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Emerging gaps in research on agricultural landscapes

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Abstract

This article is dedicated to Professor Hans Renes who retired after 40 years of continuous research on cultural landscapes as historical geographer in the service of the landscape. Starting with his precious teachings and valuable contribution in this field of studies and from EUCALAND's (see below) collective scientific experience, the authors of this cooperative article reflect on emerging gaps in research about European agricultural landscapes (EALs), finishing with highlighting emerging gaps. The authors will summarise a part of Hans Renes' research with a special focus on agricultural landscapes. In line with his scientific life work, he also was, since the beginning, the president of the Institute for Research on European Agricultural Landscapes e.V. (EUCALAND).

Keywords: agricultural landscapes, Europe, heritage, international, landscape research

1. Introduction

This article is dedicated to Professor Hans Renes who retired after 40 years of continuous research on cultural landscapes as a historical geographer in the service of the landscape, as Baas and Purmer (2021) called their paper to honor Hans Renes. There is no better way to express it. Unfortunately, our friend and valuable colleague passed away at the end of September 2023.

His dedication towards historic landscapes are multiple, starting with his precious teaching and valuable contribution in this field of research he was the leading expert of the EUCALAND (see below) collective scientific work. In this sense, the authors of this cooperative article reflect on research needs about European agricultural landscapes (EALs), finishing with highlighting the emerging gaps. The authors will summarise a part of Hans Renes' research with a special focus on agricultural landscapes. In line with his scientific life work, he was since the inception, the president of the Institute for Research on European Agricultural Landscapes e.V. (EUCALAND). This association aims at making agricultural landscapes of Europe, with visible and invisible characters and with tangible and intangible values, legible and accessible to the European people. The latter shall be enabled to better understand, consider and use EAL. EUCALAND's activity intends, above all, to help respect and preserve identity and heritage of agricultural landscapes. Hans Renes taught us, what landscape research means and how it could be done (Renes 2021: 108ff). He always questioned the reasons behind – behind landscape's history, behind landscape change and behind

landscape character (Renes 2010b: 76ff, Renes 2018). To understand the driving forces, helps to recognise characteristic but also differences between landscapes which do look similar at first glance (Renes 2010a: 73).

EUCALAND has members from 17 European countries; most are institutional members from universities, companies and administrations. In line with its grassroots' democracy and participatory concept of functioning, its projects and activities are constituted according to specific conditions. The primary aim is collecting national data on European Agricultural Landscapes (EAL), including classifications, descriptions and mappings. The second goal is to connect actors and to raise awareness. Therefore, the association is regularly organising workshops and conferences. Thematic working meetings are envisaged as a once a year, special session at the permanent European conference of studying the rural landscape (PECSRL) (http 11), which are organised every second year. Establishing interdisciplinary contacts between different stakeholders is another important task of the association. EUCALAND promotes the knowledge of values and meanings of EALs among the wider public in cooperation with international institutions like UNESCO, FAO-GIAHS (Globally Important Agricultural Heritage Systems), PECSRL (Permanent European Conference of studying the Rural Landscape) and ICOMOS (International Council on Monuments and Sites). It has implemented an e-Atlas on EAL, which will be continuously enlarged (http1).

Another objective of the association is to support science and research on the agricultural landscapes of Europe, especially their cultural and historical development. The research findings are regularly disseminated – aiming at the scientific public as well as towards practitioners – to make them internationally accessible for research, teaching, politicians and planners but also to the wider public (http2). Last but not least, the endorsement of relevant authorities, and organisations as well as their activities on national and international level, related to the protection of cultural landscapes is a further aim. All things considered, this seems a privileged position from which to discuss current research gaps about EALs.

2. EALs: European agricultural landscapes

Agriculture has shaped the earth's epidermis since antiquity, presenting a continuous field of interaction between man and nature (Renes 2010a: 73). It is responsible for the major shift of mankind from being a nomadic collector to becoming a permanent cultivator and producer of food. This

major change is responsible for the transformation of human societies – and as a consequence the creation of anthropogenic residential settlements, thus human colonies. The practice of agriculture, of being the provider of food, forage, fibre, bioenergy and pharmaceuticals for mankind has also created landscapes expressing all four aspects of heritage: tangible, intangible, digital and natural. According to Eurostat (2016), there are 10,3 million farms in Europe and 22 million laborers. Two-thirds of the farms are less than 5 hectares, thus expressing a mosaic of high heterogeneity. Varying from arable to crop land, fruit and vegetable groves to rice fields and mixed agro-forestry systems with semi-natural agro-systems, agricultural landscapes present great ecological, economic, aesthetic, cultural and recreational value.

EAL represents the major part of European landscapes and forms an essential part of the European rural areas' identity and heritage (Renes 2010, Renes 2019b). In 2010, EUCALAND has described 21 European agricultural landscape types (Kruse et al. 2010). Since then, it describes one EAL per year in order to provide accessible information about history, meaning, extent etc. It seeks, above all, to support research on agricultural landscapes in Europe, which risk being lost due to globalisation, intensification of agricultural practices, abandonment and a common agricultural policy (CAP) which fails to consider national, regional, local particularities and does not yet sufficiently integrate the landscape in its own measures (Green et al. 2003, Jongman (Ed) 2004).

2. The importance of further research on EAL

Why is it so important to design and implement new research on agricultural landscapes at this time – at the beginning of the Anthropocene?

The European Landscape Convention (ELC) (CoE 2000) defines a landscape as an area, as perceived by people. Applied to agricultural landscapes, this definition institutes two intertwined dimensions:

The first means that agricultural landscapes have a materiality and this materiality is the result of what farmers have done in the past in terms of agricultural production and what they do now without necessarily having a landscape intention. Thus, these landscapes are an image of the agricultural economy and can establish a connection with food products and with positive and negative effects of the farming practices on the environment. Being able to describe the landscapes precisely, to make categories, to depict their history and to identify the processes which than lead to a change is a prerequisite for any reflection on the management of agricultural landscapes.

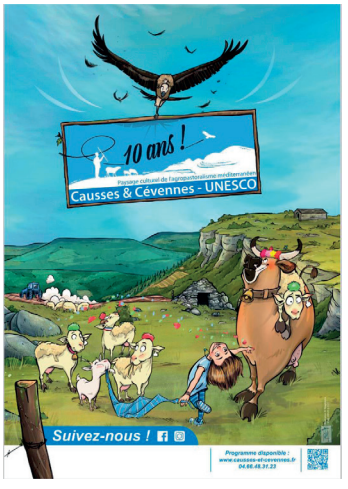


Figure 1a: Entente Interdépartementale des Causses et des Cévennes: Rapport d'activité 2020, provided by Yves Michelin.

Figure 1b: https://www.lecolombiersaintveran.com/evasion-parc-grands-causses-vacances-authentiques-pleine-nature-gite-exception-aveyron-le-colombier-saint-veran-piscine-privee-5-etoiles-proximite-viaduc-de-millau-destination-occitanie/ provided by Yves Michelin.

Secondly, it has to be stated that agricultural landscapes are also the result of personal sensitive perceptions (sight, smell, and hearing) that defer from one to another and inspire different meanings and values. Some authors consider that the landscape is like an extension of each individual (Debiesse 2016). It expresses one's own experience of a particular relationship with the world. There are not, however, as many different landscapes of the same place as there are viewers because social processes lead to shared landscape constructions. Neighbours sharing the same experiences, farmers doing the same practices in the same places can consider the landscape of their surroundings in the same way but many more general social dimensions contribute to modify the evaluation of their personal experience and weight in the debates concerning landscape protection (Debiesse 2016).

From a political point of view, all through the 20th century, in many European countries, agricultural landscapes have been a teaching subject in school to make the future citizens aware of their homeland. Famous examples are "L*e tour de la France par deux enfants*", by G. Bruno, 1877, or "*Nils Holgerssons underbara resa genom Sverige" by Selma Lagerlöf, 1906-07*). As a result, some typical agricultural landscapes have now a high value in the public opinion, even if they are disappearing, due to agricultural changes. We can see the latter in the *Causses et Cévennes* cultural landscape, inscribed on the UNESCO World Heritage List, as a testimony of Mediterranean pastoral landscapes (Figure 1).

Figure 2: "Poppy field", Claude Monet, 1873, Musée d'Orsay, provided by Yves Michelin.

UNESCO has inscribed this traditional Mediterranean agropastoral landscape because Causses et Cevennes region gathers an incredible number of typical items like this *'lavogne'*, a traditional way to store rainwater for water for the flocks (Figure 1). But great changes occurred recently in the sheep production systems and less and less farmers use them. The most beautiful landscape elements are still maintained due to the fact that they are in a protected area but as the number of farmers decreases, the landscape is closing and this shadowing is amplified by the restrictions farmers need to adapt to. The recent development is partly due to the Common Agricultural Policy of the European Union and partly due to the World Heritage inscription.

From a philosophical point of view, Alain Roger (1995) considers that a countryside which has never been artistically represented is the degree zero of a landscape. He suggests that a scenery becomes a landscape only after an artist has made an artistic representation of it (painting, photography, poetry…). After this founding event, people base their own opinion in reference to this artistic representation. His theory explains why today a majority of people appreciates a landscape of crop fields with red poppies, in reference to the famous painting of Claude Monet (Figure 2). However, at the time that Monet exhibited his painting for the first time, the critics were shocked by this representation because it gave an aesthetic value to "bad seed field" that were considered as ugly by the elite. In the same perspective, Cézanne wrote, "I do not paint a landscape as it is now but as it will be seen in the future".

Nevertheless, this theory fails to explain why people who have no artistic knowledge are able to appreciate specific landscapes. With a sociological approach, Yves Luginbuhl (2007) proposes the concept of "landscape model", an archetypal representation of different landscape types that associate different significant elements. Following him, E. Guisepelli (2005) analysed the social representations of the landscape in the northern part of the Alps and showed how these representations oriented the management plans of local stakeholders (Figure 3).

Figure 3: Left: The touristic regional model: an idealistic representation of pastoral mountains depicted predominantly in postcards, provided by Yves Michelin. Right: The emblematic model of farmers with the similar characteristics of the Tyrolian model of local elected people (E. Guisepelli, 2005), provided by Yves Michelin.

This theory helps to understand why so many tourists choose their destination with regards to the most famous places where they can see these models. For instance, the model of desert landscape that is visible in many touristic flyers is a combination of sandy dunes, camels and palm trees whereas 90 % of desert landscapes are made of stony plateaus (Figure 4).

Figure 4: Special issue of a French Weekly journal, "le 1 hebdo" with a typical desert landscape model n° 259, 2019-07-31, provided by Yves Michelin.

For all these reasons, many conflicts appraise the quality of the landscape and its future. For example, conflicts of words when people use different words whose meaning differs from one social group to another while talking about the same thing. For instance, in the French Massif Central, farmers use "fallow land" when they speak about an abandoned pasture colonized by heather for expressing their negative opinion, while environmentalists will name the same plot "heathland" and ask for the protection of this important biotope type with an extraordinary biodiversity, inscribed on a European endangered list

(http12). On the other hand, the same name is sometimes used for qualifying landscapes that are not similar. In landscapes with wetlands, many times people use the term "peatland" to describe wetlands when some of them are just low marshes without any peat. However, this lack of exactness in the terms is a source of conflict when it comes to discussing their management, as a peat bog does not function in the same way as a low marsh. This is the reason EUCALAND and its members do work a lot with glossaries, most often at the beginning of each new project: Glossaries are a tool for democracy and participation on an equal level, no matter what the stakeholder's background is (Kruse et al. 2010, Marot et al 2018, Kruse et al. 2018). The following two conflicts are especially important to mention and to overcome:

The first is a conflict of values attached to the landscape because our societies today are more urban, more distant from agricultural life and often know little about farming. The notions of *clean* or *dirty* landscape, the opposition between a wild or a human made aspect, are correlated to farming practices and, depending on the relation everybody develops with the Nature, the appreciation of the landscape quality will differ. Breeders often appreciate homogeneous dark green meadows that give them an impression of productivity and cleanness. In contrast, urban people prefer seeing less productive ones but covered with colourful flowers that attract butterflies and bees and look like pure nature.

The second is the conflict of power for the control of the land and for defining which practices are allowed or forbidden. This conflict is based on a lack of knowledge about how the agricultural landscapes had been and still are shaped by farming activity and farming practices. In many situations, local or national authorities take a decision based on standardised evaluations of what is good or bad for these landscapes, without integrating their local history, or without considering the connection with local farmers' practices and their expectations (Schmidt 1999). This idea of "good practices" has spread in the mind of many politicians, advisers and public officers, yet a practice is not good or bad in an absolute way but adapted or not to a local context (COST-ESF 2010). One typical example is the use of fire for eliminating shrubs. If fire is driven by farmers who know perfectly the weather, the fire behaviour, and have enough know-how to control it, the environmental impacts are very low and are often even considered as something positive especially for biodiversity reasons and nutritive for farming. Therefore, in the United States of America, fire is a common tool for managing nature preserves (Birnbaum 2009). Nevertheless, if the practice is forbidden in most European countries (Montiel-Molina 2015), mainly for pollution and security reasons, this knowledge disappears and only illegal practices continue with

often negative impacts on the environment (Ribet, 2014). However, it is more complicated and more time consuming to construct a solution adapted to a local situation in a participatory way than to apply a universal guideline designed by outside experts in a compulsory way (Butler 2018).

Some of these conflicts could be resolved by a careful definition of what we are talking about in terms of agricultural landscapes and by clarifying which factors are responsible for the state of these landscapes. However, this will not resolve all conflicts. Nevertheless, the remaining contentious elements could then be dealt with well-argued debates rather than through polemics based on the fight of general opinions taken out of any local context (Jones 2018). Due to the fast evolution of farming in Europe which is characterised by the reduction of the number of family farmers, the increase of big farms that belong to investors living far from the place where the farms are located, environmental crisis amplified by climatic change, deregulation of agricultural policies that engender intense and worldwide competition between producers not on an equal level.

This framework of reasoning leads to three types of research that needs to be developed urgently.

– We need research considering the materiality of agricultural landscapes. Their main goal is to produce practical tools to describe and categorise them in forms that can be shared by all stakeholders involved in cultural land management, and to model their dynamic, which are considered as the result of a combination of ecological, agricultural, economical, and social processes. In this regard, different actors and variable approaches have to be brought together. Still too often, landscape statistics are addressed (only) at bio-ecological topics. Also, landscape management is connected either to farming or to nature conservation issues instead of combining the two land use forms (Schmidt 1999). Furthermore, cultural landscape aims but also recreation needs are neglected. Although many works have already investigated this domain, a lack of knowledge still exists, especially when it comes to holistic approaches combining ecological and human processes.
– Furthermore, research exploring the social representations of the landscapes that orient people preferences and often generate conflicts is necessary. Anthropological and sociological approaches have still given a good fundamental knowledge of this aspect but need to be applied in many different social and cultural contexts. What a Swedish farmer appreciates in a landscape, whose farm produces organic pigs in the Blekinge region is rather different to what a Portuguese small farmer likes in the Montado where his black pigs feed on acorns. Nevertheless, they both produce remarkable agricultural landscapes (Kruse et al. 2010) – and related products. However,

they associate different landscape values with their landscape, which cannot be applied in another social, historical, and economical context.
– Last but not least, research on the modalities of landscape mediation favouring local participation, democratic debate and the construction of bottom-up operational solutions is needed. What Egoz (2014) defines as "landscape democracy" will be one of the major issues in the following years, but here again, there is still work to be done to make this generous idea operational.

3. EUCALAND approach: collaborative research on EALs

With this agenda in mind, EUCALAND's statutory objectives are realised especially by networking with organisation that share the same aims, collecting landscape data, making directories of publications, current projects, and translations accessible and informing about existing online databases. Therefore, the network of volunteers has decided to describe in a collaborative and participatory way one European agricultural landscape (EAL) type (Kruse, et al. 2022) each year. The comparative analysis of the historical development, cultural significance, identity, current use and meaning as well as a state of the art analysis regarding national legal status, protection and/or funding schemes is conducted. The comparison between different European countries often shows astonishing parallels as well as a lot of national differences and/or specialties, which risk being lost due to a common agricultural policy (CAP), which fails to consider national, regional, local particularities.

Some research results are summarised in the following sections. After this, an overview on missing research and especially new arguments for conducting the research will be detailed.

3.1 Wooded grasslands

In 2016, the chapter about "Wooded grasslands" was published by Centeri et al. in *Biocultural Diversity in Europe* edited by Agnoletti and Emanueli. Fifteen researchers from seven countries started EUCALAND's detailed yearly description of EALs and stated that wooded grasslands played a more important role in Europe in former times in many local landscapes than they play nowadays. Many sources have proven that they have existed since early times with a peak of importance in the nineteenth century and during a large part of the twentieth century. Today, they have the highest importance and extension in Southern Spain. Even by analysing several national data, their exact coverage in Europe is not known and thus the risk of losing them is

increasing. One of the authors' conclusions was that mapping – at least the most valuable ones (mapping of hotspots) – is needed to provide information about their presence for those who want to save them. This demand for mapping will recur regularly since with all EALs reviewed by EUCALAND.

The authors demonstrated that there are different types and subtypes of wooded grasslands and that their comparability and cultural heritage values have not been sufficiently discussed and investigated from a Pan-European point of view in the past. Although local studies and studies about single subtypes do exist, a pan-European overview is missing.

Wooded grasslands, like many historic EALs, can only be protected if they remain in use. Based on discussions with experts, local people, scientists, and examined standardised questionnaires, it was concluded that single short-time efforts for their renovation are not enough for their long-term preservation. All over Europe, wooded grasslands are facing similar problems, mainly decline and abandonment, which leads to overgrowth by bushes and trees, regardless of their location, origin, situation, and subtypes. The authors finished their comparative research with an urgent appeal for the application of a comparable approach by policy, planning, and decision-makers.

Interestingly enough, in the meantime, especially wooded grasslands, but also linear biotope types finally get the recognition for their importance as a binding link between two different habitats (grasslands and forest) (Ulrich et al 2020, IEEP 2007). Already Rackham (2000) and Hæggström (1998) have pointed out their importance for biodiversity protection, provision of ecosystem services (see further down, 4.4), socioeconomic aspects, tourism, and agricultural added values. Some of the wooded grasslands are part of the Hungarian national nature conservation area system, which means that their value has been recognized by the Hungarian authorities. In Germany, they are listed among the landscapes, which have to be protected (by law) (http 1). Nature conservation value of wooded grasslands is also mentioned in connection with high natural value (HNV) areas, where Iberian wooded grasslands are cited to have 135 plant species on a square meter compared with as few as one or two plant species on intensively managed grasslands (http2). Further research on the contribution of wooded grasslands towards global threats like climate change and the globalisation of agriculture is needed.

3.2 Terraced landscapes

The next landscape type reviewed was terraced landscapes with their great variety in form, material, function, history and construction. For many years, terraced landscapes had not been a study topic at all, although they are so

predominant in many cultural landscapes, not only in the Mediterranean but also in central and northern Europe. EUCALAND joined the emerging research network of ITLA (http3) and cooperated in some publications e.g. Kladnik et al. (2017a, 2017b), Šmid Hribar et al. (2017), Pipan and Kokalj (2017). This recent research on terraced landscapes did not only reveal impressive national inventories e.g. in Croatia (Andlar et al. 2017), Slovenia (Ažman Momirski et al. 2015 and 2009), and Slovakia (Špulerová et al. 2017). Slamova et al. (2017) delivered an analysis on environmental factors, which influence the distribution of terraces. It was very interesting to see that not only terraces on steep slopes, e.g. in river valleys exist in all countries and are most often used for wine production. Also former agricultural terraces in today's meadows, pastures and forests are very well spread around Europe (Figure 5). Knowledge is fading though, especially of the latter ones.

Like for wooded grasslands it is also true for terraced landscapes that there are many ecological values (Raba 1996, Socci 2019) which have already been recognised at least in some European countries (e.g. Hungary, Italy, Slovenia). Some terraced regions have an impressive number of indigenous and/or endangered species. On the abandoned terraces of the Sár-hegy in Hungary we can find the pallid pea (*Lathyrus pallescens*) that is strictly protected in Hungary, and also numerous other protected species, e.g. *Polygala major, Dictamnus albus, Centaurea triumfettii, Achillea chritmifolia, Jurinea mollis, Linum tenuifolium, Linum hirsutum, Pulsatilla grandis, Adonis vernalis, Phlomis tuberosa, Stipa tirsa, Stipa dasyphylla, Iris variegata, Orchis morio, Orchis tridentata, Amygdalus nana* (=*Prunus tenella*), *Ranunculus illyricus, Vinca herbacea* (Malatinszky and Penksza 2004, Malatinszky et al. 2008, Mravcsik et al. 2009).

There are many other places where these natural values show up after abandonment, all the following settlements listed are in Hungary:

- Zádorfalva: *Pulsatilla grandis, Stipa pennata, Linum flavum, Jurinea mollis, Anemone sylvestris, Prunella grandiflora,*
- Gömörszőlős: *Gymnadenia conopsea, Orchis purpurea, Orchis tridentata, Orchis militaris, Polygala major*
- Rimóc: *Gentiana cruciata, Gymnadenia conopsea, Orchis ustulata, Aster amellus, Linum hirsutum*
- Bátonyterenye-Szúpatak: *Adonis vernalis, Linum tenuifolium, Polygala major*
- Karancslapujtő: *Scabiosa canescens, Adonis vernalis, Linum hirsutum, Linum tenuifolium, Dianthus deltoides*

Advantages and disadvantages (mainly labour-intensive) are not only discussed in Europe but also in other parts of the world, e.g. China (Lui 2021). In Slovenia, where approximately 20 % of the land is terraced there

a. Former field terraces in the Vosges (France) look quite similar to those in the neighbour photo, which is located 500 km away in Germany. (Photo: A. Kruse 2019)

b. Today former field terraces are used as pasture and most people do not recognise this cultural landscape element as terraces. (Photo: A. Kruse, 2017, Dieringhausen, Oberbergisches Land, Germany)

c. An example from Switzerland, close to the border with Italy. (Photo A. Kruse 2012)

d. Abandoned terraces due to Filoxera disease, protected plants appeared, Sár-hegy, Hungary. (Photo: C. Centeri, 2014)

e. Mastic trees on terraces in Greece. (Photo E. Athanasiadou)

f. Terraces on Cyprus have many different facets and often mixed use. (Photo A. Kruse 2023)

Figure 5: Some examples for former field terraces in Europe, which show the similarities in European agricultural landscapes. Former field terraces incorporate European history as such – the need for cereal production wherever it was necessary in the mediaeval times, the decline of cereal production due to decrease in population linked to the 30-year war. Later, thanks to the increase of productivity, cereal production was concentrated on arable fields which leads to a higher performance. Therefore these less productive areas where not used for cereal production any longer.

are no funding schemes for maintaining them. Several countries have experimented with enlarging terraces to adapt them for mechanical use (tractors). While it worked out more or less fine in some parts of Slovenia), it turned to be a bad solution in the German region of the Kaiserstuhl, where cold winds and humidity in the back part of the huge terraces led to moisture (Pennig 2012). For a long time neglected, terraced landscapes played the most important role of protection against erosion and landslide (Ažman Momirski 2015), which again will increase in importance as one fact of climate change is the increasing frequency of heavy rains and thunderstorms.

In the Mediterranean region, terracing the earth was the way the old generations used to maintain the fertile soil and valuable water in place but also assist crop husbandry. This is very evident in olive groves on the Greek islands. Furthermore, looking at Chios and its unique importance to the world mastic culture (a type of resin), one can see the following pattern of utilisation of terracing: creation of dry stone wall terraces, planting of fruit trees on the edges, like almonds, figs and also mastic trees to 'bind' the dry stone wall with their root systems and 'hold' any amount of excess water draining from the levelled soil plateau and maintaining the levelled plateau for arable and horticultural crops.

3.3 Hay-making structures

From 2017 to 2019, EUCALAND did comparative research on hay-making structures with their related landscapes. Hay-making structures are a very common and nevertheless very characteristic part of the agricultural landscape of meadows and pastures and can still be found all over Europe (Špulerová et al. 2019). Even if there are many similarities, their distribution patterns, as well as their characteristics and regional features, depend on geographical area, climate, culture, and degree of agriculture. Today, intensively used hay meadows are the most dominant, using heavy machinery to store hay mostly as rounded or square bales, which have dramatically changed the appearance of hay-making landscapes throughout the last 20 years – again a European phenomenon.

EUCALAND has defined traditional hay-making structures as structures or constructions, used to quickly dry freshly cut fodder and to protect it from humidity (Špulerová et al. 2019). Although the 'ancient' forms of traditional hay-making structures are becoming a relic, due to mechanisation and the use of new technologies, they have not disappeared from the people's awareness. They remain present in cultural

events, paintings, as photo scenery or decorative elements, both in movable, seasonal form or as built artworks e.g. on roundabouts. The research has revealed not only an impressive variety of forms, materials and structures but also the persistent recognition and increasing awareness especially for ecological reasons but also for reasons concerning health, wellness and high-quality food. Considering the complexity of the research area and the extent of the collected information and data, for the first time, it was decided to spread research over a longer period and to produce two separate larger publications: One, published in 2019 by Špulerová et al. deals with the theoretical overview on three different types of hay-making structures and the reasons why they had been preserved – unlike other traditional farming techniques, thus they are associated with a strong cultural identity. A second publication by Kruse et al 2023 provides a comparative collection of national features, including a photographic overview from 9 countries.

3.4 Water meadows

Water meadows are a rare European heritage. "From the Middle Ages until the twentieth century, water meadows in Europe were primarily irrigated to improve their productivity and to lengthen the growing season." (Renes et al. 2019: 107, Figure 6). They were a common feature in plains but also in mountain areas, knowing that the technical aspects were different, depending on location, need, and natural appearance of water. Water meadows are an important agricultural heritage as they demonstrate the degree to which farmers changed and formed the land in order to gain productivity. Today, historic water meadow can hardly be detected, unless we check the digital terrain model (DTM).

Next to the described topics, several others have been worked on cooperatively, always following the same manual and methodology. The findings have already been or will be published in the coming years:

- Enclosed landscapes as part of the European Agricultural Heritage by Kruse et al. in 2022
- Transhumance, commons, and new opportunities: A European perspective by Potthoff, Kruse, Renes (accepted)
- Hay-making landscapes as part of the European Agricultural Heritage Part 2 – Country perspectives by Kruse et al. 2023
- Dispersed Settlement landscapes by Centeri et al. 2023
- Orchards by Renes et al. 2023
- Reclamation landscapes by Athanasiadou, Kruse, Renes et al. 2024

a. Historic water meadow in Germany (Paderborn). The relief structure is still visible for an educated eye. (Photo: A. Kruse, 2023)

b. The digital terrain model model still clearly shows the regularity of the water meadow of Paderborn. (Source: https://www.tim-online.nrw.de/tim-online2/)

Figure 6: Water meadows are examples for relict landscapes and agricultural heritage at the same time.

4. Outlook

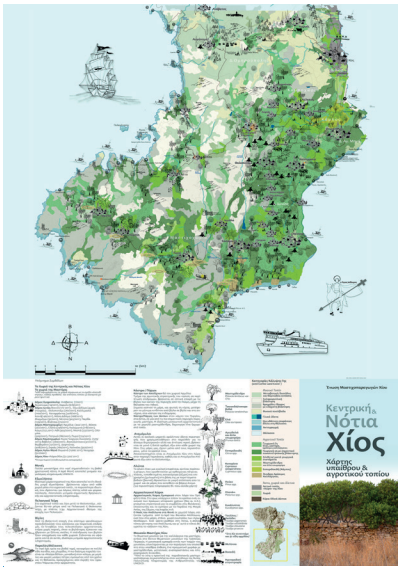
EUCALAND's motivation to achieve the enormous task of doing the above-described comparative research is not only based on the individual personal love for agricultural landscapes, but also because the network's members are convinced that research is necessary. National and European overviews on agricultural landscapes, databases and atlases – are all still needed in order to produce sound agricultural policies and regional planning (Gaillard et al. 2020, Guisepelli 2005). However, all actors are persuaded that this research is essential for future planning and for realising a sustainable and resilient way of living and production for many reasons. Some of them are briefly tackled in the following paragraphs.

4.1 People can only protect what they know

Following this presumption, it is necessary to provide actors in the rural countryside with knowledge and information (Debiesse 2016, Egoz 2014). This addresses farmers as well as landscape planners and decision-makers in regional planning. Nevertheless, this also addresses politicians and the local people, who are using landscape for leisure and as a given public good. Interestingly enough, the demand for information is growing in our society. You cannot manage a countryside with interdiction panels as it was still at the end of the 20th century. Today, people are interested in knowing the reason for measures which had been taken – for example, in forest management the reason as for keeping a landscape open or revitalising a stream bed (Figure 6). A fact, which might also be a consequence of many efforts in participation and the demand for civil society engagement.

a. In the middle of large fields, close to Versailles (France), this information board of the association of fauna and agriculture informs about the farmer's cooperative activities and the impact on flora and fauna (A. Kruse 2021).

b. Here, we have an example of a more elaborated education panel that combines having a rest and getting some information about the area one is walking or cycling through. Thematic information is provided as audio in two languages, supported by bilingual panels. The main body of the construction is made from transportion boxes for apples – the main fruit of this region (A. Kruse 2019, Altes Land/Germany).



c. A map of the rural and agricultural landscape of Chios Island (size A1), commissioned by the Mastic Grower's Association of Chios Island and created on a mostly voluntary basis by E. Athanasiadou consisting of 2 pages, the cover is exhibited here. (Athanasiadou , 2021)

Figure 7: Examples of today information and education panels.

d. These days, people are reacting rapidly to clear-cutting in forests. In 2021, the French national forest agency ONF has erected signboards to explain their measures (A. Kruse 2021, Versailles/France).

Figure 7: Examples of today information and education panels.

4.2 Stop rural exodus

From 2016 to 2019, EUCALAND conducted the FEAL Project "Multifunctional Farming for the sustainability of European Agricultural Landscapes" (Gaillard et al. 2020). The project aimed at providing young farmers, young rural entrepreneurs and family farmers a training system about the conceptualisation and implementation of sustainable, multifunctional farming practices. By linking the diverse interests of farmers – most of all, to gain a living – and the rural society within European agricultural landscapes, the project highlighted positive external effects on European agricultural landscapes of the farmer's genuine production. The project collected best practice examples from all over Europe where farmers have practiced or invented sustainable innovative concepts to be economically successful with an activity based on the valorisation of the historic cultural landscape and, at the same time, valorising the ecosystem services provided by agricultural landscapes. The examples show that the protection of landscape goes hand in hand with environmental protection and that strengthening biodiversity can increase farming's results and therefore create new visions for rural entrepreneurs. This is the beginning of a circle: If people find (again) a mean to earn a living in the rural countryside, they stay, which leads to a revitalisation of the rural countryside, which will attract new inhabitants (Slamová et al. 2021, Naturkapital Deutschland 2016, Figure 8).

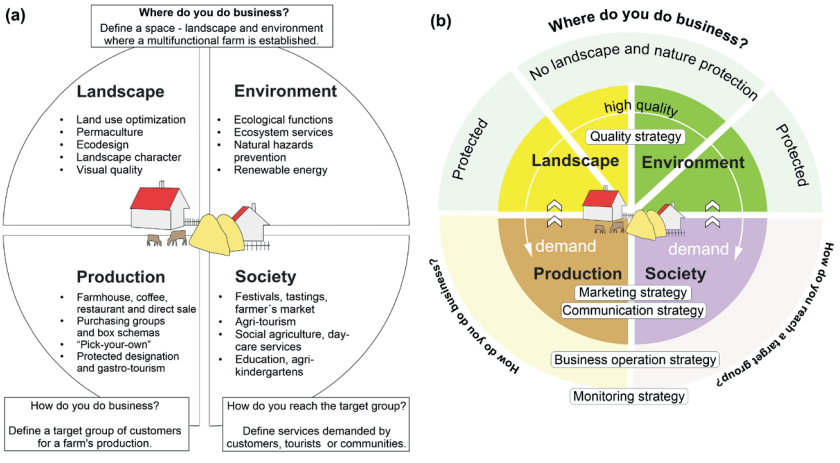


Figure 8: Left: The figure illustrates how society, farming, landscape and the environment are interwoven and depending on each other (Slamová et al. 2021).

4.3 Agricultural landscapes: Inclusion into main policy directives and initiatives (SDGs, EU Green Deal, CAP, European Landscape Convention and GIAHS)

The 17 Sustainable Development Goals (SDGs) of the United Nations via the 2030 agenda of sustainable development which was adopted in 2015 (UN, 2015) mention agricultural landscapes and they link them directly or indirectly with major global issues such as hunger and poverty, responsible consumption and production, sustainable communities, climate change etc. Sustainable agriculture is mentioned directly in Goal 2 with the expressed will to support small-scale food producers with an emphasis on women, indigenous people, family farmers, pastoralists and fishers, to implement resilient agricultural practices of increasing productivity and production. Furthermore, to maintain ecosystems, genetic diversity of seeds, plants, animals and their related wild species is mentioned as well as the overall aim to strengthen the capacity of humanity for adaptation to climate change (Gkoltsiou et al., 2021). According to the President of the European Commission, Ursula von der Leyen, The European Green Deal is Europe's new growth strategy, aiming at transforming Europe as 'the first, neutral climate continent in the world by 2050'. Four main goals (zero pollution, affordable secure energy, smarter transport and high-quality food) are supported by a 1 trillion euros investment from a just transition fund, which will leverage public and private money with the help of the European investment bank; giving investors the confidence to make long term decisions on environmentally responsible projects. Agricultural lands affect all four

goals and will be affected by the EU green deal initiatives, therefore farmers and fishermen are key to manage the transition (EC, 2019).

Dating back to 1962, the Common Agricultural Policy (CAP) presents itself as a partnership between agriculture and society and between Europe and its farmers (EC 2021). The proposed CAP reform will be implemented from January 1, 2023 on, with the agricultural sector focusing and contributing significantly to the European Green Deal via the 'farm to fork' strategy and the 'biodiversity strategy'. In order to achieve CAP strategic plants from 2023, higher ambitions are set not only on securing a fair deal and worthy economic future for farmers, but by safeguarding agriculture's position at the heart of European society and also setting higher ambitions for environmental and climate action. These three broad goals are broken down into nine specific objectives, with the objectives of climate change action, environmental health, preservation of landscapes and biodiversity and fostering of vibrant rural areas, being more involved with the aspect of 'landscapes' and this being the first time one sees the term 'landscape' directly on the focus of the CAP. Many of the agricultural landscapes are habitats belonging to Nature 2000 network (11 % of utilized agricultural area and 23 % of forest land in the EU are designated as Natura 2000 zones, farmland and forest land make up more than 70 % of the Natura 2000 network) and supporting species, which are often protected, via. i.e. the Habitats Directive and the Birds Directive (EC 2021, http13, http14). A precondition for more biodiversity on farmland is the creation of refuges in the form of landscape elements like hedges, trees, ponds, field margins and typology like short-rotation coppice, fallow land and agro-forestry systems. Maintaining wildlife corridors, 'wildlife-friendly areas', the 'state' of agricultural landscapes and 'landscape-friendly management' are also very important. Furthermore, sensitive agricultural landscapes like wetlands and peatlands ought to be protected since they are carbon–rich soils, maintained as permanent grassland (EC, 2020). For the European Commission, rural development, which is directly associated with landscape, is the second pillar of the common agricultural policy (CAP). This reinforces the first pillar of income support and market measures. Rural development is essential for 'strengthening the social, environmental and economic sustainability of rural areas, thus acknowledging that agricultural land is not just a 'factory' of income, but that it also possesses qualitative attributes (http8). The European agricultural fund for rural development (EAFRD) is the largest tool CAP has towards EU's rural development objectives. Furthermore, the EAFRD implementation is achieved via rural development programmes (RDPs), co-financed by national budgets. On priority 4, of the RDP's one finds the

goal 'restoring, preserving and enhancing Ecosystems'; and on priority 6, one finds 'social inclusion and economic development'. Notable features of RDPs include spending on climate and the environment, supporting local actions, promoting smart villages and providing financial instruments. To conclude on the CAP discourse, the heart of the European agricultural landscapes are the farmers and CAP theory sets farmers at the center of European society, trying to combat the ageing population and focusing on helping a new generations to join family business, encourage transfer knowledge etc. CAP also cleverly focuses on enhancement and enhancement of the rural landscapes farmers live, act and shape; local development of rural areas include bio-economy, sustainable forestry and eco schemes (EU, 2021).

According to the European Landscape Convention (art. 5, d) it is necessary to "integrate landscape into regional and town planning policies and in cultural, environmental, agricultural, social and economic policies, as well as in any other policies with possible direct or indirect impact on landscape"(Council of Europe, 2000), Yet, despite the need for incorporation of the word 'landscape' to official documents, the word 'landscape' is not mentioned once in United Nation's SDGs or the EU Green Deal. Is mentioned though as a major goal in the new CAP under the title 'preserving landscapes and biodiversity' (EU, 2021). By preserving agricultural landscapes, one is protecting heritage, for the generations to come.

One of the most direct initiatives on conservation and adaptive management of agricultural heritage landscapes (AHLs) and especially traditional, sustainable agri-cultural systems is GIAHS, Globally Important Agricultural Heritage Systems, initiated under the Food and Agriculture Organization (FAO) of the UN in 2002, during the World Summit on Sustainable Development (WSSD, Johannesburg, South Africa) (http15). GIAHS designation criteria focus on the 'system' and not the 'produce', setting humans and their actions at the heart of many centuries old and evolving spatio-temporal cultural landscapes, accumulating experience over and for generations, resilient to climate and other eco-challenges and socio-economic forces (Santoro & Agnoletti 2021).

Only lately, since 2020, has it been recognised by the European authorities in Brussels that cultural landscapes can play an essential role in the connection of biotopes and therefore have to be included in the new concept of Green infrastructure (Heiland 2017, http4, http6) as well as in the European Green Deal (http7), although the concepts themselves do already exist on the political agenda since at least 2009 (EC 2020a, EC 2020b, EC 2020c, Figure 9).

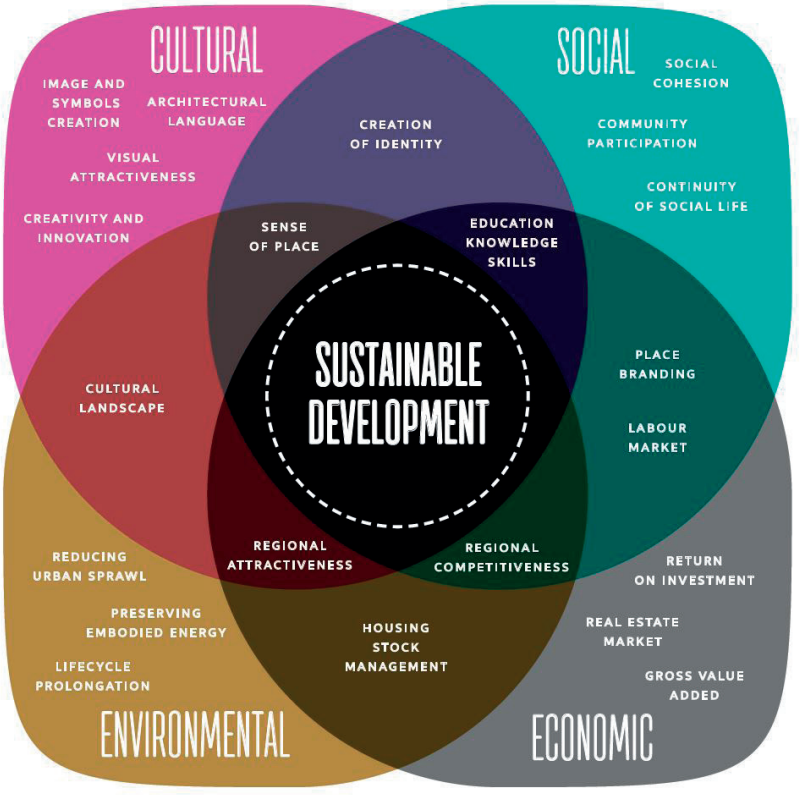


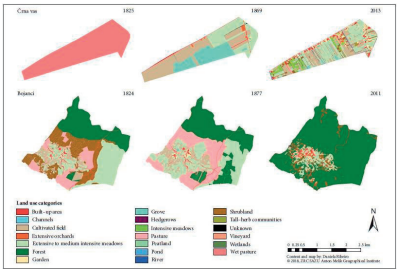
Figure 9: Cultural Landscapes as one pillar of sustainable development (Giraud-Labalte et al, 2015: 17)

In this context, several research projects with European funding have been or will be started, where cultural landscape research has been included – mostly only subsequently (e.g. http 5.). The aim of the Shared Green Deal – "Social sciences & Humanities for Achieving a Responsible, Equitable and Desirable Green Deal" – project is to stimulate shared actions on Green Deal initiatives across Europe, by providing Social Sciences and Humanities (SSH) tools to support the implementation of eight EU Green Deal policy areas, at the local and regional level. It is recognised that societal transformations are needed to deliver EU Green Deal ambitions. The project will stimulate behavioural, social and cultural change across Europe, aligned with EU Green Deal policy priorities. Uniquely, the project positions itself to bridge the 'shared' middle ground between: collectives/individuals; citizens/professionals; theory/practice; research/policy; EU/local; and social/technical.

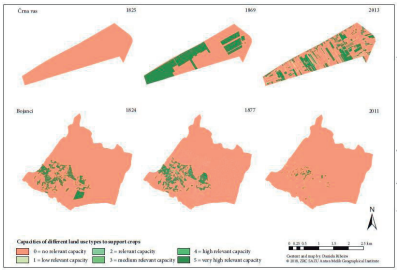
4.4 Agricultural landscapes and ecosystem services, green infrastructure and nature-based solutions

Agricultural landscapes with a mosaic of ecosystems are inherently related to ecosystem services, which are understood as the benefits that people receive from ecosystems (MEA 2005). According to the concept, ecosystems have certain functions and when they provide benefits to humans, they are referred to as ecosystem services (http16). Thus, a change in landscape structure can affect their functions and consequently ecosystem services. Ribeiro and Šmid Hribar (2019) examined the link between landscapes, their changes and the ability to provide ecosystem services. By studying two pilot areas in Slovenia, they showed that as landscapes change, so do ecosystem services (Figure 10). A comparison of selected ecosystem services provided over 180 years for the pilot areas revealed that land abandonment and depopulation caused a decline in provisioning and cultural services, while regulative ecosystem services increased. On the other hand, settlement and land intensification lead to the opposite trends: increase in provisioning and cultural ecosystem services and decrease in regulative ecosystem services. Moreover, they showed the ecosystems (or landscape elements) that require low human input, are typical of European agricultural landscapes and provide multiple ecosystem services. At the same time, such landscape elements are most threatened by intensification but also in other regions through land abandonment. It should be emphasised here that, in addition to land intensification, under-use or non-use significantly affects the multifunctionality of landscapes and thus biocultural diversity and ecosystem service flows (Mauerhofer et al. 2018). These findings are particularly relevant for landscape planners and decision-makers, who should steer and govern landscape in a sustainable way. Furthermore, it is relevant for local communities, who should be aware of the processes going on in their local landscapes?

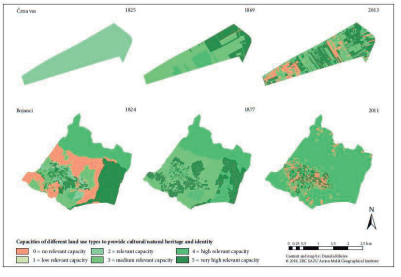
Green infrastructure is a term used a lot for urban systems, indicating that all 'green' and ' blue' natural elements of the city are of major value when it comes to improving climatic conditions, water and soil management, biodiversity, relationship of man to nature etc. Beyond the city limit, suburbia begins and rurality, in many cases large areas of agricultural landscapes, provide substantial patches of green, preserving as well as managing fauna, flora, soils, water and microclimate. Agricultural landscapes are big green infrastructural patches providing ecosystem services and improving ecology, at least in regards to the sterile and ecologically unfriendly urban lands.



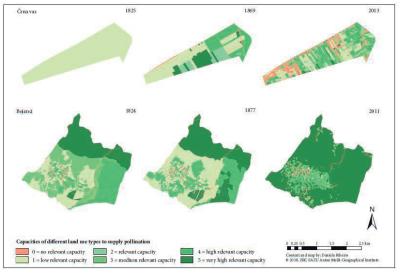
Land use categories in the research area.



Capacity of different land use types to support crops.



Capacity of different land use types to provide cultural/natural heritage and identity.



Capacity of different land use types to supply pollination.

Figure 10: 4 maps of landscape changes and changes in capacities, based on a Spanish research (Ribeiro and Šmid Hribar 2019). The maps show the ecosystem services agricultural landscapes can provide. Graphics provided by M. Šmid Hribar.

Nature-based solutions are solutions inspired by nature (EC, nature-based-solutions) and which technically do not depend on human technology, but on nature's way of dealing with problems and building efficiency, sustainability and resilience. These are cost-effective solutions, which depend on natural processes and landscapes as infrastructure, which have to 'benefit biodiversity and support delivery of a range of ecosystem services' (EC, nature-based-solutions). Agricultural landscapes are large scale green infrastructure, their careful and sustainable management can prevent soil erosion and preserve organic matter, conserve water, aid life of various flora and fauna and ultimately help combat climate change via careful re-planning, re-design and management.

4.5 Managing agro-urban landscapes

Agricultural landscapes have been re-conceptualized according to the principle of multifunctionality: in addition to the production of food, they can produce feed and fibres, conserve biodiversity, produce renewable energy and offer social, cultural and leisure services to the citizens (Brandt, Vejre,

2003). Many parts of Europe can be considered as rural-urban continuity, where farmers and urban citizens work and live side by side. Nearby, quality food production is probably the most important benefit of an agro-urban continuum: wheat, fruits, vegetables, renewable energies are provided by farming land; green infrastructure within farming landscape contributes to biodiversity, connecting the ecological networks. Finally, urban dwellers can use farming spaces as a sort of huge park, hiking in a "leisure landscape" (Bujis, Pedroli, Luginbuhl, 2006). It must be said however that all these benefits are more potential than real, since agricultural production is not always ecologically and productively diverse, nor urban-related, nor as sustainable as it should be. Moreover, the more urbanisation spreads and agriculture intensifies, the more conflicts emerge, in terms of land use, pesticide pollution, tensions for mobility, etc. Therefore, urban dynamics, agricultural practices, environmental processes often collide with citizens' expectations, requiring a great effort to manage the interaction between agricultural landscape and urban functions. Farming and habitation side by side can carry mutual benefits but also reciprocal disturbances. This intertwined situation needs a reciprocal adaptation between farmers and inhabitants, with common objectives, shared rules and integrated policies (Ferrario, 2010). Managing agro-urban landscapes needs unconventional urban planning and integrated policies that must be sustained by new geographic interpretations.

5. Future Research

In the future, EUCALAND will put even more effort into international and interdisciplinary communication among researchers and practitioners on agricultural landscapes, especially in Europe but also worldwide. They will facilitate, expand and promote, in particular through scientific events, publications and internet presentations exchange among them. In particular the cooperation between the younger generations of scientists shall be consolidated. The important interconnection between and among research on agricultural landscapes for questions of environmental protection, landscape planning and rural development stresses the need for new and more research. Additionally, researchers must be aware of the farmers' needs in terms of education and training in order to link-up agricultural land use with the goals of sustainable development as well as to strengthen their sense of place (Feld et al. 1996). European projects like FEAL and TRANSFARM in which EUCALAND is actively participating aim at filling this gap (http17, http18).

While looking at the need for more awareness-raising in the general public concerning agricultural landscapes, the connection established between cultural heritage, cultural *and* agricultural landscapes when inventories of cultural elements are being implemented and collected in a databank as well as measures of valorisation of the landscape are being taken highly contributes to the protection and consideration of the landscape.

As was shown, the future research needs to overcome several types of obstacles and implement a new methodological approach:

– Overcome the lack of multidisciplinarity: Because this type of research requires a great deal of open-mindedness, rigor in the analyses and is difficult to valorise scientifically. One way is to focus only on several elements in the landscape that help institute a dialogue between natural and human sciences;
– The lack of operativeness: Because it is not easy to publish the result of such works;
– The lack of local democracy: Because to access this dimension, researcher must leave their position as an observer and become, at least for a while, an actor in the ongoing social process. This requires a great deal of empathy, because in order to draw general lessons, they must return to their distant position, which is not always easy to justify to the local actors.

This is also, what Hans Renes impressively demanded in his farewell lecture "Landscape, Heritage and National Identities. Multidisciplinarity, cooperation, overcoming of borders – in our life, in our minds and first of all in our research (Renes 2022). The interdisciplinary project *Cultural Heritage counts for Europe* (Giraud-Labalte et al. 2015) resumes with 10 key messages as strategic recommendations. The authors would like to lean on these key messages, adapted for agricultural landscapes in order to prove why their research counts more than ever:

1. Agricultural landscapes are a key component and contributor to the attractiveness of European regions, in terms of private sector inward investment, offering recreation for people from both the towns and rural areas.
2. Agricultural landscapes are attracting talents and footloose businesses – thereby enhancing regional competitiveness both within Europe and globally.
3. Agricultural landscapes provide European countries and regions with an often unique identity that creates compelling narratives providing the basis for effective marketing strategies aimed at developing agricultural tourism and attracting investment.

4. Agricultural landscapes are a significant creator of jobs across Europe, covering a wide range of new types of job and skill levels: from conservation-related farming to all kind of multifunctional farming and related businesses.
5. Agricultural landscapes are an important source of creativity and innovation, generating new ideas and solutions to problems, and creating innovative services — ranging from sustainable land use techniques, new sorts of healthy food, to eco-system-services, landscape management, and recreation infrastructure, making them accessible to citizens and visitors.
6. Agricultural landscapes have a record of accomplishment on providing a good return on investment and is a significant generator of tax revenue for public authorities both from the direct economic activities of farming and indirectly through spill-over from agricultural landscape related projects leading to further investment. This can mean at any time the influx of population into the rural areas. This trend has gained new importance since the Covid-pandemic of 2020.
7. Agricultural landscapes are a catalyst for sustainable heritage-led regeneration.
8. Agricultural landscapes are a part of the solution to Europe's climate change challenges, for example through renewable energy production, CO2-binding production and sustainable, soil protecting production forms.
9. Agricultural landscapes contribute to the quality of life, providing character and ambience to neighbourhoods, towns and regions across Europe and making them popular places to live, work in and visit – attractive to both residents and tourists.
10. Agricultural landscapes provide an essential stimulus to education and lifelong learning, including a better understanding of history as well as feelings of civic pride and belonging, and fosters cooperation and personal development.

As was shown in this article, agricultural landscapes combine many of the above-mentioned positive impacts to build social capital and help deliver social cohesion in communities across Europe – not only in model projects, providing a framework for participation and engagement as well as fostering integration. Therefore, in the future, EUCALAND will focus even more on interdisciplinary, joint forces of all disciplines working on agricultural landscapes i.e. agronomists, ecologists, landscape architects, planners with all potential stakeholders i.e. farmers, the public, students

and investors in order to reach out to policy makers. These latter have to be convinced about the importance of those rural, neglected agricultural landscapes as units capable of making a change towards a socio-economic and ecological future with planet earth. Cities might still be man's favourite habitat, yet it is the rural landscape that possesses the power to connect humans to mother earth, a connection very much needed, especially in the competitive and non-human urban anthropogenic settlements.

Future emerging research of EUCALAND counts on the enlargement of the team of experts from different countries and professions. EUCALAND experts created a concept of the EALs E-Atlas (http10), as one output of the successful FEAL project. The EAL database will be gradually enlarged and disseminated. Common international collaboration on the variety of EALs requires the methodology strengthening and terminology refinement. Therefore, exchange of attitudes, exact facts and last but not least, free academic debates with a broad scientific community and public bodies engaged in landscape management during *The Permanent European Conference for the Study of the Rural Landscape* (PECSRL) (http11) always bring a fruitful palimpsest of information. This international scientific platform started in 1957 and it is the driving force of the EALs research. An individual subjectively perceives a landscape (Egoz 2014). Even if we agree that landscape planning and management has to be based on exact data, we are reminded that it is necessary to link these data with the views and opinions of the local population, living in the countryside (Debiesse 2016). The daily work of residents create not only economic but also cultural value and initiates important social ties. Research in this area is generally underdeveloped and EUCALAND has the scientific potential to fill this gap.

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