AGRARIAN LANDSCAPE HERITAGE AND CLIMATE CHANGE TOWARD DYNAMIC CONSERVATION

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ABSTRACT

In cultural heritage, historic agricultural landscapes combine long-lasting features with intangible significance. Landscape is more than the sum of its parts, representing a blend of heritage that is both tangible and intangible (Scazzosi, 2018; ELC, 2000, ICOMOS, 2017). Since the Venice Charter in 1964 and the Convention for the Safeguarding of the Intangible Heritage in 2003, cultural heritage has expanded beyond tangible elements to include intangibles, i.e. all knowledge derived from human practices, expressions, and associated objects and spaces recognised by communities as part of their heritage.

Disasters and climate change, caused by high greenhouse gas levels, threaten historic agricultural landscapes, damaging infrastructure, ecosystems and social systems. ICOMOS (2019) states these are essential to quality of life. However, such landscapes can help with modern challenges, such as droughts and floods.

The Venice Charter (Art.10) stresses the use of both ancient and modern integration techniques. However, ancient practices can help to mitigate the effects of climate change and prevent disasters.

To conserve and use agricultural heritage effectively, a dynamic approach is needed, along with increased awareness and knowledge among farmers and citizens. This requires going beyond "the conservation of monuments in perpetuity" (Art. 4 of the Venice Charter).

The concept of dynamic conservation, borrowed from environmental science, mirrors nature's principles: a resource degenerates if not regenerated, paralleling societal values like trust and inclusivity (Morin, 1990). It addresses climatic exigencies by managing landscape transformations over time to adapt to evolving needs while preserving structural constants (integrity) that underpin the landscape's heritage value.

The historical irrigation system in plain and mountain landscapes (intangible heritage list since December 2023) present opportunities to refill groundwater and mitigate climate change effects.

In continental climate and irrigated plain (Milan, Italy), the medieval practice of winter flooding is practised in water meadows and rice paddies: well-moistened soil can provide adequate water during spring or summer droughts and absorb excess water during floods, thereby minimizing urban damages (Branduini, 2023).

In a semi-arid climate and mountainous region (Granada-Almería, Spain), the Islamic water channel of acequias has been demonstrated to be sustainable and highly resilient for more than one thousand years. Particularly interesting are the water sowing and harvesting practices. The most famous one are the *acequias de careo,* used for the artificial aquifer recharge in the Sierra Nevada range from the

top of the mountains, with channels up to 2.500 ms hight to ensure water supply for crops irrigation and provide water to urban area (Civantos et al, 2023).

In both scenarios, the preservation of irrigation structures is coupled with farmer training courses and citizen engagement initiatives aimed at enhancing heritage awareness. The university plays a pivotal role in integrating scientific and empirical knowledge while actively enabling mediation. Heritage communities (Faro, 2003) are crucial in pursuing dynamic conservation.

Dynamic conservation preserves the intrinsic identity of heritage while engaging all stakeholders in their future stewardship and should be applied when formulating disaster risk reduction policies and initiatives for local economic and social development (UNDRR 2015).

Keywords: Dynamic conservation, Heritage communities, Participation, Identity, Nature based solution

INTRODUCTION

Within the realm of cultural heritage, historic agrarian landscapes represent a tapestry of enduring physical features intertwined with intangible significance. Landscape transcends mere accumulation, embodying a composite of tangible and intangible inheritances (Scazzosi, 2018; ELC, 2000, ICOMOS, 2017). From the Venice Charter (1964) toward the Convention for the saveguarding of Intangible heritage (2003) the concept of cultural heritage extended beyond tangible elements to embrace the intangible dimensions of heritage, encompassing the entirety of knowledge derived from human practices, expressions, and associated objects and spaces recognized by communities as part of their cultural legacy.

Historic agrarian landscapes face threats from disasters and effects of climate change, due to the unprecedented concentrations of greenhouse gases. These changes already inflict harm on infrastructure, ecosystems, and social systems – including cultural heritage – which are vital for community well-being and quality of life (ICOMOS, 2019).

However, historic agrarian landscapes can offer contemporary responses to urban climate challenges such as droughts and floods.

To conserve and utilize agrarian heritage effectively, a dynamic approach to heritage preservation is imperative, alongside heightened awareness and knowledge among farmers and citizens. This necessitates moving beyond “the conservation of monuments on a permanent basis” (Art. 4 of the Venice Charter) and connect conservation to the social contexts and integrate it with societal needs.

The agricultural landscape heritage requires dynamic conservation, as it must adapt to economic market variables and climatic emergencies. It must also respond to the needs of the farmers who manage it and the communities that live in it.

The aim of the paper is to show how, in landscapes with very different climatic characteristics (continental irrigated plain and semi-arid mountain), dynamic conservation of the agrarian landscape is implemented by involving the population in all phases of heritage conservation, from the knowledge phase to the valorisation and management phase. The role of heritage communities in a dynamic conservation approach is shown to be crucial for the implementation of effective and

sustainable climate change mitigation strategies, and the role of academia as a facilitator is fundamental in driving action.

TANGIBLE AND INTANGIBLE DIMENSION OF AGRARIAN LANDSCAPES IN THE POLICIES

Cultural landscapes have a large number of values, made up of elements in which agrarian activities and the historical relationship of human beings with the environment play a fundamental role. This cultural heritage has an obvious material part, but also another intangible, linked to practices, local ecological knowledge or beliefs and rituals, festivities or forms of social relations.

Europe has rich and complex landscapes which result from the interaction of nature and culture over time. Local communities have a crucial role to play in conserving and protecting this heritage, with benefits for communities themselves and for wider society. However, current conservation measures and land use decisions consistently fail to consider the historic and cultural dimensions of landscapes and underestimate the contribution which local practitioners make to sustaining the environment through its active use.

These elements are usually considered in terms of a general characterisation of cultural landscapes, but they are not usually considered in isolation. This is partly due to a static concept of cultural heritage which prevails in legislation, largely linked to the idea of monuments, architecture and art history. Regulations and the concept of immaterial heritage are often disconnected from reality, especially in regard to agricultural and ecological knowledge and local practices. Territorial planning and environmental regulation rarely take into account traditional practices and, in the case of the latter, traditional activities are harmed by limitations linked to a biocentric vision of nature conservation.

On the other hand, the regulations and agreements that have been developed in the EU over the last twenty years have been favouring a more integrated and complex vision of cultural landscapes (COE 2000) and citizen participation in the management and preservation of cultural heritage (COE, 2005). However, other regulations, which are clearly positive from the point of view of sustainability and the global challenges we face as a species in an increasingly degraded and environmentally unpredictable world, make no reference to this heritage or end up damaging it by the way they are transposed into national or regional legislation and planning.

Examples include the European Water Framework Directive (EU, 2000), Farm to Fork Strategy (EU, 2020a) and Circular Economy Strategy (EU, 2020b) in the EU and UK. Rural development strategies under the Common Agricultural Policy (CAP, 2023-27) have a direct impact on landscapes and culture. Development and spatial planning policies are disconnected from environmental policies. Agricultural policies typically focus on mechanising, intensifying and industrialising production, significantly impacting the environment, territory, landscapes and cultural heritage. The narrow and outdated focus on productivity and competitiveness, based on technological and engineering innovation, is problematic. Agricultural production and the rural world are undergoing changes at a global level, in parallel with society. These changes have consequences, including depopulation and the loss of identity and heritage linked to traditional farming.

Disconnected agricultural policy has negative consequences for development and the cultural models developed since modernity have always been based on the peasantry and the rural world being

denied and contemptuously disregarded. These models have been created in urban contexts since the 1950s and driven by consumerism. For all these reasons, policies to protect and conserve rural areas should also focus on traditional agricultural activities, crafts and man's historical relationship with the environment.

Agricultural heritage (Ruiz et al, 2023) comprises all assets derived or used by agricultural activity over time. It encompasses tools, traditional knowledge (soil types, crops, meteorology, languages) needed to carry out agricultural activity.

The ICOMOS-IFLA Principles on Rural Landscapes as Heritage (ICOMOS-IFLA, 2017) state that "Rural landscapes are expressions of social structures and functional organisations that realise, use and transform them, in the past and present" (Art. 1 Definition). Landscapes used for growing food, farming animals or collecting resources show how human activity affects nature. Having a variety of agricultural, forestry, livestock, fisheries, aquaculture, wildlife and other resource practices is important to support global human life in the future, including in the face of climate change. Agriculture is a social practice which has helped shape human civilisation.

It has a cultural value that is historically and traditionally rooted in the sustainable management of the environment, as well as being key to human nutrition and survival and the harmonious relationship with the territory.

DYNAMIC CONSERVATION

Dynamic conservation, borrowed from environmental science, reflects the laws of nature: a resource degenerates if it is not regenerated; societal values such as trust and inclusivity are also at stake. It adapts to climates by managing landscape change over time, maintaining the landscape's structural constants (integrity) that underpin its heritage value Landscape heritage, and especially agricultural heritage, needs adaptive conservation that responds to economic changes based on agricultural policies and global and local markets.

Adaptive conservation allows the preservation of assets' unique characteristics and engages all stakeholders in their future. In an agricultural landscape, the key is in cultivation techniques, plant associations and water management. These must be physically transmitted through training. It's also important to preserve intangibles as they're constantly changing (ICOMOS, 2008).

Regular maintenance is vital to reduce intervention costs and loss of material. It can be achieved through ongoing care (Ronchi, 2020) and networking (Della Torre, 2010).

The idea of Dynamic Conservation, from environmental science, aims to temporarily boost habitats and support species in a changing world. This approach is especially vital for migratory species, marine systems and species redistribution caused by climate change (Reynolds et al. 2017). In forestry, dynamic conservation emphasises maintaining the evolution of tree populations to ensure they can adapt.

As in nature, a resource is lost if it is not regenerated. The same is true of cultural values in society. Landscapes are made up of nature and culture, the tangible and the intangible. Both need to be regenerated, so passing on techniques and practices is as important as preserving material permanence.

Dynamic conservation for mitigating climate change risks

Dynamic conservation strategies are vital for biodiversity, especially in the face of climate change. Agriculture is particularly vulnerable to extreme weather. Its conservation must be able to adapt over time, without losing its integrity.

When defining policies for disaster risk reduction, reconstruction and local economic/social development, cultural context must be considered (UNDRR 2015). Empirical knowledge of cultural heritage can contribute to community resilience:

"Together, the proper conservation of cultural landscapes and the safeguarding of traditional knowledge, values and practices can increase communities' resilience to disasters and climate change".Community resilience is based on a cultural heritage's capacity to engage communities in a proactive process of preventing, coping with and recovering from disturbances. Heritage actions can stimulate a circular economy in the territory by strengthening cohesion, reducing urban decay, and creating employment opportunities. Systems with agro-ecological characteristics can be identified and preserved or revitalised with new projects or technologies. The aim is to promote systems that are productive, conserve resources, and are socially equitable and economically sustainable.

Dynamic conservation and people involvement

In 2002, the FAO launched the Globally Important Agricultural Heritage Systems programme (GIAHS) to protect significant agricultural landscapes. Altieri and Koohafkan's dynamic conservation approach was adopted to manage these systems(Koohafkan and Altieri, 2011). GIAHS are defined as land-use systems that support significant global biodiversity, evolving through the interaction between environment and community needs. All actions to maintain the agricultural economy in areas at risk of depopulation and land abandonment are part of the dynamic conservation of the GIAHS.

This must be implemented with stakeholders at different levels. Farmers must be supported by collaboration between traditional family farming communities, indigenous peoples and local/external institutions to encourage agro-ecological farming practices. Combining farmers' empirical knowledge with academics' scientific knowledge is key. Local expertise can be used by applying participatory development approaches. These combine the knowledge of local farmers with that of external agents to spread appropriate agricultural techniques. Rural knowledge has two strengths. It is based on both acute observation and experiential learning. External institutions can facilitate a participatory and action-oriented approach. Researchers must translate general ecological principles and natural resource management concepts into practical advice for family farmers and smallholders. Public institutions drive and order the process, and must do so continuously.

Volunteers and farmers are the human capital for dynamic landscape conservation. In the circular economy, it's vital to value human capital, not waste it, but focus on building relationships. For sustainable development, it's essential to regenerate cultural values to match the current economy. The values of cooperation, collaboration and coordination must inform investment and market choices.

Caring for cultural heritage strengthens the culture of collective memory. It encourages the inclusion of others, solidarity and integration. These must be constantly regenerated as soon as they are used

up. Cultural values must constantly be redefined in terms of freedom and responsibility. The circular economy relies on cooperation, trust, truth, transparency and respect for rules.

DYNAMIC CONSERVATION AND HERITAGE COMMUNITIES IN TWO DIFFERENT LANDSCAPES

The historical irrigation system in plain and mountain landscapes (UNESCO intangible heritage list since 2023) present opportunities to refill groundwater and mitigate climate change effects.

Landscape of irrigated plain in continental climate and mitigation of climate change effects

In continental climate and irrigated plain (Milan, Italy), the ancient practice of winter flooding is practised in water meadows (locally called *marcite*) and rice paddies: well-moistened soil can provide adequate water during spring or summer droughts and absorb excess water during floods, thereby minimizing urban damages (Branduini, 2023). *Marcita* is a type of meadow of medieval origin capable of producing large quantities of fodder thanks to a capillary network of canals that allow water to flow even in winter (Fig.1, 2 and 3). It is based on runoff irrigation, which today is frequently supplemented with irrigation pumps and drip irrigation, or automated sprinkler irrigation systems based on fixed or mobile supports. Moreover the lack of supply of animal labour, the change in cattle feed from fresh grass to silo maize, the decrease in the transmission of technique, and the decrease in manual skills, with a preference for using large and heavy machines contributed to the marcita decrease. Lastly, in the seventies, consumers refused to buy yellow milk from marcite fodder, because it was wrongly considered spoilt: dairies no longer collected yellow milk, preferring white milk from silage feeding, consequently many farmers converted their marcita fodder to maize fields (Bove, Branduini and Molina, 2020)

Fig. 1. The winter submersion of water meadows melts the snow and keeps the soil alive and forage production. (*Paola Branduini*)

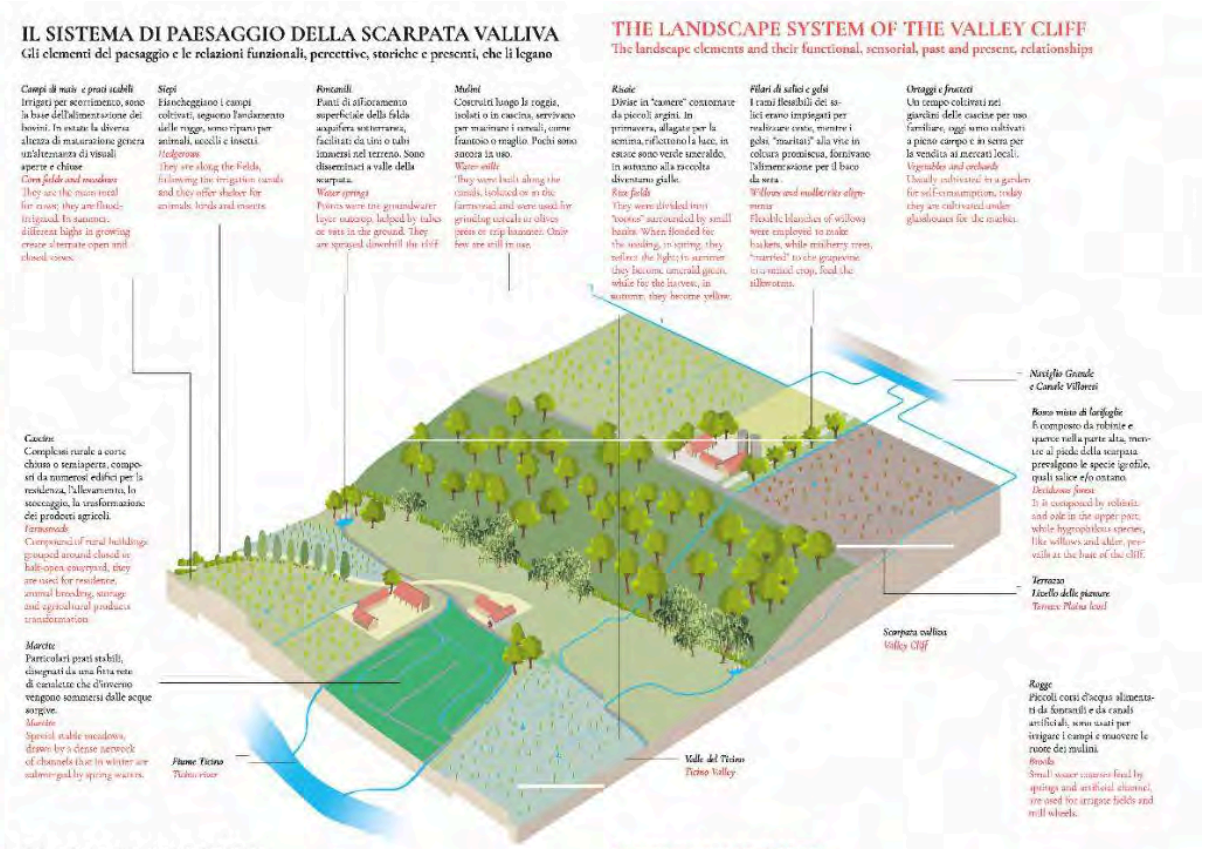

Fig.2 .The groundwater and surface water flow system in the marcita landscape (*Parco Valle del Ticino*)

Fig. 3. Manual skills in the daily management of the marcita (*Marco Tessaro*)

Climate change has brought long periods of drought and short periods of heavy rainstorms: there is less snow on the mountains and violent and short water falls from the sky, where water tends to flow superficially instead of penetrating the ground and recharging the water table. If the soil is maintained with an adequate amount of water, it is able to absorb sudden weather events and compensate for water shortages in case of drought. This has been observed in both rice fields and permanent grasslands, providing empirical evidence (Negri et al, 2020). The Interreg Central Europe project "Maurice" (www.interreg-central.eu/projects/maurice/) aims to quantify the benefits of winter irrigation in some test areas in the east of Milan. The ECHOES-Nosedo project will model the benefits of water meadows and involve high schoolers in data collection and monitoring (Polimi, Polisocial Award 2024). Agronomists have observed further positive environmental effects, including the fact that a balanced water table makes soil resilient to water: absorbing excess and providing a minimum. In contrast to dry soils, which run off like saturated soils, balanced soils are partially absorbed. A surface water table is also beneficial for surface water species such as butterflies and

frogs. Flooding in winter keeps the water table high, and low rainfall in summer provides water for plants. However, a lower water table does mean greater vulnerability. It is important to note that runoff irrigation from sprinklers or drip irrigation does not provide any benefit to the ecosystem.To ensure the optimal functioning of the water table, it is recommended to maintain flow irrigation throughout the year, with drip or sprinkler irrigation being employed exclusively during July and August.

Actions for involving people

The "Amici delle marcite" community (Friends of the *marcite*) was promoted by the PaRID lab (Research and international documentation for landscape) of ABC Department, Politecnico di Milano, around the agricultural landscape of the *marcite* to systematise a series of actions and projects for the recovery and valorisation of the management practice of the water meadow. Since the 1990s, the Ticino Park has made direct contributions to farmers to maintain the winter flooding of the *marcite*, financed by various regional (Lombardy Region, Cariplo Foundation) and European (Life) projects.

Two pilot projects for the recovery of *marcite* have been implemented: one in the Ticino Park, in the period 2017-2019 (financed by the Lombardy Region, Directorate of Agriculture) and one in the Lambro Park in Milan, between 2021 and 2023 (financed by the Lombardy Region, Directorate of Agriculture; Fondazione Cariplo, Coltivare Valore programme). Awareness-raising activities have been carried out in schools (primary, secondary, first and second grade) and at fairs (Abbiategrasso, Inveruno, Milan); a travelling exhibition and a map for a bicycle route to discover the marcite in the Ticino Park have been created; walking and cycling tours have been organised with environmental associations (FAI, Legambiente) during environmental awareness events (Milan Green Week 2019, 2022, 2023); numerous field days with university students and off-site days in companies have been organised. Two courses for new water managers (transfer of practices from old farmers to new ones) were held: the Ticino edition in 2020 and the Milan edition in 2022, attended by farmers, agronomists, environmental guides, unemployed people, including migrants (Fig.4). Foreign researchers from Japan, the United States, China, Spain, France and agricultural entrepreneurs from Switzerland were welcomed to discover *marcita*. A final event was organised for the recovery of the marcite, which initiated the conscious involvement of all actors around the landscape heritage of the marcite (2023).

As a result of the mobilisation of all these actors and the interest shown by institutions, professionals, farmers and the local population, it was decided to set up the Friends of the Marcite heritage community in order to ensure the continuity of the educational and cultural aspects, as well as the conservation and production.

In particular, the participation at the community aims to regularise the volunteers work in the maintenance phases of the *marcita*. Once the essential work to flood the *marcita* in winter has been completed (cutting back the shrubbery and herbaceous vegetation, reshaping the channels, cleaning and repairing the hydraulic structures), ongoing maintenance is required, consisting of two levels of action: on the one hand, periodic mechanical work every one or two months (mowing the grass, cleaning the banks, consolidating the artefacts), On the other hand, there are daily or weekly manual operations ("flushing" the water to allow it to flow slightly over the wings, controlling the flow of water from the main inlet to the secondary watering holes, removing obstacles - branches and rubbish - from the banks and canals, cleaning the hydraulic artefacts). The former must be carried out by an agricultural worker or gardener, as they require the ability to manoeuvre agricultural

equipment; the latter can also be carried out by specially trained volunteers, as they require limited physical effort and the use of hand tools (shovels, spades, rakes and buckets). In fact, these simple tasks were carried out both by vulnerable people employed by the social cooperative during the recovery phases of the *marcita* itself (people in social rehabilitation, people on probation, unemployed people) and by children and young people from primary and secondary schools (Fig.4 and 5).

A programme of differentiated actions has been set up for the two parties, the cooperative/farmer and the volunteers, to allow the conservation of the hydraulic artefacts recovered and the management of the vegetation part in order to maintain the *marcita* throughout the year.

Fig. 4. New water manager learning from old watermen during the course. (*Paola Branduini*)

Fig. 5. High school student cleaning and recovering a hydraulic artifact. (*Paola Branduini*)

Irrigated mountain landscape in semi-arid climate as a Nature and Culture based Solution

In semi-arid climate and mountains region (Granada and Almeria, Spain), the islamic water channel of *acequias de careo* recharge not only the high springs but also the low riverbed in case of lower average rainfall and provide water to urban area (Martos Rosillo *et al*. 2019 and 2020; Zakaluk *et al.* 2021; Jodar *et al.* 2022; Martin Civantos *et al*, 2023) (Fig. 6 and 7).

Fig. 6. Careo channel in Sierra Nevada (Lugros, Granada)

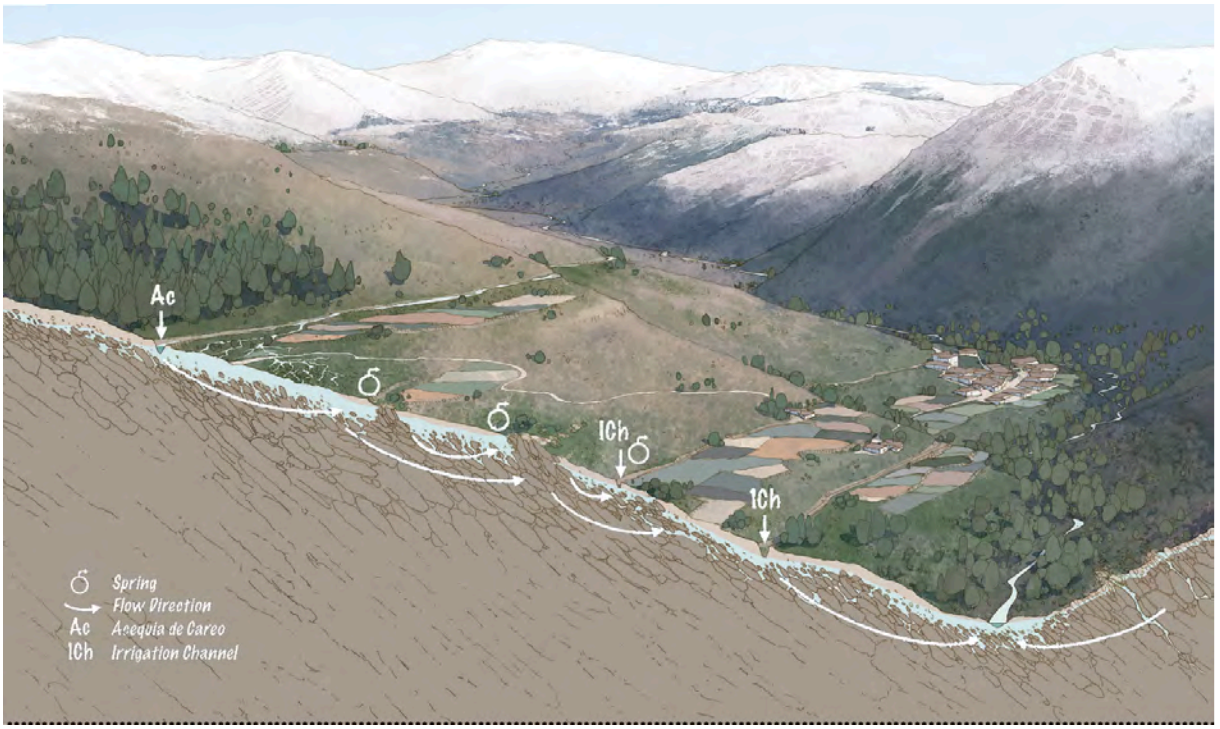

Fig. 7. Artificial aquifer recharge using the 'careos' in Sierra Nevada (Martos Rosillo *et al*. 2018)

The historical irrigation and hydraulic management systems are one of the main signs of identity of Eastern Andalusia and the Levant of the Iberian Peninsula. Their construction in medieval Islamic times has indelibly marked not only the way of life of the inhabitants and the exploitation of resources, but also the transformation of the deeply anthropised landscape. These networks of

irrigation ditches are fundamental for the recharge of aquifers and the maintenance of springs, the creation of pastures, intensive irrigated farming areas and the maintenance of biodiversity through a whole series of ecosystem services that have hitherto been little taken into account from a scientific point of view. However, the enormous territorial impact of the thousands of kilometres of irrigation ditches and the terraces and infrastructures associated with them is today threatened by the lack of profitability in the current economic context and in the face of the accelerated processes of agricultural intensification and industrialisation. The progressive disappearance of traditional forms of exploitation and the progressive fall in agricultural income have led to the marginalisation, deterioration and partial abandonment of these systems.

Over the years some of these systems have been studied, with the help of the irrigation communities themselves, the ones in charge of communal water management. In the provinces of Granada and Almería (Spain), 830 historical irrigation systems, managed by 505 irrigation communities have been documented. This represents approx 190,000 members and around 200,000 ha of irrigated land (www.regadiohistorico.es) (Fig. 8) . Almost all of them were created in the Andalusian period, during the medieval Islamic period, and many have been in existence for over a thousand years, demonstrating that these systems are highly sustainable and resilient. More than 4,000 km of irrigation ditches (only a small part of the existing ones) have been mapped. The spatial analyses carried out allowed to calculate that in these two provinces the acequia network must have had around 24,000 kms of irrigation ditches.

Fig. 8. Commoners discussing about water rights and distribution

This gives an idea of the volume, the work and effort and the organisational capacity of past peasant communities to transform the environment and ensure their subsistence, but also of the balances

generated through a co-evolutionary process that has generated landscapes of enormous cultural, environmental, social and productive values. It is possible to consider these systems such as Nature based Solutions (NbS), ecological corridors, green and blue infrastructures, Integrated Water Management Systems (IWMS) and tools for adaptation to climate change. As mentioned above, over the last thousand years they have proven to be highly sustainable and resilient, as well as productive. They are examples of socio-ecosystems in which co-evolutionary processes have generated trade-offs between humans and nature. They are also examples of participatory governance (https://regadiohistorico.es/argumentario). (Fig. 9)

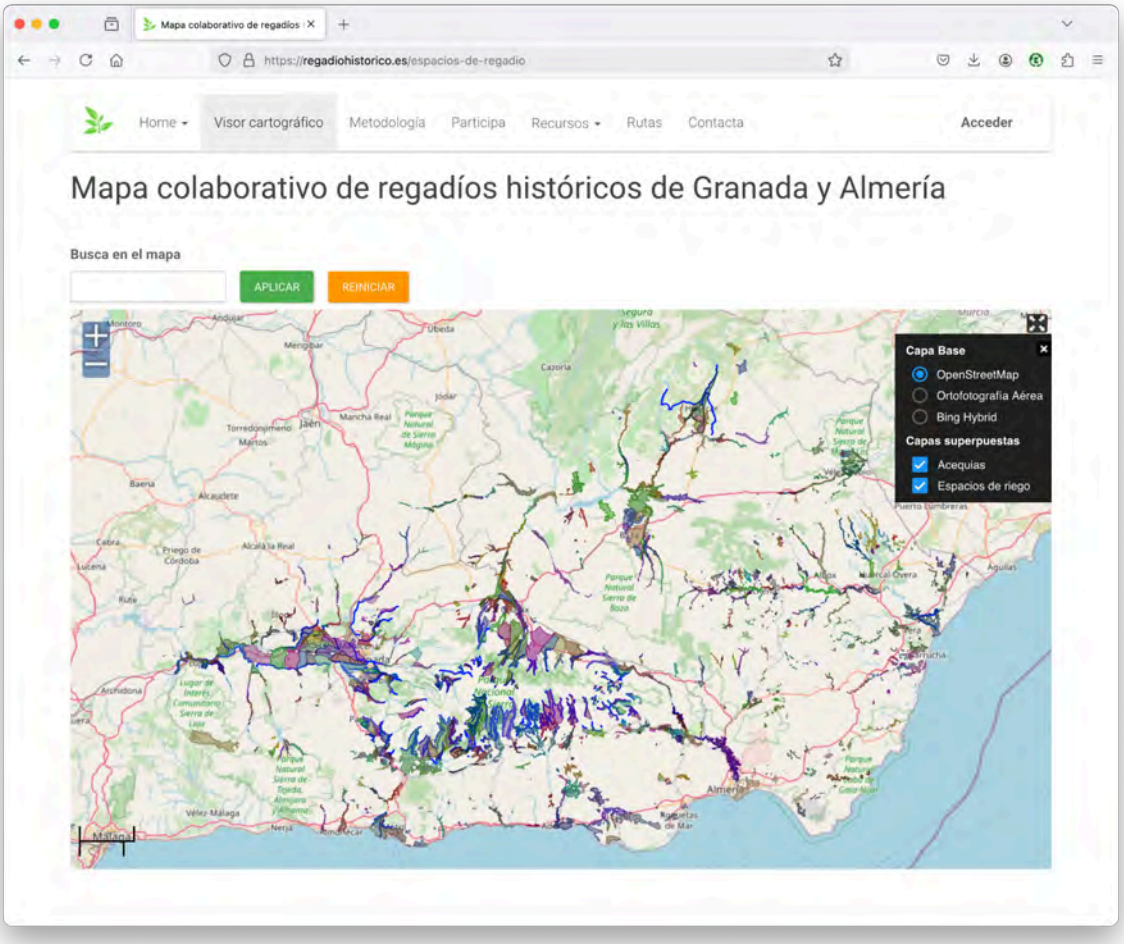

Fig. 9. Historical irrigation collaborative map of the Granada and Almería provinces.MEMOLab UGR. https://regadiohistorico.es

These systems are in danger of disappearing. Economic marginalisation has been exacerbated by intensification and industrialisation of agriculture, driven by public policies and investments based on a developmental and extractivist concept of water efficiency. This globalised and highly competitive production model has an enormous impact on the environment, resources, landscapes, neighbours and farmers themselves. Irrigation communities are facing immense pressure to implement so-called 'modernisation' projects, which destroy and replace traditional irrigation systems. These policies fail to consider the loss of knowledge and cultural heritage. Water policy is being driven by a misguided efficiency perspective, based on outdated productivism and extractivism. The premise is to save water using pressurised and localised irrigation systems. The theory is that it saves around 30% of

water, but these policies have led to a rise in water consumption. This is part of the so-called 'Jevons paradox' (Corominas Masip and Cuevas Navas 2017; González Cebollada 2018; Grafton *et al.* 2018; Lecina et al. 2009; Perry et al. 2017). The effects are devastating: they accelerate resource depletion, amplifying the impacts of climate change, and have severe social, cultural and environmental consequences.

Recovery actions with the communities

MEMOLab, the University of Granada Biocultural Archaeology Laboratory, has been working for ten years with irrigation communities to defend historical irrigation systems and their water rights, not only researching and arguing from a scientific point of view, but also proposing real alternatives. The MEMOlab proposal is based on a conception of efficiency in water use based on multifunctionality and the production of ecosystem services, which are nowadays fundamental to face the challenges of the environmental crisis. To this end, more than 100 km of irrigation ditches have been recovered since 2014, working with the communities themselves and with more than three thousand volunteers who have attended the planned activities (Fig. 10 and 11). The restoration of irrigation ditches is a social intervention tool that allows them to work in a different way with the communities. Firstly, by giving them recognition and visibility, empowering them and trying to reactivate them to improve their governance systems and recover local ecological knowledge and sustainable management practices, incorporating nature conservation and ecosystem services as a fundamental part of their activity. In this sense, the restoration of irrigation ditches can be said to be a provocation, both for the communities and for the institutions responsible for hydraulic, agrarian, heritage and territorial policies (Correa Jiménez *et al.* 2024a and 2024b).

Fig. 10. Restoration of one of the careo channels in Lugros, Northern face of Sierra Nevada-Granada

Fig. 11. Restoration of the Barjas irrigation channel in Cáñar, Southern face of Sierra Nevada (Granada)

From there, other social innovation tools have been proposed, always based on multifunctionality and with a positive return, both material and symbolic, for the communities. The first has been the agreements on payment for services, signed initially between the community and its local council, but with the idea that they are not only replicable but also scalable. Within these services provided by the irrigation communities, the creation of cultural trails along the irrigation ditches have also included, as a resource made available to the municipality for use and exploitation. The second has been the Land Stewardship contracts between the university itself or other local entities and the irrigation communities, to support the nature conservation work they carry out. The third has been the development of participatory management plans by irrigation communities, taking into account not only practicalities and infrastructure, but also the ecosystem services themselves and the values they generate. Fourthly, the implementation of river contracts at sub-basin scale has been proposed, to agree and promote collaboration between water users in order to improve planning and public policies. Fifthly, the promotion of productive alternatives based mainly on sustainability criteria, including support for local and agro-ecological production, the recovery of local varieties or the development of agroforestry projects for use as structural wood (https://revierte.es/). Finally, associations between irrigation communities have been enabled and energised, so that they can collaborate and work together to defend their historical rights, their work and governance systems, to give visibility to these values, knowledge and work, and to be interlocutors with the public administration, pushing for changes in public policies in line with a more integrated and sustainable vision of agricultural activity and water policies.

FINAL CONSIDERATIONS

In both landscapes, ancient agricultural irrigation practices demonstrate to be resilient and sustainable and offer solutions to the contemporary problems of climate change mitigation, while

they both recover existent structures without energy and material inputs and recall techniques and knowledge able to solve hydric contemporary critical issues.

In both scenarios, the preservation of irrigation structures is coupled with farmer training courses and citizen engagement initiatives aimed at enhancing heritage awareness.

Dynamic conservation of landscape as heritage takes place in the preservation of material characters and in the continuous regeneration of vegetation and human capital: landscape caring belongs to the community who recognise the values and engage in their maintenance and transmission.

The university plays a pivotal role in integrating scientific and empirical knowledge while actively enabling mediation, but it cannot replace the role of the community in making decisions.

In both examples dynamic conservation preserves the intrinsic identity of heritage while engaging all stakeholders in their future stewardship and should be apply when formulating disaster risk reduction policies and initiatives for local economic and social development (UNDRR 2015).

The initiative for the recovery of historical irrigation ditches is therefore mainly a tool for social intervention, which aims, above all, to provoke, energise and set in motion participatory processes of reflection and debate linked to action. It also aims to provoke discussion on the sustainability and multifunctionality of agricultural activity, the usefulness of local ecological knowledge, community governance and environmental, agricultural and heritage policies, and the role of the consumers in saving or destroying landscapes. One of the objectives of *marcita* and *acequia* restoration activities is precisely the reactivation of these communal functioning mechanisms, including the transmission of knowledge and the promotion of generational renewal (including old and new generation and local female participation, which is even more complicated). Therefore, it is less important that a large number of community members attend, but rather to support the community and facilitate its processes of dynamisation and empowerment as part of the intervention strategy. One of the conditions for undertaking any of these actions is that they are useful. The restoration of an irrigation ditch or the cleaning of an irrigation channel is a need, a demand, which entails a commitment to its maintenance because it will be useful for the recharge of aquifers, the creation of pastures or the irrigation of some farms. It is the use, the utility, the practice, which guarantees its maintenance. Otherwise, it would be completely impossible and would lose its meaning to a large extent.

What has been done to date, despite the effort and the figures, is very little in relation to the needs. It is not just a question of voluntary work or even the physical recovery of irrigation channels and infrastructures, but rather of recognition and support from the administrations. Recognising the multifunctionality of agricultural activity, of traditional systems, should be translated into support policies for the restoration and improvement of these systems and of the work and living conditions of those who manage and use them. Recognising these values and ecosystem services as essential for sustainability and our own development should be translated into concrete measures to facilitate the work and diversify the income and economic activity of farmers and shepherds.

Our modern Western society has always tended to despise work in the countryside, the peasantry, as a symbol of underdevelopment, ignorance, poverty and backwardness. Therefore, just as important as acting on income is acting on the recognition of agricultural activity and the local ecological knowledge and practices derived from it. This knowledge is fundamental and is scientifically valid in most cases. They have proven to be highly sustainable and resilient over generations, and have generated landscapes full of cultural, social, productive, environmental and aesthetic values that not only represent a huge capital, but are key to guaranteeing our future as a species.

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