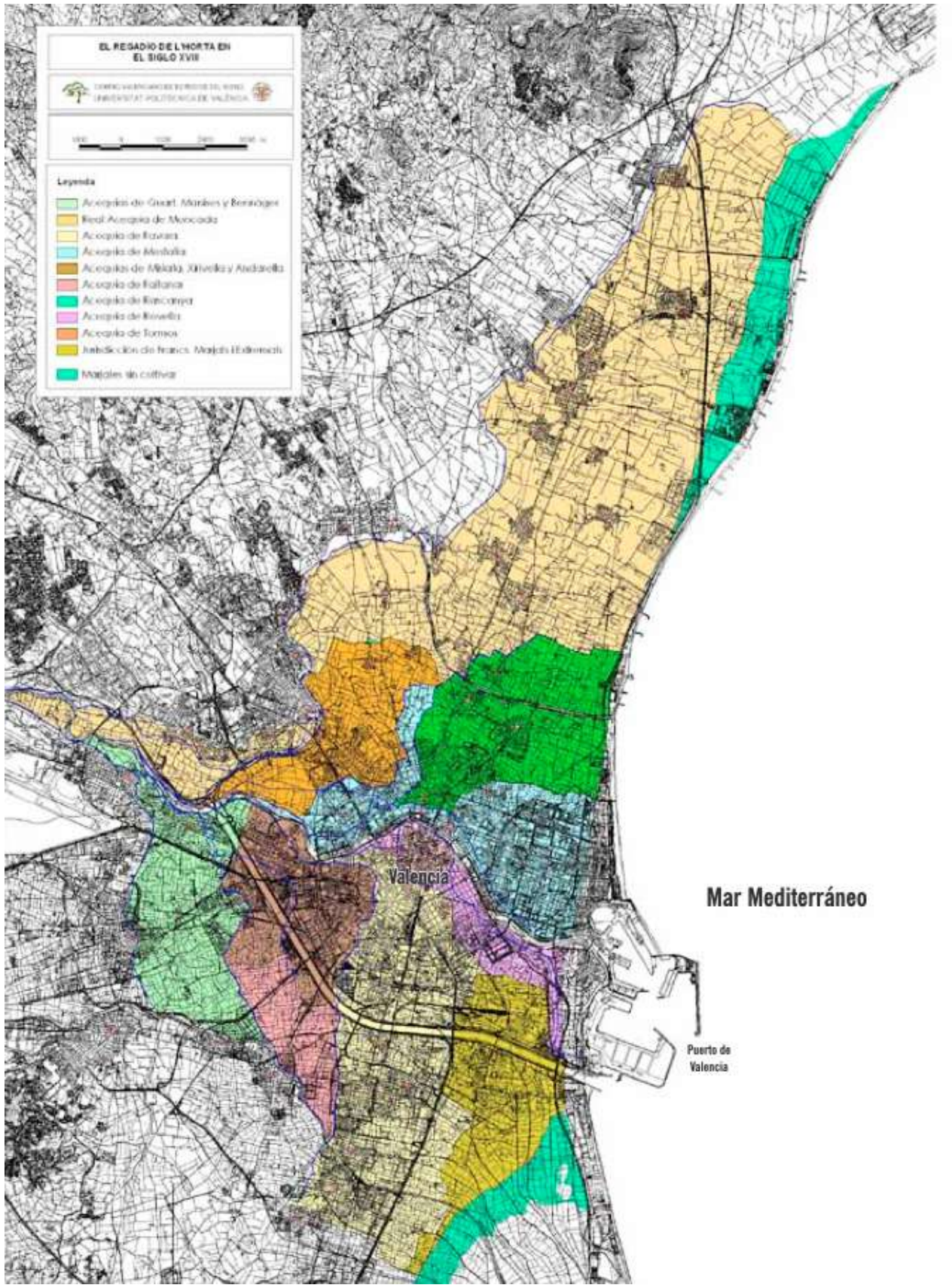


Figure IV.6. XVIIth Century

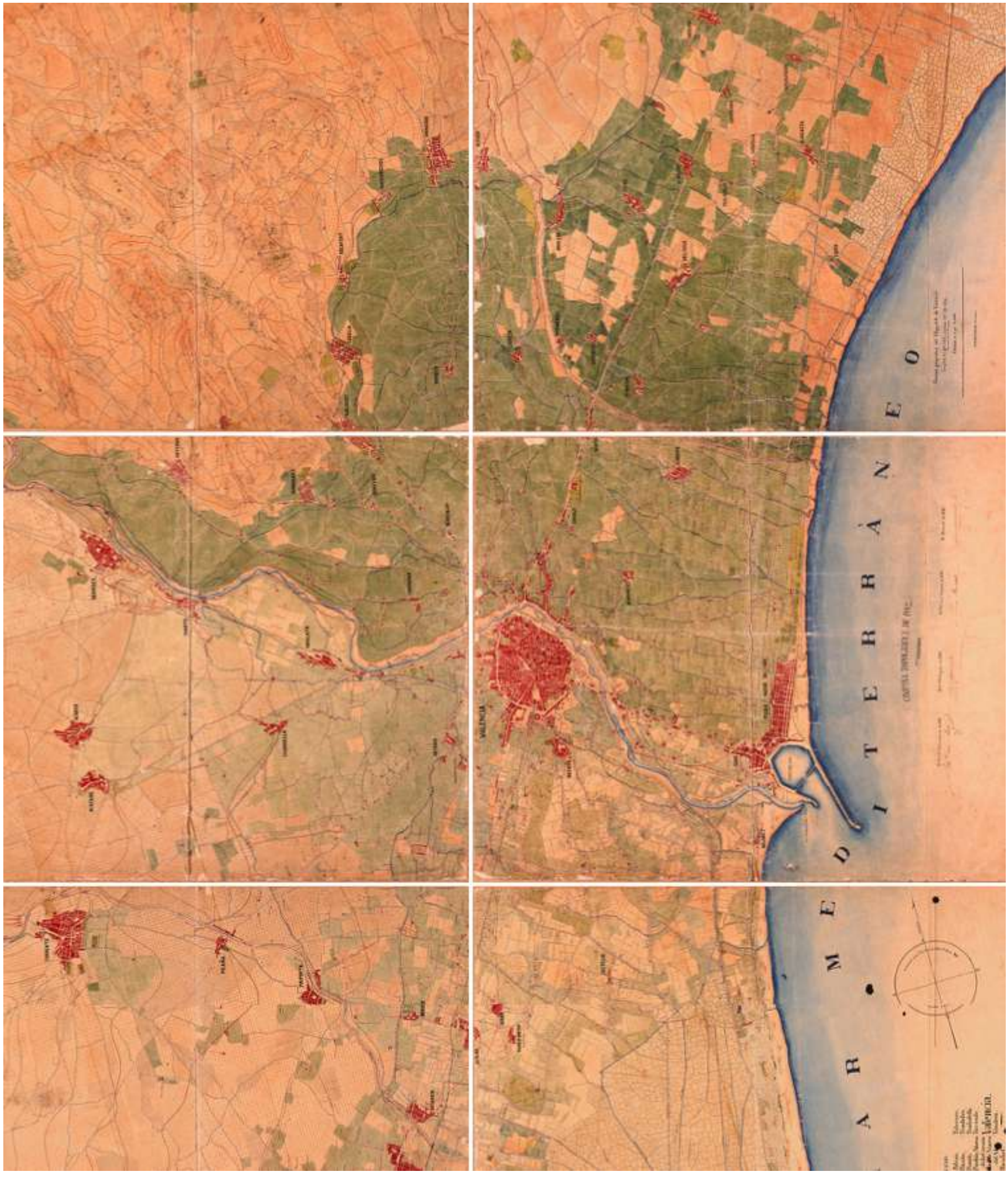


Figure IV.7. XIXth century from Militar Cartography (1882)

Figure IV.8. Connected landscapes and links

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