

Knowing the landscape to understand the territory: A case study in agronomy education

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Abstract: GUIPA is a trademark created to publish new-conception guides which lead to knowledge of a territory through comprehension of its landscapes. GUIPA also organizes training in reading the landscape following an holistic approach. The training development and the application of reading the landscape technique was applied to a case study in agronomy education. Both the educational aspects and the case study are the topics of this paper. The training course teaches professional interested in landscape management and territory planning techniques to interpret and understand the landscape. To show advantages of these techniques, a case study was conducted on the coastal plain in eastern Liguria where a PhD student in agronomy is conducting his research on effects on land abandonment on vegetation management in and around the cultivated fields. This new approach to landscape reading reveals the connection between the agricultural vocation and the history of the area. The knowledge framework that emerges can support local authorities to manage and plan agricultural activities accordingly.

Keywords: holistic approach, landscape reading, history, geomorphology, agronomy, education, planning

Short introduction to GUIPA

GUIPA, an acronym for Guides to the Landscape in Italian, is a trademark created in 2004 to publish new-conception guides which lead to knowledge of a territory through comprehension of its landscapes.

A landscape is not just a synthesis of elements, natural and human, comprising a territory but is a picture (or better, a snapshot) of a dynamic whole in which these elements relate to one another in a scheme resulting from the history of a place. A landscape embodies not only the natural history of an area but also the events and culture of the people who have inhabited it.

Understanding the landscape, its features, the distribution of its components and their interrelations means giving a meaning to nature's forms and seeing how human endeavor has modified the natural environment. And so aside from the scenic aspect, the landscape possesses a specific significance, comprehension of which is indispensable to a correct assessment of any intervention to be effected, whether conservationist or developmental, as well as being a stimulus for the observant traveler.

Although reading the landscape has an important role in many disciplines involved in land study, planning and management, outside specific circles its multi and trans-disciplinary approach is still scarcely applied. Nevertheless the holistic character of landscape analysis is the key to a complete understanding of the interactions between human activities and natural territorial assessment.

The aim of GUIPA is to popularize landscape knowledge following an holistic approach, which is inspired by the methods used in studying landscapes for professional/scientific purposes. From the practical standpoint it meant creating a publication that makes popular and appealing an approach that students of a territory normally have towards the landscape: *descriptions and explanations of the natural and human dynamics whose evolution and interaction have made a territory what it is today.*

Among its activities GUIPA also organizes training in reading the landscape following the holistic approach devoted to students, professionals and other stakeholders. GUIPA-WEB is the

communication tool used as interactive instrument between the user and the landscape/territory at any level of knowledge and it can serve as an interface divulging landscaping effects of human intervention and verifying its feedback. Thanks to its holistic approach to landscape understanding, GUIPA-WEB is particularly useful in dealing with landscapes where human factors and natural territorial assessment are strongly interconnected and variable (for instance a rural landscape).

The training programme/development and an application of the GUIPA approach in an agronomic case study are the topics of this paper.

Course of reading the landscape following an holistic approach

Aim of the course

The aim of the course is to teach basic concepts in reading and interpreting the landscape as a tool for territory understanding. The course is addressed to professionals, students and other stakeholders carrying out studies or activities connected to the territory and/or dealing with landscape valorisation, protection and planning. More in detail the involved fields are the following.

a) Territory Planning and Management

- √ *Target activities* – Landscape evaluation, valorisation and planning. Territory development planning. Landscape/environmental monitoring
- √ *Related disciplines* - Agronomy, archaeology, architecture, biology, botany, ecology, environmental engineering, forest sciences, geology, history.

b) Tourism Industry

- √ *Target activities* – Cultural tourism dealing with environment, history and wine & food. Territorial marketing.
- √ *Related disciplines* - Environmental and cultural tourism guiding. Environmental and cultural tourism tour operating.

c) Education and Scientific Popularization

- √ *Target activities* – Landscaping popularization. Environmental education
- √ *Related disciplines* - Agronomy, archaeology, architecture, biology, botany, ecology, environmental engineering, forest sciences, geology, history.

The ideal stakeholder has good knowledge of one discipline, at least, and basic of other disciplines. More in general, all stakeholders with no specialization but with a cultural base sufficient to approach the disciplines involved in general terms can participate in the course.

Content of the programme/course

The main purpose of the course is to provide the stakeholder with the ability to consider the landscape as a key factor in territory understanding.

The holistic approach explains how each single element shaping the territory is strictly connected to all other elements even if they belong to a totally different study field. This view will help to better understand the dynamics and meaning of each element under examination and consequently could improve its possible result/application.

In order to achieve its purpose the programme is basically finalized to teach a study method applicable to landscaping whatever the target activity. The course consists of both theoretical and practical sections.

The theoretical section (16 h) includes:

- √ General part (introduction to the meaning of landscape and overview of landscape interpretation theories).
- √ Preparatory part (natural and human factors shaping the landscape, interaction between the natural environment and human activity)
- √ Specific part (landscaping as multidisciplinary study, reading the landscape with an holistic approach: philosophy and method)
- √ Applicatory part (landscaping in territory study, planning and management, guipa-web: a tool for landscaping application and popularization)

The practical section (24 h) includes:

- √ Landscape reading and related interpretation method applied to a case study (preliminary investigation, landscape elements field survey: their distribution and space-time relationship with other elements, preliminary interpretation, documentary verification and meaning of present-day and historical interactions, final landscape interpretation). In this part the stakeholder is requested to fill in a data-collection card including both field and documentary data related to the case study.
- √ Landscape representation (realization of panoramic photos and photo elaboration technique).
- √ The panoramic photos together with the data-collection card will allow the stakeholder to prepare a proof of GUIPA - web application specifically referred to the case study.

In total the course lasts six days

Analysis of the interactions between research disciplines and between research and education/formation

The course emphasizes the importance of a multidisciplinary approach to territory study, also in the case of analysis aiming at comprehension of specific discipline-related factors. Resulting from abiotic (geology, geomorphology, building, mining etc.) and biotic processes (ecology, agriculture, etc.), landscape is the synthesis element which combines the different disciplines involved in territory study. Holistic landscaping outlines how the contribution of each discipline is indispensable to correct territory comprehension. For instance, to better understand/evaluate land's agronomic characteristics it is important to consider interactions between agriculture and other territory elements as type of stone, landform, soil characteristics, animal/vegetation occurrence, human history, building, land use, etc. Holistic landscaping facilitates understanding of how the above mentioned elements (disciplines) interact (and had interacted in the past) with agriculture.

In terms of education this approach enables the student to consider specialized knowledge in a larger context from both the scientific research and practical use standpoints. The multidisciplinary approach to territory study is both the success of the course and its difficulty. The wide range of knowledge (disciplines) involved and their relationships is indubitably perceived as an innovative approach, giving the stakeholder unexpected and stimulating perspectives. On the other hand, the same factor could discourage the stakeholder unless supported by a sufficient basic knowledge/interest.

Links between the educational programme and action and work experience

The main stimulus inducing stakeholders to take the course is learning a new method of territory study. This will lead to different results according to the stakeholder's professional/study qualification. In the case of activity not related to a specific discipline, such as cultural tourism, the holistic approach to landscaping gives a global view of territory able to improve professional performance. In case of specialistic activity, both professional and scientific, the multidisciplinary approach to landscaping provides better understanding of the dynamics and results of each discipline

involved in territory study. In any case the educational programme represents an innovative approach/knowledge upgrading current activity.

Reading the landscape with an holistic approach is still not a professional/scientific activity/discipline. Nevertheless its application could become a profitable route to follow in performing territory related study/activity. As a matter of fact, work opportunities are already existing in many fields, such as tourism, territory planning and valorisation, land use, etc.

Evaluation

The first session of the course was held in southern Sardinia and its basic purpose was to popularize reading the landscape as new approach for cultural tourism. The feedback from the first session clearly indicates that reading the landscape with an holistic view is a stimulating and useful practice for professionals with different qualifications involved in landscaping. Several participants in the course and professionals expressly contacted believe that holistically reading the landscape could become a new professional activity concerning land planning and management for both conservation and use of the territory.

According to these results GUIPA is now planning courses of holistic landscape reading expressly devoted to professionals in order to provide basic knowledge of this possible new discipline.

Probably the most significant bottleneck encountered during the course was the practical representation of the examined landscapes. In the educational programme landscape representation requires sketch maps and panoramic pictures to be used as graphic support to carry on the study case. In many cases the stakeholder had difficulties in practical execution of both sketch maps and panoramic pictures, therefore reducing the education potential of the course. Actually sketch maps don't require high quality and they could also be very rough, while on the contrary panoramic pictures have to show medium to good quality and their creation requires a certain ability. In order to avoid/limit this problem, a section of the course is devoted to panoramic photograph realization and photo elaboration techniques.

The course, and more in general the study method for reading the landscape with an holistic approach, could be successfully adapted to all educational contexts dealing with territory study in both the scientific and professional fields.

Reading the landscape following an holistic approach in agronomy education

Study framework

The study was conducted on the coastal plain along the southwestern edge of the Apuan Alps (Italy) (Fig. 1) in an area which is subject to a PhD thesis regarding land abandonment effects on management of the vegetation in and around remaining cultivated fields.

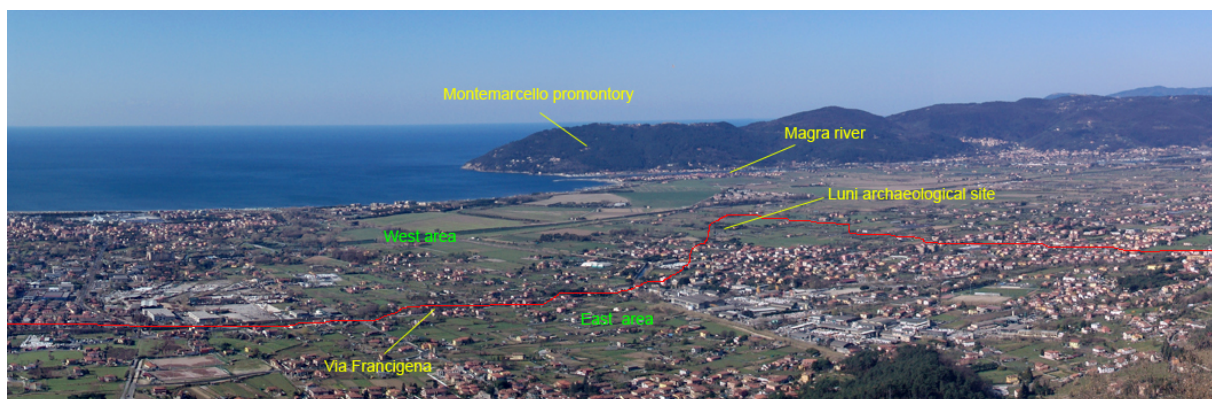


Figure 1. Luni coastal plain.

The plain has long been populated and the original natural appearance of the territory has been largely obliterated both by the presence of more or less concentrated human settlements and by the use for production purposes of almost all of the rest of the available area. Human inhabitation of this territory dates from ancient times and even in the Roman epoch the plain was widely populated, although settlement distribution and use of the land were different from what they are now. In fact, what we see today in terms of human presence/activity is the result of the plain's continuous adaptation to the population's needs and the physical changes it has undergone through the centuries. In particular, the evolution of the characteristics of the human community in the past two thousand years is closely tied to the geological and geomorphologic evolution of the territory; a relationship that has surely also had an influence on current farming on the plain, in terms of both production capacity and the areal distribution of farmlands.

Thanks to its interpretation of natural and human marks made on the territory, the holistic reading of the landscape makes it possible to comprehend the general dynamics of this relationship. The knowledge framework that emerges is very useful in the stage of managing and planning agricultural work and other activities eventually connected with it.

Reading and interpreting the landscape

The proposed reading method begins – after collecting and analyzing bibliographical documentation for the territory being examined – with identifying what can be considered the landscape's main features. In this specific case, the elements most typical of the landscape of the plain are the *non-uniform distribution of residential settlements and a perceptible variability in area of the zones devoted to farming*. In fact, if we exclude the urban area of Marina di Carrara, on the plain we find an area featuring the presence of very extensive farmlands, usually devoted to intensive single-crop farming, with relatively small population density, along with a much more populated area having farmland fragmented into small plots frequently used for densely-planted mixed crops. The former area is fragmented by the highway and ends westward near the Magra river whose course is part of the Montemarcello-Magra Natural Park.

On the scenic scale the contact zone between the two areas looks uneven and at times quite nuanced, but a direct survey of the territory would show that in reality the two areas are cleanly separated by a morphologic rise of a few meters oriented approximately North-South determined by the two areas' differing in elevation: the western area is lower than the eastern area.

On the landscape level it is also possible to note that between the two areas there is a structure whose significance is very interesting for the purposes of our interpretation: these are the ruins of the ancient Roman city of Luna, founded in 177 B.C. and host to a port from which were shipped the marbles extracted from the Apuan quarries. The port is a few kilometres inland from the current coastline and so the plain we see today must have undergone great changes from its appearance in Roman times. This means that the key to reading the entire territorial context can be found in the dynamics underlying formation of the plain.

From this standpoint, simply looking at the landscape leads one to imagine that the plain was formed by the accumulation of alluvial deposits, especially from the Magra River, whose mouth can be seen in the distance underneath the Montemarcello promontory. Surveys stemming from this observation indicate that the coastal plain developed over a graben, still active today, between the SW edge of the Apuan chain and the Montemarcello promontory. As it sank the graben was gradually filled with detritus borne by the watercourses flowing down the mountains in the zone. In this genetic context the relationship between the velocity at which the graben sank, the amount of detritus with which it was filled and the velocity at which this happened, and the oscillations in sea level, must have led to frequent variations over time of the height and size of the coastal plain. So one can hypothesize that, for its very nature, in the course of its formation the entire plain underwent variations both in breadth and in environmental characteristics of such magnitude as to have an (often determinant) influence on the fates of the populations inhabiting it. In fact, in the past two thousand years the coastal area has gradually been filled in, greatly increasing its size. And testimonials to this

enlargement can be seen today in the form of historical structures and settlements (such as the city of Luna) whose position finds a logical explanation only in a territorial context very different from today's that must have characterized the zone in earlier epochs.

Analysis of the historical survey indicates that the fall of the Roman Empire and the subsequent progressive fill-in of the harbour caused a decrease in economical activities of the area (Fazzini & Maffei, 2000). Together with the fact that in medieval times the shoreline facing the ruins of Luna became an unhealthy and uninhabited swampland, these developments can be considered the main reasons for the city was abandoned. Given the dynamics of the landfill the physical limits between the marsh and hinterland must have been constituted by an eroded ridge approximately corresponding to the ancient coastline in Roman times. This ridge is what now separates the two different areas identifiable on the scenic level, which coincide, respectively, with the swampy area and hinterland in medieval times (Delano Smith, 1986).

Showing the diversity between the two areas, the landscape thus provided the input needed to understand not only the evolution that gave the territory its current characteristics but also how this evolution was the result of the interaction of different components. In fact, the differences seen were clearly due both to reasons of an environmental order (soil composition, water system, etc.) and to those of an historical nature (farming traditions, land parcelling, etc.), which in any case seem directly or indirectly tied to a particular geomorphologic (and, in turn, geological) evolution of the plain. In essence, the holistic interpretation of the landscape brought to light the close relationship existing between geology, geomorphology, the history of human settlement and the current characteristics of human inhabitation (structures, activities).

With the great deal of information revealed by these connections comes the possibility of reconstructing – with good approximation – the traces of the Via Francigena, the road that in medieval times connected northern Europe with Rome and that doubtless passed through the ruined city of Luna. It is likely, for a set of historical reasons and practical considerations, that the road passed through the interior near the banks of the ancient swamp, probably following a trail that must at least partly have been used in the Roman epoch. As the territory stands today the ancient route can be found along the contact zone between the two areas previously described. As well as being an element of indubitable historical value, this fact creates a direct relation between the distribution of farmlands having different characteristics and the main historic road in the zone, thus opening interesting prospects for studying the evolution of land use on the basis of greater or lesser frequentation of the territory.

The holistic interpretation of the landscape could also provide a key for reading current agricultural uses of the territory. Considering the two areas from an agronomic point of view we can easily locate two very differentiated agricultural systems:

Area east of Via Francigena

General description

This area is characterized by a highly fragmented and differentiated landscape with a high planned biodiversity and small fields (table 1). Here we can find little orchards, olive-groves, horticulture, vineyards and gardens all intermingled with individual houses (fig.2). All these systems require an intensive manual labour force because mechanization is almost impossible due to reduced field surface. Hobby farmers have an important role in keeping land cultivated.

Table 1. Landscape characteristics of the 2 areas, west and east of via Francigena.

Landscape characteristics	West area	East area
Total plots area (Km ²)	9.18	6.46
Total agricultural area (%)	76.4	54.25
Horticulture	6.66	7.81
Meadows	21.57	14.44
Grain Crops	33.00	3.52
Olive	1.39	3.79
Vineyards	4.35	10.3
Garden/Other uses	9.44	14.39
Abandonment (%)	6.96	10.73
Urbanized / Industry (%)	10.27	16.34
Sprawl (%)	6.36	18.67
Mean agricultural plot size (ha)	0.96	0.38

We can recognize those areas as the nearby vegetable garden of "1.000 AD new-towns" that developed all around Luna hills, parallel to the costal line. The soil characteristics, the moderate slope and the slight elevation with respect to the sea level give this area a natural vocation to agricultural productive purposes. This area has a long history of profitable cultivation until agricultural mechanisation started to spread after the second World War. At same time labour force was attracted to a much more profitable activity in the Industrial Zone Apuana (ZIA), on the extreme left of the panorama (Fig. 1). Ironically the ZIA chemical production was addressed also to pesticides for industrial agriculture.

The reason for land reformation did not take place in this area is likely the extremely high level of fragmentation and the scattered habitations of the owners, mainly due to the origins of area - middle-age vegetable gardens - and the long history of inheritances that has split plot ownership among many heirs during centuries. The ownership structure is nowadays the main constraint. Management operations cannot be mechanised and the labour intensive hand work makes production little profitable. The presence of scattered country houses throughout the area has increased the land price because the plots are suitable to build on and the territory is characterised by presence of country houses already. Land owners therefore speculate and wait for building permits.

Agronomical constraints and dynamics

The technical possibility to build everywhere, in combination with the low economical importance of agricultural activities have driven owners to give less attention to plot management. Abandonment, neglected maintenance and incoherency of water management at landscape level are frequent features in this area. Although in some occasions land abandonment creates an opportunity for professional farmers to expand their activities for free, in most perspectives abandonment is detrimental to the development of agricultural activities in this area. Land owners may allow local professional farmers to work their land for free as long as no building permit is given. These are simple oral agreements which allow the land to be managed to some degree (local farmer interviewed by S. Carlesi, 24 July 2009) . However, the uncertainty of continuity in time makes that the farmers do not invest in these fields, for example in drainage system maintenance. Also, the level of extension of these contracts is low since farmers have no access to EU subsidies for the part of their activities performed on these fields since there are not officially registered as land they cultivate. The fact that many maintenance operations should be done at a territory level in order to be effective, makes it for professional farmers little profitable to perform such maintenance operations (e.g. cleaning of drainage works). Consequent lack of water management leads to problems in the entire area. Occasional flooding may occur and farmers have more difficulty to perform operations timely because of the prolonged soil humidity.

Another drawback of abandonment is the effect it has on the species-pool present at landscape level, enhancing unwanted, sometimes invasive, species presence. Abandoned field will follow secondary succession and shrubs and trees will slowly take-over. This will result in reduced species richness and often it's the fast-growing species which dominate these patches. *Ailanthus altissima* (tree of heaven), an invasive tree from China, is an example of such a species. Besides growing quickly and being tall, it also suppresses other species in its vicinity by releasing allelochemicals. Other species present in the area are *Arundo donax* and *Rubus* spp. These species therefore reduce the local species pool.

Historical farmers disappearance causes both local knowledge losing, and degradation of the local production chain. This initiates a snow-ball effect because it enhances difficulties for the remaining farmers to keep activities going from a logistic point of view. How to dry and keep grain if no dryers and no silos are any more available at local level? how to sell little amount of production profitably?



Figure 2. Land use map of the two areas. East part is yellow edged, west part is green edged.

Area west of the Via Francigena

General description

This area is, contrarily to area east of Via Francigena, characterized by few big ownerships, big plots and low crop diversity (Fig.2 and table 1), with the exception of the strip of land just east of the Magra River which is more similar to the area east of Via Francigena. At present main owners are a bank and some construction companies (<http://www.condotteimmobiliare.com>, 2009, 1). The production activities are mainly oriented by the bank policy. Land use is characterised by maize and alfalfa, also some professional horticultural activities are present. The entire area is mechanized, only few individual houses are scattered over the area and two new villages (1950-60') were developed along the coastline and the river. Despite these positive territory assets some areas characterised by abandonment are present. (Fig. 2).

The history of this area is much more recent than the eastern zone. After abandonment of Luna and harbour silting, this area was a coastal swamp. A big reclamation was performed during middle of XIXth century by a private owner (Dell’Arsina & Trivelli, 2003). That act was the main event and it strongly influenced the present ownership structure and main production development: milk and commodities.

Agronomical constraints and dynamics

During the second part of XXth century the lower price of commodities lead to a decreasing intensity in land use and abandonment started to spread (local owner, interviewed by S. Carlesi 23 June 2009). More profitable land use types took over and recently a part of land has been rented for aromatic herbs growing. The fact that the land is owned by a corporation and not by an individual family alters the management response to market fluctuations and developments to a less aggressive/intensive management policy. Milk production still prevails, but also this kind of activity became less profitable. Seen the local territory assets, a river, a natural Park and the seaside, more profitable land use types are being explored. There now is a plan to build up a big touristic village with yachting harbour and this proposal has already been submitted to public opinion, but the agriculture part is planned to be maintained. (<http://www.condotteimmobiliare.com>, 2009,2).

Apart from the economic character of productive activities, a big driving force on this area is given by ownership interest on the wide area. The functional field surface size is surely a strength of this area, jointed with ownership's investment capacity that can adjust and modify the productive organization with few structural constrains. Also unification of water management should lead to a properly and coherently regulation in accord to agricultural activities, both for drainage and sub-irrigation.

On the other hand, the high density of channels and dikes gives an extra workload for territory management. Water management is partly responsibility of land owners, but maintenance of the main water works such as channels and dikes, is of competence of the local authorities. If these waterworks are not managed correctly, agricultural land use becomes jeopardized. In the area west of Via Francigena, unfortunately, there are some signs of inadequate management and as a consequence high densities of rodents are reported. These cause considerable damage to agricultural production especially at sowing. (Farm Manager, Interview by S. Carlesi, May 2009).

Despite the overall positive territorial assets, the presence of big meadows and plot abandonment show a decreasing interest in agriculture production in this area too. Part of this can be explained by the fragmentation of production units by the high-way. Some fields are owned by private citizens or farmers having the major part of their properties in other areas and these fields are therefore more subject to abandonment.

Vineyards deserve special attention. In contrast to the local trend and traditional land use types, a large professional vineyard has been set up in this area and it obtained the “DOC” certificate “Colli di Luni”.

Prospect for areas

Eastern area

The decreasing presence of professional farmers and the lack of incentives to manage the productive areas cause an ever increasing problem for the continuation of agricultural activities in this area. Existing farmers have difficulties in cultivating profitably and the degradation of the local support chain decreases access they have to the output markets. The territorial assets make the area little attractive to new farmers. This means that the only possible agricultural activities in this area are hobby farming.

Family farms could have some success if they would develop a closed food-chain on farm and therefore aim at selling local products. However, this would need considerable investments on farm

and for territorial management which cannot be sustained by the farmers themselves but should be initiated by local policies. If local policy makers would be interested in conserving the local small-scale agricultural landscape, still showing the characteristic structure of the middle-age vegetable gardens, policies would have to be developed to stop urbanisation and to stimulate small-scale professional farming. Besides strengthening the local market with appropriate tools such as direct selling systems, another opportunity could be linking up of the agricultural products with the historical context. The presence of “Via Francigena”, the historical value of middle-age garden and the presence of Lunae ruins all give an extra possibility to increase the value of local products: historical middle-age agritourism. Offering local agrotouristic accommodation with a strong historical character would provide the possibility to consume products related to the history of the place, conserving at same time the historical footprint on the landscape.

Western area

The compact ownership structure together with vicinity of the seaside and the Magra river – origin of all deposits that created this piece of land – create on one hand a risk for the agricultural development of the area; compact ownership makes negotiations for selling or changing land use easier and the seaside and river make the area extremely attractive for mass tourism. On the other hand, the vicinity of the Montemarcello-Magra Natural Park and the presence of Luni archeological structure represent an opportunity to develop sustainable tourism which is in harmony with the history of the area. Enlarging the borders of the Regional Natural Park up to the Lunae ruins, and therefore including the plain area, could represent an interesting alternative to the heavy impact of yachting tourism. The transition of local milk production to eco-compatible practices could create interesting opportunities for local farmers. The combination of local dairy products and high-quality enological products available for local consumption together with presence of an enlarged natural park, beach and river in a natural preserved contest, could stimulate eco-friendly tourism, so preserving the environmental and historical local capital.

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