LIFE Natura 2000 Value Crete

NATURA 2000 Network

Ecosystem Services of Agricultural Areas of Crete

Natura 2000 Development's seed

INFORMATION GUIDE

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This publication was implemented by the University of Crete - Natural History Museum of Crete (NHMC) in the framework of the LIFE Natura 2000 Value Crete project: "The ecological services, social benefits and economic value of the Ecosystem Services in Natura 2000 sites in Crete" (LIFE13 INF/GR/000188). The project is co-financed by the European Commission/DG Environment at a percentage of 50% and was also co-financed by the Ministry of Environment and Energy (MEEN), the Green Fund and the A. G. Leventis Foundation. Associated beneficiaries are the Decentralized Administration Authority of Crete – Directorate of Coordination and Supervision of Forests and the Hellenic Ornithological Society (HOS).

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Care, goods, investment

INFORMATION GUIDE





Preface

The natural ecosystems of Crete support the economic, social and cultural well-being of the island's inhabitants. More specifically, ecosystem services are considered the benefits for the people, derived from the natural environment and include the raw materials necessary for social well-being, natural processes such as photosynthesis and soil-formation which affect air purity, climate and rainfalls, as well as cultural services such as artistic inspiration and recreation.

The Information Guide that you hold in your hands was published under the LIFE Information & Communication project entitled "The ecological services, social benefits and economic value of the Ecosystem Services in Natura 2000 sites in Crete" (LIFE13 INF/GR/000188 - LIFE Natura 2000 Value Crete, http://www.ecovalue-crete.eu/). The project is implemented by the University of Crete - Natural History Museum of Crete (NHMC), the Directorate of Coordination and Supervision of Forests of the Decentralized Administration Authority of Crete and the Hellenic Ornithological Society (HOS) and its duration is four and a half years (July 2014 - December 2018). The European Commission – Directorate General for Environment co-finances the project at a percentage of 50%, while the project has also been co-financed by the Ministry of Environment and Energy (MEEN), the Green Fund and the A. G. Leventis Foundation.

The objective of the "LIFE Natura 2000 Value Crete" project is the implementation of an environmental information campaign for the population living and operating inside the NATURA 2000 areas and the wider Cretan population regarding the environmental, economic and social value of the areas included in the Network.

The Information Guide makes reference to the ecosystem services in the areas of NATURA 2000 Network in Crete, the nature, society and economy of the areas concerned, as well as jobs and employment opportunities. We believe that with this guide we will manage to overturn the misconception that NATURA 2000 areas are an obstacle to development and demonstrate that the conservation of biodiversity is a guarantee for sustainable development, prosperity and quality of life.

Dr. Michalis Probonas

University of Crete – NHMC
Project Coordinator "LIFE Natura 2000 Value Crete"

Contents

1 INTRODUCTION

1.1 Ecosystem services

Natural ecosystems in Crete offer many benefits to the health and well-being of the island's inhabitants. More specifically, ecosystem services are defined as the benefits for the people derived from the natural environment and include the raw materials necessary for social well-being, natural processes such as photosynthesis and soil formation which affect air purity, climate and rainfalls, as well as cultural services such as artistic inspiration and recreation.

The evaluation of ecosystem services is a means of assessing the provision of these services in economic terms, aiming at the integration of economic values of ecosystem services in policy making and the improvement of environmental decision-making.

In 2000, the UN launched an initiative to assess ecosystem services at a global level. This initiative and its conclusions were documented in the "Millennium Ecosystem Assessment" (MEA) Report, which was completed in 2005. The above-mentioned Report (MEA), recognized four main categories of ecosystem services, but later the Common International Classification of Ecosystem Services (CICES) established a three - categories classification as shown in Table 1.

In conclusion, natural ecosystems provide benefits that promote economic growth, offer new opportunities for investment and employment, but also improve the living standards and quality of life of local communities. Consequently, the protection and conservation versus the degradation of natural ecosystems increase or decrease respectively the range of benefits that can be gained by the local communities of Crete in the future.

TABLE 1. Ecosystem services according to CICES (2017).

Regulating and Maintenance services	Necessary for the operation of all other services such as oxygen production and soil formation. Benefits from ecosystem functions such as climate regulation and extreme weather protection.
Provisioning services	Products obtained from ecosystems such as food, water and timber.
Cultural services	Sensory pleasure, artistic inspiration and recreation.

1.2 NATURA 2000 Network

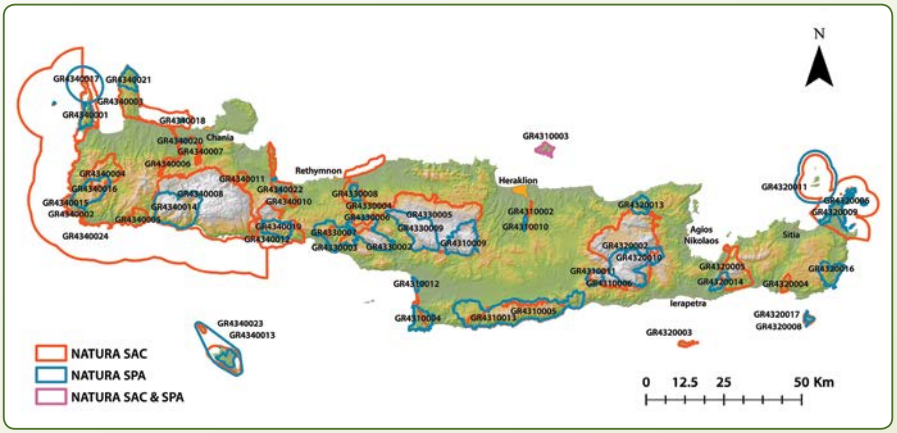
The European Network of Protected Areas NATURA 2000 is the basic legal and institutional framework of the European Union for the protection of biodiversity. It is based on two European Directives:

1. Directive 92/43/EEC "On the conservation of natural habitats and of wild fauna and flora" (or "Habitats Directive") and

2. Directive 2009/147/EC "On the conservation of wild birds" (or "Birds Directive", which replaced the original Directive 79/409/EEC).

The main objective of Directive 92/43/EEC is the protection of biodiversity through the conservation of natural habitats on the European territory. For this reason, it establishes a coherent ecological network of Special Areas of Conservation (SACs) called "NATURA 2000", which includes the Special Protection Areas for birds (SPAs), as have been defined by the "Birds Directive".

MAP 1. The NATURA 2000 Network areas in Crete.



The NATURA 2000 Network in Greece consists of 443 areas. In Crete, it covers around 30% of the island's area and includes 54 areas (SACs and SPAs), several of which overlap (e.g. the SPA of "Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi – Koustogerako" and the SAC of "Lefka Ori paraktia zoni").

The framework for the management of the NATURA 2000 Network areas foresees the establishment of Protected Areas Management Bodies (PAMBs) that can undertake the management of one or more areas.

Despite the large extent of the NATURA 2000 Network on Crete, there are only two PAMBs, the "Management Body of Samaria National Forest and Western Crete" and the "Management Body of Protected Areas of Central and Eastern Crete".

The sand dunes at the beach of Balos.

Finally, the NATURA 2000 Network framework does not prohibit any economic activity; however it sets restrictions that ensure the protection of local ecosystems, which in turn contribute to the sustainable development of Crete (see subchapter 1.4, pp. 12-13).

1.3 Crete

Crete, the largest island in Greece and the second largest in eastern Mediterranean is located at the southern edge of the Aegean Sea, between three continents - Europe, Asia and Africa. From the seashore to the highest peaks of Psiloritis and Lefka Ori, over an area of 8,336 square kilometres, a mosaic of landscapes unfolds.

Rocky and sandy shores, deep valleys and steep gorges, small fertile plains and pastures, barren and rocky slopes are some of the landscapes that one encounters in Crete. These landscapes have been sculpted by rain, air and time, as well as the long human presence on the island.

The kermes oaks, the cypresses, the palm trees and the carob trees, as well as the sea lilies, the orchids, the ironwort and the anemones, are only few of the plants we find on the island. Next to the sea or between

Olive groves at the gorge of Ha.

Vineyard cultivation.

stones, there are bushes and wildflowers coexisting with many small animals such as snails, beetles, the spiny mice and lizards. Also, there are large animals such as the Cretan wildgoat (agrimi), the Cretan wildcat and the bearded vulture (kokalas), animals inherently linked with the Cretan tradition and history.

An important part of the island and its history are the agricultural and pastoral activities such as the cultivation of olive groves and vineyards, the production of honey and cheese products.

All these landscapes, humans, animals and plants compose and contribute to the creation of a unique mosaic, inextricably con-

Traditional cheese making in a shepherd's mountain hut (mitato).

nected with the history of Crete.

1.4 Protection status and development potential inside the NATURA 2000 Network

Below are summarized the activities permitted inside the NATURA 2000 Network, as well as some activities prohibited in these areas.

What is allowed inside NATURA 2000 protected areas [L. 1650/1986, L. 4042/2012] (based on environmental licensing terms, distances, uses and deadlines where applicable):

- Agricultural activities.
- Livestock activities.
- Beekeeping.
- Grazing.
- Ecotourism.
- Sports activities.
- Recreational activities.
- Road construction following a Special Ecological Assessment (impact study inside a NATURA 2000 area) and the issuing of Environmental Terms Approval Decision (ETAD) for a certain period of time.
- Hunting of the species mentioned in Ministerial Decree 127568/2533/07-08-2015 (GG B 1670) (e.g. from 20/08/2015 to 29/02/2016 hunting of hares, ferrets, thrush, woodcocks, etc. was permitted).
- Building after an autopsy and permission by the competent authorities.
- Creation of mountain shelters.
- Tourism and other mild economic activities following Special Ecological Assessment.

Hunting is allowed in specific areas and time periods and concerns certain animal species.

From Japan to Crete, for the Cretan tulip

- The harvest of ironwort, marjoram, sage and oregano to cover individual needs (up to 500 grams, during the flowering-maturing period, using shears or knife, and without removing all shoots from each plant in order to guarantee their reproduction).
- The collection of herbs for marketing only after the permission of the competent Forest Service.

What is forbidden inside the protected areas NATURA 2000 [L. 1650/1986, L. 4042/2012] (some of the following prohibitions also apply to areas outside the NATURA 2000 Network):

- Any activity inside the areas of absolute protection (as defined in the Management Plans and/or the Special Environmental Assessments).
- Hunting without a legal hunting license.
- Hunting of wildlife (Regulation EC 338/1997, CITES Convention, L. 4042/2012).
- Hunting of non-game species.
- Hunting inside residential areas and within a radius of 250 metres from them.
- Hunting inside cultivated and fenced areas.
- Hunting inside wetlands.
- Hunting within 300 meters from the coast.
- Hunting inside fire-stricken areas.
- Hunting inside archaeological sites.
- Hunting inside areas where PPC infrastructure exists.
- Hunting during snowfall.
- Hunting around dams.
- Hunting when local regulations forbid it.
- Scattering of poisoned baits.
- Uprooting or complete cropping of the shoots of all kinds of aromatic, medicinal, apicultural, floricultural and decorative plant, sapling, shrub, or herb.
- The unlicensed collection with the aim of marketing of ironwort, marjoram, dittany, sage and oregano in all areas included in the NATURA 2000 Network.

2 NATURE, SOCIETY AND ECONOMY

As agricultural ecosystem, we define all the areas that man manages in order to increase plant and livestock production.

Agricultural ecosystems are an important resource in the world and are an integral part of most societies. As a result, over time, special bonds have developed between people and these systems. The relationships between society and agricultural ecosystems relate to the economy, tradition and aesthetics, as we will see in this guide. For a better functioning of the relationships between society and agricultural ecosystems it is necessary to have a good background ecological knowledge. This knowledge can facilitate the proper evaluation and utilization of the goods offered by agricultural ecosystems. Taking into account the constant changes (e.g. economic, climate), and in order to preserve the richness and quality of agricultural ecosystems, it is very important to get to know and understand the goods they offer to us.

Agricultural ecosystems have many simultaneous functions. Land and livestock farmers use the ecosystem for agricultural and livestock production for their livelihoods. However, the same ecosystem provides

A mosaic of cultivations.

housing to people who are often not directly related to the earth, e.g. people who work in the cities and choose agricultural areas as their holiday or primary residence. Also, agricultural ecosystems are ideal for recreational activities such as fishing, hunting and cycling, while offering sensory pleasure, artistic inspiration and spiritual rest. These benefits are available both to residents/owners of agricultural land, and to visitors. It seems, therefore, that in addition to provision services, such as the production of goods, agricultural ecosystems also have the potential to be used for other non-agricultural purposes. Every so often the utilization of the agricultural landscape for the provision of cultural services has helped the economic development of a region.

As people depend on the services of agricultural ecosystems, their welfare is affected by changes in their composition and function.

Throughout the world, scientific evidences indicate that the impact of humans on the ecosystems endanger their "health" and, consequently their ability to provide their services to humans. For example, excessive logging or changes in land use (e.g. from wetland to farmland) in order to increase production, can adversely affect the fundamental services of ecosystems such as the provision of habitat for wildlife plants and animals, or intensify soil erosion. Disturbances in these services usually cause problems in the smooth operation of other services, resulting, for example, in the reduction of agricultural production or the destruction of natural landscapes. These disturbances are translated into economic losses (e.g. loss of revenue from the sale of goods and tourism) and deterioration in the peoples' qual-

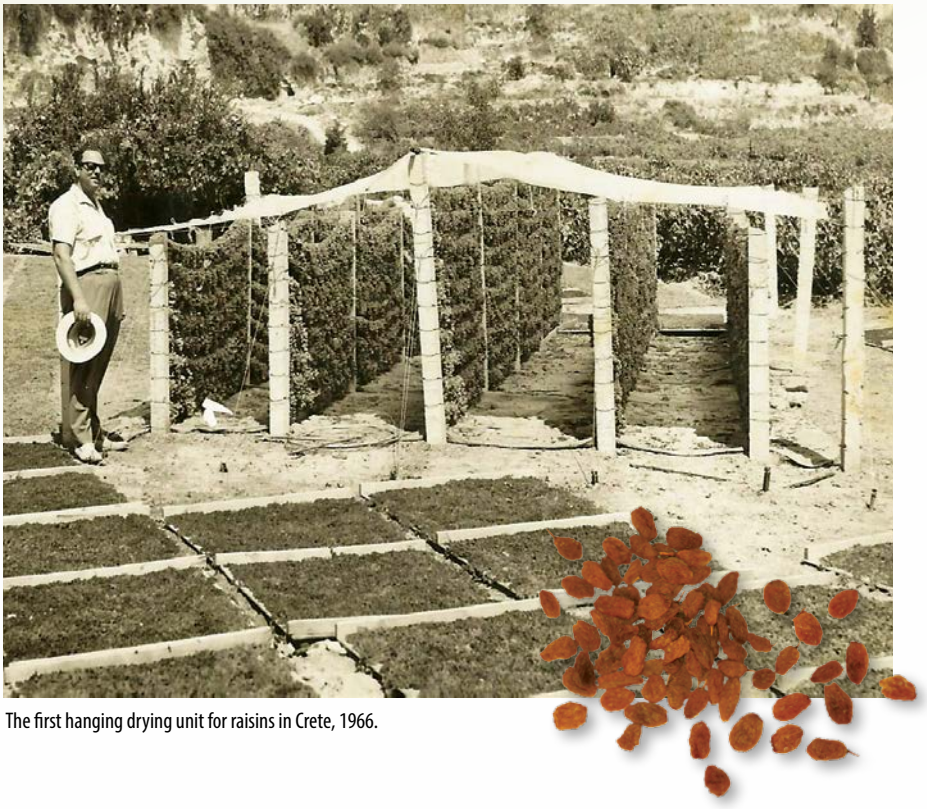
Restored watermill.

Area of the Kourtaliotiko gorge.

ity of life (e.g. failure to meet basic needs, get education and perform cultural activities). It is also very important to note that service losses have both short-term and long-term consequences for the society and man. Therefore, the choices of society on how to use the goods of agricultural ecosystems play a crucial role for their future preservation and use.

Below are summarised the most important services of agricultural ecosystems. Especially for Crete, many of them have played a major role in the social and economic development of the island for many centuries.

Open-field fruit and vegetable crops in Crete.



The first hanging drying unit for raisins in Crete, 1966.

TABLE 2. The most important services of agricultural ecosystems in Crete.

Regulating and maintenance services	• Provision of habitats for animals and plants.** • Oxygen production. • Soil formation. • Recycling of soil nutrients. • Genetic diversity. • Pollination. • Biological control. • Water flow regulation. • Soil erosion prevention. • Soil drainage.* • Water supply and purification. • Damage prevention (e.g. crop destruction). • Climate control.
Provisioning services	• Land available for cereal, fruit and vegetable cultivation. • Olive oil production. • Grape production (for raisins, wine and table grape). • Milk production. • Dairy products production. • Meat production. • Beekeeping. • Timber. • Wool production. • Production of leather from animals. • Fuels (e.g. biofuels).
Cultural services	• Agrotourism. • Wine tourism. • Bird watching. • Cycling. • Hiking. • Hunting.

** The soil drains excessive water and prevents damages to the crops.*

*** For example, olive groves as shelters of wildlife.*

3 ECOSYSTEM SERVICES AND NATURA 2000 NETWORK

"There is a land called Crete in the midst of the wine-blue sea...".

"A country, Crete, inside a sea of wine...". *Homer, Odyssey, rhapsody τ (Translation: N. Kazantakis - I. Kakridis).*

"The outskirts of Chania... forests of olive trees... are interrupted by fields, vineyards, gardens and streams, along which myrtle and oleanders grow". *J.P. de Tournefort, Journey to Crete and the islands of the archipelago 1700-1702 (Translation: M. Apergis - M. Apergi).*

"The outskirts of Heraklion consist of large and fertile plains rich in all sorts of cereals". *J.P. de Tournefort, Journey to Crete and the islands of the archipelago 1700-1702 (Translation: M. Apergis - M. Apergi).*

Threshing, a forgotten agricultural work.

Volistri (big sieve) and the hand mill for grinding small quantities of cereals.

3.1 Brief history

Agricultural ecosystems have been at the service of man and society for thousands of years. As far as Crete is concerned, human ties with agricultural ecosystems were created when the first inhabitants settled on the island about 8,000 years ago and brought with them livestock and plants such as pigs and cereals respectively.

To date, but also for many centuries, the main crops in Crete have been three: cereals, grapes and olives. The cultivation of olive and grape has been dominant in Crete, not only in modern times but also thousands of years ago, according to archaeological finds on the island. The first olive and vine crops date back to almost 4,000 years ago, while references to Crete and its agricultural riches are abundant in historical texts (e.g. in Theophrastus phytological dictionary) but also in modern literature and folk tradition (for example, in mantinades, the rhyming couplets of Crete).

During the period of Venetian and Ottoman rule, agricultural production focused on particular products in accordance with the needs of the rulers. Initially (1320-1450 AD), the interest of the Venetians focused on the cultivation of cereals, but afterwards (1450-1645 AD), due to historical circumstances, wine production took the lead. At that time, the exceptionally high demand for wine from the West led to the creation of many irrigation projects (e.g. linies in the Lasithi Plateau) or drinking water projects such as the construction of aqueducts etc. which have survived to this day (such as the aqueduct near Archanes in the Regional Unit of Heraklion) and the development of new techniques for the intensification of wine production. The economic blossoming due to the cultivation of vineyards and the production of wine also led to the cultural and artistic blossoming of the island. During the presence of the Ottomans in Crete (1645-late 19th century AD), the vineyards were replaced with olive groves. This happened mainly because oil demand in the international market had increased, while the cultivation of olive trees was not so expensive and did not require as much care as that of the vine.

The Karidakiani Arch in the Agia Irini gorge, Archanes.

Apart from the olive and the grape, Crete produces a wide variety of fruits and vegetables, known throughout Greece for their excellent quality. This change and the new balance in the agricultural production of Crete followed after the island was liberated from the Ottomans. Gradually, the production of new products such as citrus fruits and various vegetables and other fruits began. Nowadays, in addition to vegetables produced in large quantities (such as tomatoes, cucumbers, potatoes and peppers), less "common" products such as pears, pomegranates, bananas, avocados and kiwis are also produced. Furthermore, aromatic plants such as dittany are grown.

Beekeeping in Crete is quite widespread since the Minoan period. This is evident from various archaeological finds, such as the clay hives in the palace of Phaistos and the golden necklace with the two bees in the palace of Malia.

A stalk of bananas.

Finally, livestock farming is part of the history of Crete (e.g. sheep and goat bones have been discovered in many archaeological sites). Although organized livestock farms are few, there is a strong production

Livestock farming is one of the major professional careers for Cretans.

of cheese and dairy products, especially in the mountain areas.

In sum, the rich agricultural and livestock production as well as the excellent quality of the products have contributed to the economic growth and prosperity of the island.

The bee had a significant position in the Minoan period. Archaeological museum of Crete.

It is evident that the benefits from Crete's agricultural ecosystems to the people are not only economic but also sensory. Particularly, in the traditional societies of Crete, cultural services offered by agricultural ecosystems are related to the cultural identity of societies. For example, during grape harvesting and wine production, wine tasting events are taking place, while later, the famous rakokazana (distillation fiestas) are organized for the production of tsikoudia (raki spirit). These events, in addition to the economic benefit, strengthen the social ties of the local community, while in the cultural events taking place at the same period (e.g. traditional dances, local festivals) the local customs and traditions are disseminated to the visitors.

Traditional dance in Agia Irini, Spilia.

Another example of the cultural services that agricultural ecosystems offer in Cretan society is related to the olive tree. Due to the long history of its cultivation, there are several "monumental" olive trees on the island. These olive trees - monuments that are scattered all over Crete, are usually of great age (some of them are several centuries old). Their overall appearance (size, trunk relief, inner hollows) illustrates their history and the history of the place over time. The "monumental" olive trees are religious, mythological and historical symbols and enable the further development of the cultural heritage of a region (e.g. with the creation of an Olive Museum).

It is therefore clear that the benefits of agricultural ecosystems are important for the daily life of Cretans.

Nature and culture, together diachronically. Monumental olive tree in ancient Gortyna.

Ancient olive tree, Lissos.

Illustration of olive branch on a Minoan fresco. Archaeological Museum of Heraklion.

Although there are often challenges (e.g., economic ones), the benefits of these ecosystem services are of immense value.

Representation of olive harvesting as the Minoans depicted it 3,500 years ago. Archaeological Museum of Heraklion.

3.2 Activities inside the NATURA 2000 Network in Crete

Agricultural land is mainly used for the production of crops and livestock related activities, while providing habitat and natural services (e.g. water, protection from weather phenomena such as floods, etc.) to humans.

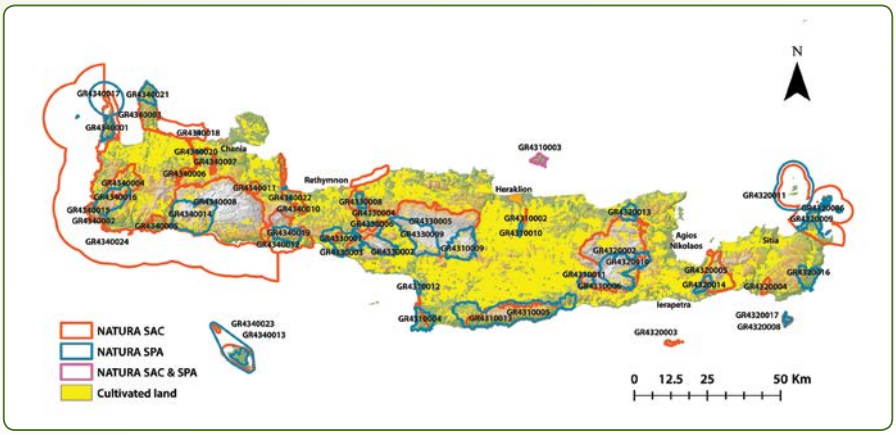
Due to the natural landscape and the topographic relief of Crete, large part of the agricultural activities of the locals and the primary production of the island take place inside the NATURA 2000 areas of Crete. Accordingly, large part of the population lives or works in the NATURA 2000 areas.

Further down (Table 3 and subchapter 3.4, pp. 30-33) data on the main ecosystem services inside the NATURA 2000 Network areas is presented. These values have been calculated for the local geographical units of which at least 1% of their area lies inside a NATURA 2000 area.

TABLE 3. Extent of the NATURA 2000 Network in Crete and overlapping with agricultural areas (calculated using: http://www.eea.europa.eu/data-and-maps/data/ecosystem-types-of- europe).

Local communities with at least 1% of their area inside the NATURA 2000 Network	255 of 578
Terrestrial part of the NATURA 2000 Network in Crete	31.8% of the total area of Crete
Agricultural land	10.6% of the total area of Crete
Agricultural land inside the NATURA 2000 network in Crete	15,6% of the total agricultural land of Crete
Percentage of agricultural land inside the NATURA 2000 Network in Crete	4.7% of the total area of the NATURA 2000 Network

MAP 2. Extent of the NATURA 2000 Network in Crete and overlapping with agricultural areas.



3.3 Agricultural biodiversity

A very important element of agricultural ecosystems is their biodiversity. As agricultural biodiversity, we define species of fauna and flora that are directly or indirectly related to the agricultural production and which support the balance of agricultural ecosystems. More precisely, these species are used in agriculture (e.g. the grape and its local varieties such as Kotsifali, Mantilari and Liatiko), livestock farming (e.g. local sheep breeds of Asterousia, Sfakia and Anogeia), production of food (and animal feed) and products (e.g. wool, leather, pharmaceuticals), as well as biofuels. Also, the native plants and non-domestic animals are part of the agricultural biodiversity. These species range from large animals such as birds of prey down to small invertebrates (e.g. bees) and the micro-organisms found in the soil (e.g. bacteria).


Traditional vineyard in Vathi, Kissamos.


Sheep shearing.

Snail-picking, the favourite pastime of Cretans.

Various cultivated fruits.

The artificial lake of Agia in the NATURA 2000 area of the same name, provides irrigation water for the cultivations of the valley of Chania.

Briefly, biodiversity in agricultural ecosystems:

- Helps to increase productivity.
- Offers a wider range of products.
- Increases financial returns.
- Offers more income opportunities.
- Reduces pressures on non-agricultural areas (e.g. wetlands).
- Contributes to the stability of agricultural ecosystems.
- Provides natural protection from pests and crop diseases.
- Maintains soil health.
- Makes the use of agricultural resources more efficient.
- Reduces the dependence on artificial resources (e.g. use of fertilizers, etc.).
- Improves the quality of life (e.g. nutrition, clothing).

Cultivation of aromatic plants and herbs.

Cultivation of potatoes.

Endangered species of fern *Woodwardia radicans*, in the Fasa valley area, Chania.

Inside the NATURA 2000 Network areas, many species of plants and animals are protected by International Conventions and European Legislation. Measures for the conservation of their habitat are taken for species that: a) are threatened with extinction, b) are vulnerable to changes, c) are rare (characterized by limited expansion and small populations), and d) live in rare habitats. It is important to emphasize that the above do not forbid human activities, however, they set the framework inside which these activities can be carried out.

Below are three examples of the contribution of biodiversity to the smooth functioning of agricultural ecosystems. The selected species include two common species of birds of prey of Crete, the griffon vulture (ornio) and the common buzzard (lagoudogerako), and an endemic species of plant, dittany, found inside NATURA 2000 areas. These three species are protected and are directly linked with the local society and the cultural history of Crete.

Ornio or skara (griffon vulture - *Gyps fulvus*).

Gerakina or lagoudogerako (common buzzard - *Buteo buteo*).

- The griffon vulture (*Gyps fulvus*), called locally ornio or skara or kanavos or thrasa, is found in almost all Crete in open areas with little vegetation, and has been recorded in 21 of the 54 NATURA 2000 sites (http://natura2000.eea.europa.eu/). Despite the fact that it does not live in agricultural ecosystems, its relationship with man is important, since it prefers to feed on dead large domestic animals such as horses and cattle. The vulture, therefore, functions as cleaner of the rural (and not only) environment, by removing the remains of dead animals in a natural way.

- The Common buzzard (*Buteo buteo*), called locally gerakina or lagoudogerako (hare-eating buzzard), is one of the most common species of birds of prey in the agricultural ecosystems of Crete and has been recorded in 23 of the 53 areas of the NATURA 2000 Network (http://natura2000.eea.europa.eu/). The most common habitats are agricultural areas, such as olive groves and vineyards, and forests. The reason we find the common buzzard very often in vineyards and olive groves is that it feeds mainly on mice despite its name. We could say that birds of prey like the common buzzard are useful in protecting agricultural ecosystems from natural enemies.

- Dittany (*Origanum dictamnus*), also called erontas in the Cretan dialect, is one of the priority species in the NATURA 2000 Network areas in Crete. We find it in 20 of the 54 areas of the NATURA 2000 Network (http://natura2000.eea.europa.eu/). It is an endemic plant found on ravines and cliffs, however in the last few decades its cultivation has started in some parts of the island. Its name is derived from Mount Dikti and the word bush (Diktamnos, that is, the bush - thamnos of Dikti), and it is known since the antiquity. Hippocrates, Theophrastus and Aristotle spoke about its healing properties, while it was exported from Crete to the rest of Greece. In the folk history of Crete, dittany is the plant of love, as in one sense, its collection from the difficultly accessible places that it grows is done by people in love as proof of their feelings. Nowadays a range of dittany based products such as beverages and various cosmetic products are produced.

The examples above show us how the biodiversity of agricultural ecosystems can be brought in harmony with human activities and be used for their benefit. Besides, the common names of the species indirectly indicate the familiarization of the local communities with the fauna and flora of Crete.

*"**Amarakos the Diktamnos... endemic of Crete**". Phytological Dictionary by Theophrastus (Editing: Cactus Literature Group).*

3.4 Principal human activities

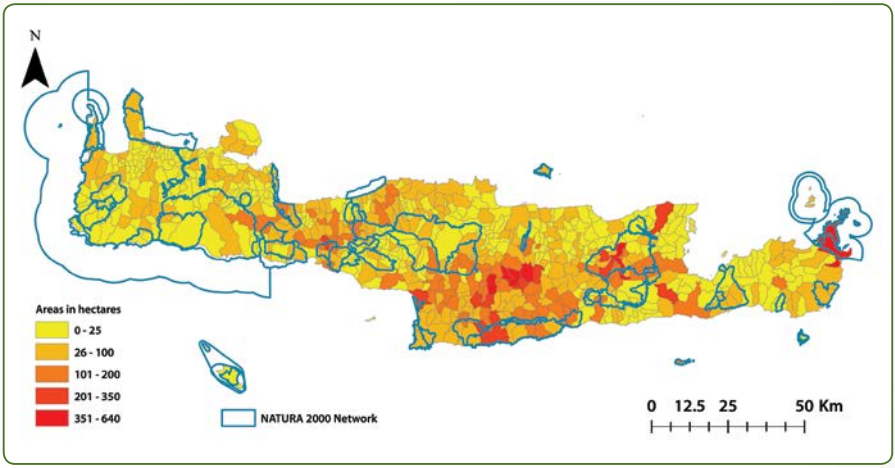
Among the characteristics of the landscape of agricultural ecosystems are the area and type of the cultivated land. The presence of man plays an important role in shaping the landscape of ecosystems, while constructions and cultural traditions further affect their shape.

In Crete, agricultural ecosystems (but not only them) have been, and are, shaped by grazing flocks of goats, sheep and cattle, as well as cultivation practices.

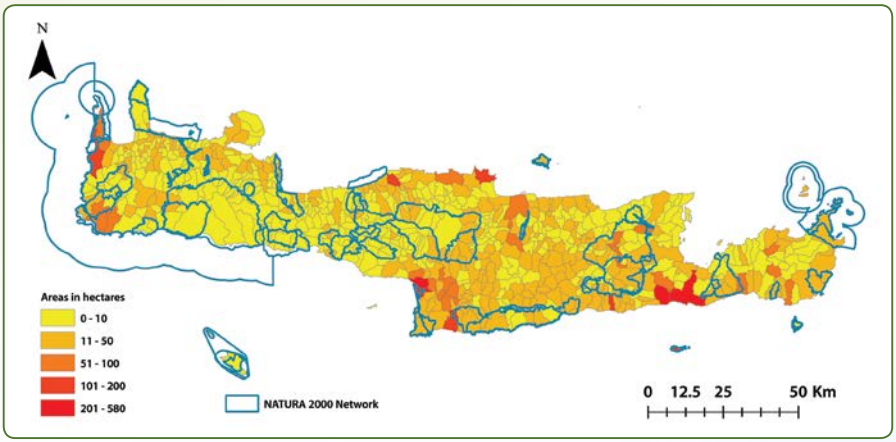
Apart from livestock farming that takes place mainly in the mountain ecosystems, olive groves, vineyards, cereal and vegetable are the basic human activities that shape both the cultural characteristics and the agricultural landscape of the NATURA 2000 Network areas in Crete. Other principal activities that shape the cultural character and consequently the agricultural landscape of the NATURA 2000 areas in Crete, are the existence and operation of local agricultural cooperatives and cultural associations, the archaeological activity as well as the local museums and thematic exhibitions.

In recent years, in addition to the classic production of olives, raisins and vegetables, other crops are gaining ground. These include the cultivation of subtropical plants, such as avocados and kiwis, and the production of aloe. In many areas, crops such as carob, arbutus, walnut, pomegranate and quince are returning, and ever more farmers are turning to the production of prickly pears.

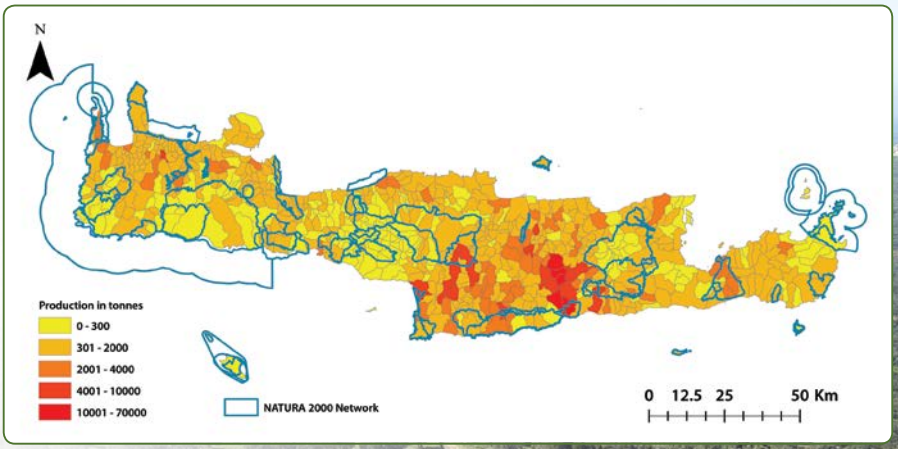
MAP 3. Cultivated plants in large scale (cereals, legumes and forages) inside and outside the NATURA 2000 Network (Hellenic Statistical Authority –ELSTAT data, 2010).



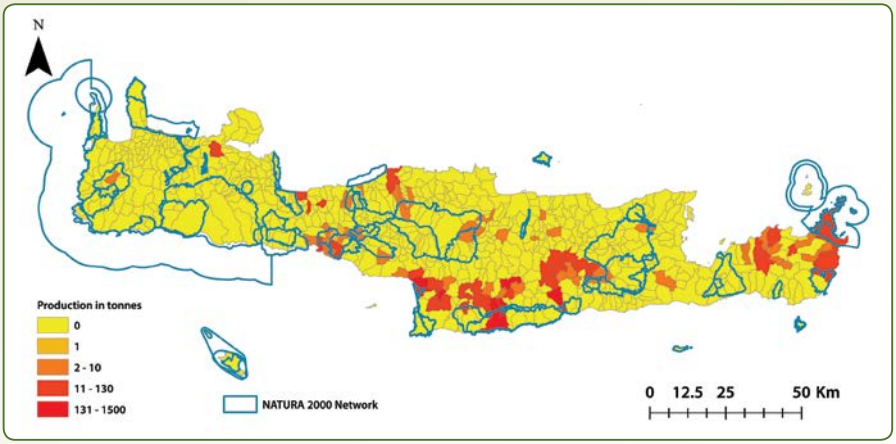
MAP 4. Vegetable cultivation inside and outside the NATURA 2000 Network areas (ELSTAT data, 2010).



MAP 5. Olive oil production inside and outside the NATURA 2000 Network areas (ELSTAT data, 2010).



MAP 6. Production of organic olive oil inside and outside the NATURA 2000 Network areas (ELSTAT data, 2010).



MAP 7. Vineyards area inside and outside the NATURA 2000 Network areas (ELSTAT data, 2010).

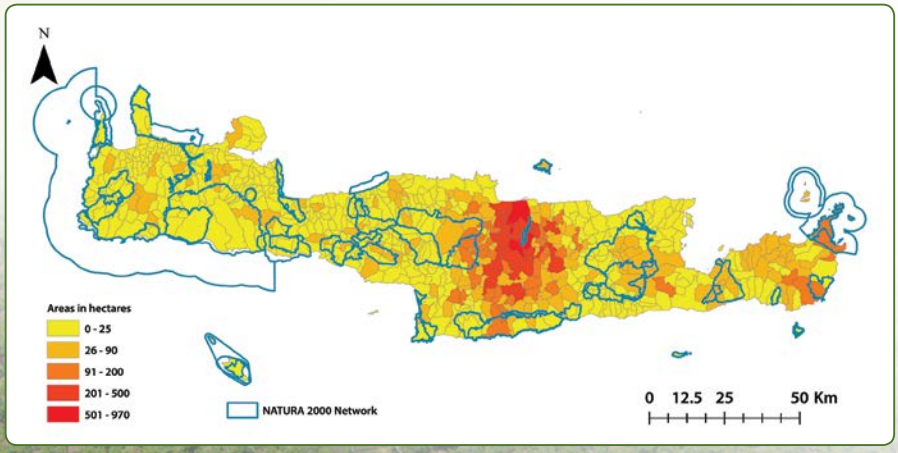
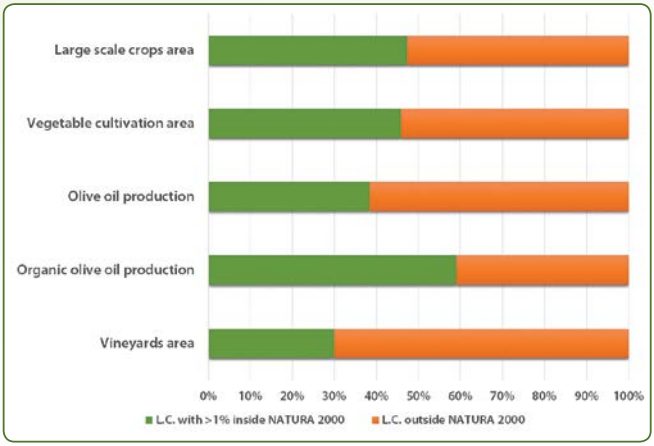


FIGURE 1. Agricultural production in local communities which overlap with NATURA 2000 Network (ELSTAT data, 2010).



Summer vegetables.

Small low-altitude plateaus provide ideal conditions for crops cultivation throughout the year.

4 WORKING POSITIONS AND EMPLOYMENT OPPORTUNITIES

Although the agricultural ecosystems inside the NATURA 2000 Network in Crete are less common, the possibilities to work inside them are many. It is remarkable that these employment opportunities concern traditional professions and aim to revive old local practices. The aim is, through these opportunities, to improve the quality of life of the local community, the cultural and social enrichment (e.g. local cultural events), the economic self-sufficiency and the protection and preservation of the environment and cultural heritage.

In order to achieve this objective, one should: (a) ensure that agricultural activities are carried out in accordance with the NATURA 2000 Network legislation; (b) preserve and promote biodiversity in primary production (e.g. promotion of local plant varieties and animal breeds) (c) develop infrastructure in order to facilitate the integration of cultural services of the agricultural ecosystems (e.g. by establishing local museums and plan tourist routes); and (d) promote the development of certified ecological systems in production.

Rediscovering the cultivation of arbutus.

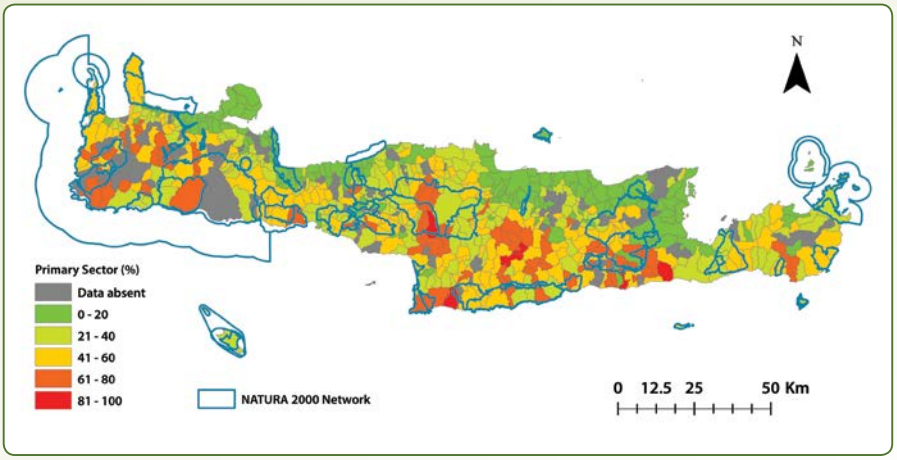
Furthermore, agricultural activities must be compatible with the Common Agricultural Policy (CAP) terms and regulations. The CAP consists of a series of regulations regarding agricultural production, financial aid to farmers (e.g. green payment, support to young farmers), development of rural areas and regulation of the agricultural products market. Furthermore, the CAP ensures that there is environmental compatibility between agricultural activity and the circulation of agricultural products. Its goal is the high quality and stability in product prices, as well as the preservation and management of agriculture-related natural resources, in the context of sustainable development.

Pomegranate cultivation.

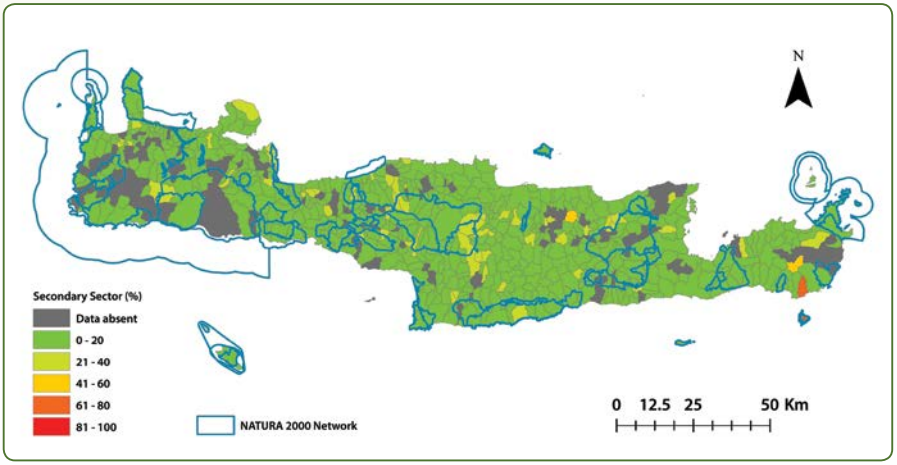
Summertime vegetable garden.

Recent olive trees terraces without drywalls, Vathi, Kissamos.

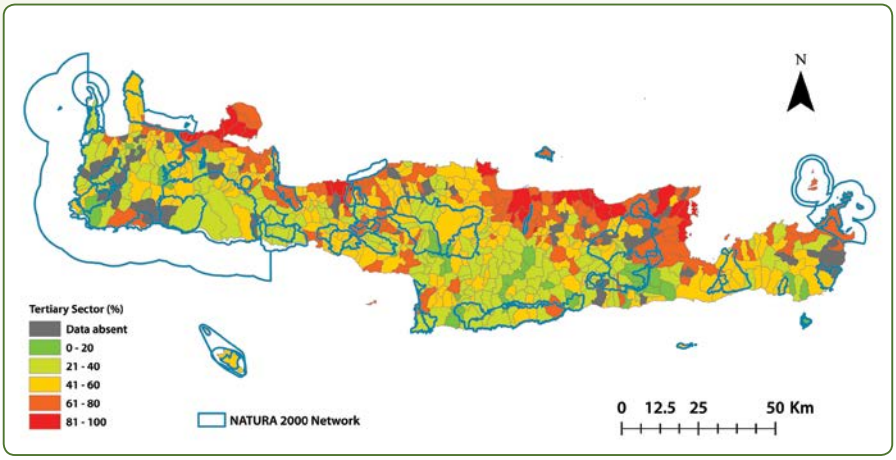
MAP 8. The primary sector includes activities related to the harvesting of goods directly from nature, in the form they exist in it (raw materials), for indirect or direct consumption. It includes agriculture, fisheries, livestock farming, mineral extraction, etc. (ELSTAT data, 2011).



MAP 9. The secondary sector includes human activities that transform the products of the primary sector using various techniques. It includes the processing of goods (e.g. fruit, vegetables, milk, wood, and leather), production of electricity, water, etc. (ELSTAT data, 2011).



MAP 10. The tertiary sector involves the provision of services to people in order to cover their needs. It includes education, health services, tourism, banking services, communications, wholesale and retail trade etc. (ELSTAT data, 2011).



Educational excursions aiming to familiarise students with the Cretan landscape.

4.1 Agro-tourism inside the NATURA 2000 Network in Crete

Agro-tourism or agricultural tourism is a special form of rural tourism, where activities occur in agricultural areas and are related to the rural cultural elements, agricultural activities, local products, traditional cuisine and the provision of accommodation and restaurant services inside agricultural facilities. It is a sector with important employment opportunities while preserving the ecological value and high quality services of agricultural ecosystems.

Some of the benefits of agro-tourism for local communities are the following:

- Supplementation and improvement of the agricultural income.
- Improvement of the quality of life and employment of rural populations.
- Retention of the rural population at its place of residence (e.g. by offering professional alternatives to young people).
- Improvement and marketing of local agricultural and craft products.
- Protection of the environment.
- Preservation, promotion and exploitation of the architectural and cultural heritage.
- Improvement of the attractiveness of agricultural areas.
- Strengthening of entrepreneurship.

Beekeeping has been practiced in Crete since the antiquity.

Traditional ceramics workshop.

Employment opportunities in the agricultural ecosystems of NATURA 2000 Network areas are strengthened by the following:

- Establishment of offices for the organization and promotion of agricultural tourism.
- Establishment of tourist information centres.
- Establishment of small restaurants and leisure companies (e.g. traditional guesthouses).
- Creation of local tasting facilities for agricultural and livestock products (e.g. olive oil tasting during the olive harvesting season).
- Establishment of craft units (e.g. traditional embroidery craft or ceramics workshops).
- Establishment of cottage craft units (e.g. cereal products, pasta, spoon sweets, jams, products with virgin olive oil and aromatic plants, salt or vinegar cured products, honey products and dried products), handicrafts (e.g. traditional costumes tailor shops, traditional instruments manufacturing workshops, ecological dry cleaners and washing units).

Traditional guesthouses in the area of Agios Dikaios.

Watermelon crop, Palekastro, Sitia.

Traditional cheese making.

- Establishment of women's cooperatives.
- Establishment of organized producers groups and agricultural social enterprises.
- Production of foodstuffs with NATURA 2000 areas products (e.g. production and packaging of beverages and cosmetics from local aromatic plants and herbs of Crete).
- Improving infrastructure in existing companies using renewable energy sources to cover their energy needs.
- Labelling of tourist attractions and monuments.

The pharmaceutical labdanum.

- Establishment of cycling routes in agricultural areas of the NATURA 2000 Network.
- Small projects that can improve the access to agricultural ecosystem services (e.g. water resources management projects, improvement of rural roads).
- Creation of cultural (e.g. food tasting), sports (e.g. dance schools) and educational (e.g. libraries, museums) facilities, as well as facilities for environmental activities.
- Improvement and restoration of communal areas in agricultural settlements (e.g. paving, restoration of parks and squares, pedestrianisations, restoration or installation of public lighting, restoration of old buildings).
- Restoration, improvement and preservation of the agricultural landscape (e.g. improvement or construction of footpaths in order to create walking trails

through the cultivated areas, small projects for soil protection and conservation, construction of observatories, planting of local tree species).

- Environmental awareness actions.
- Restoration, upgrading and preservation of the cultural character of agricultural ecosystems (e.g. fountains, springs, bridge restoration, restoration of old mills, olive mills, winepresses, drywalls, threshing floors and wells).
- Establishment of local museums with collections and exhibits related to the folk and agricultural heritage.
- Local events to present the agricultural production, livestock farming and the cultural heritage of each region.

Release of a griffon vulture in Patsos.

This old olive mill was pulsing with life during olive harvesting.

4.2 Other Opportunities: Women's Cooperatives

In Crete, according to the 2014 data of the Ministry of Rural Development and Food (MRDF), there were 23 active Women's Agro-tourism Cooperatives. Based on their postal address, all are outside NATURA 2000 Network areas, although many are very close to them.

Women's Agro-tourism Cooperatives promote the collective action of women in local societies and constitute a unique economic, social and cultural institution. In these cooperatives local resources and traditional

Carobs are a forgotten food source.

Creation of traditional folk woven textiles on the loom.

food standards are utilized and promoted, cultural heritage is preserved, agricultural income is boosted and local people stay in their place of origin. Women's Agro-tourism Cooperatives are engaged in the processing of local products and handicrafts, while they also offer restaurant and catering services.

The creation of Women's Agro-tourism Cooperatives inside areas of the NATURA 2000 Network is probably a good business opportunity that will promote not only the uniqueness of the Network's services but will also benefit local women's entrepreneurship and dynamics.

Handmade trahanas.

Wine grapes.

Cultivation of quince.

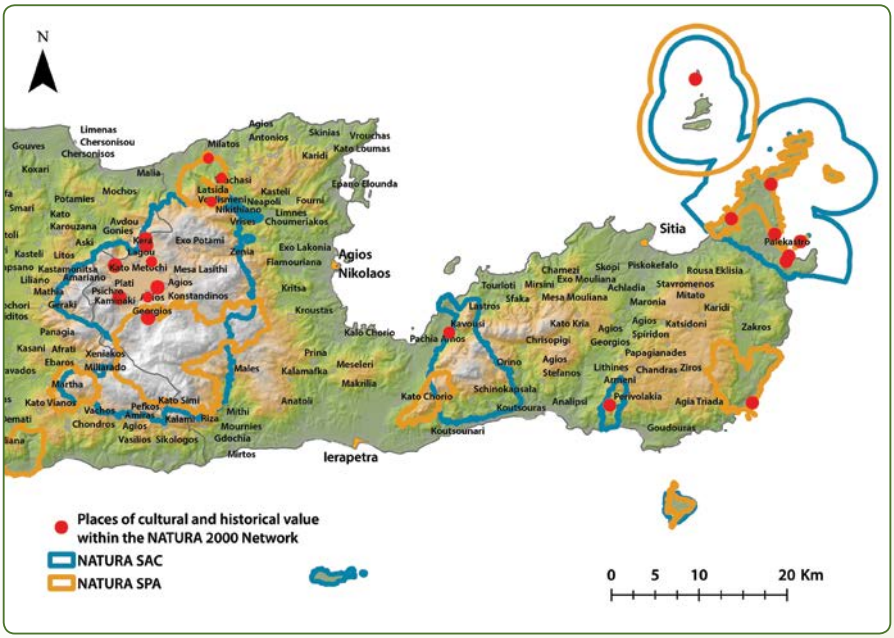
5 MAIN FORMS OF ALTERNATIVE TOURISM

Overall in Crete, there are many registered places of cultural and historical significance, inside and outside the areas of NATURA 2000 Network, which are related to agricultural ecosystems. Additionally, any places not inside the NATURA 2000 Network areas are less than 10 km away from any of them. These places are related to archaeological sites, residences of historical persons, watermills, bridges, monumental olive trees etc. Tourist tours in agricultural ecosystems can be combined with a visit to these sites as part of a walking tour.

Indicative sites in the Regional Unit of Lasithi are the following: the Dictaean Cave, the Holy Monastery of Vidiani, the ancient relics at Kefala, the Minoan settlement and the cemetery at mount Karfi, the fortifications and the vaulted tombs at Anavlochos, the Temple of Dictaean Zeus in Rousolakos, the Monumental Olive tree Azoria in Kavousi, the Hellenistic town of Ampelos in Xerokambos, the Toplou Monastery and Toplou Gorge, the ancient city of Itanos and the Petsofas Peak Sanctuary.

In addition to visiting places of cultural and historical value, it is also interesting to visit farms, participate in agricultural and livestock related activities (e.g. grapes and olive harvesting, shearing, cheese making), attend seminars on Cretan cuisine, and practice voluntary tourism (e.g. maintenance and restoration of infrastructure such as trails, fountains, threshing floors or terraces and drywalls).

MAP 11. Indicative sites of cultural and historical value, inside the areas of the NATURA 2000 Network in the Regional Unit of Lasithi.

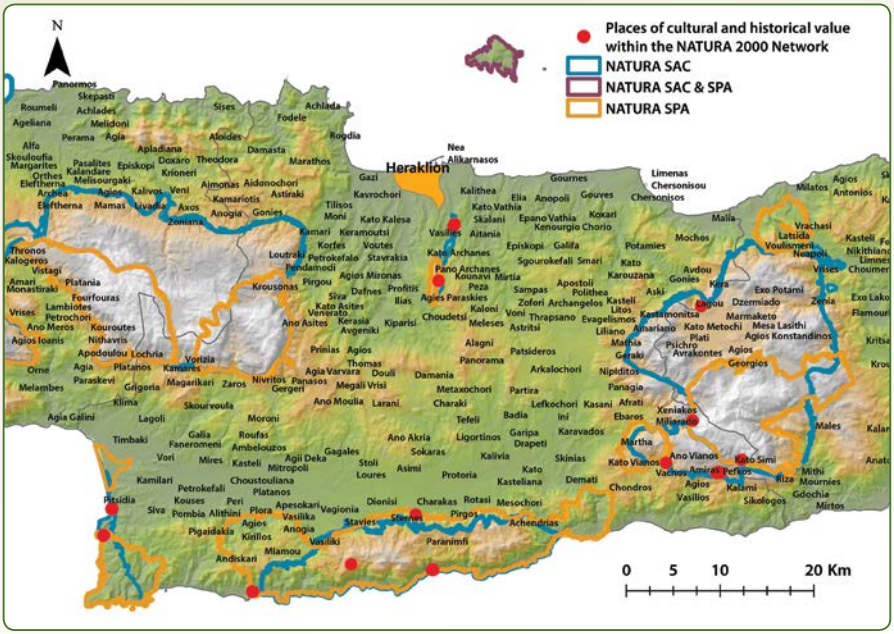


The monumental olive tree of Kavousi.

Archaeological site of Rousolakos.

Folklore Museum of Palekastro.

MAP 12. Indicative sites of cultural and historical value, inside the areas of the NATURA 2000 Network in the Regional Unit of Heraklion.

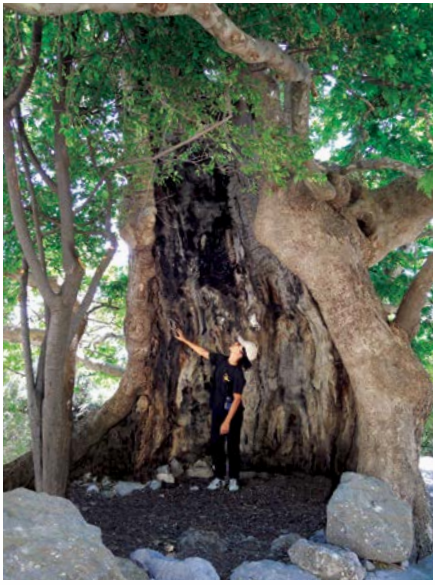


Indicative sites in the Regional Unit of Heraklion are the following: the Monastery of St. Pavlos near Tris Ekklisies, Agia Paraskevi in Harakas, the Stone Bridge and the Aqueduct in Agia Irini (Spilia), the Sanctuary of Hermes and Afroditi in Kato Simi, the Windmills at the Lasithi Plateau (near Pinakiano), the Viannos Towers, the Viannos Folklore Museum, the Ancient Kommos, the Peak Sanctuary of Giouchtas, the ancient Levina in Lendas and the ancient settlement of Matala.

Archaeological site of Kommos.

Ancient Inatos, area of Tsoutsouras.

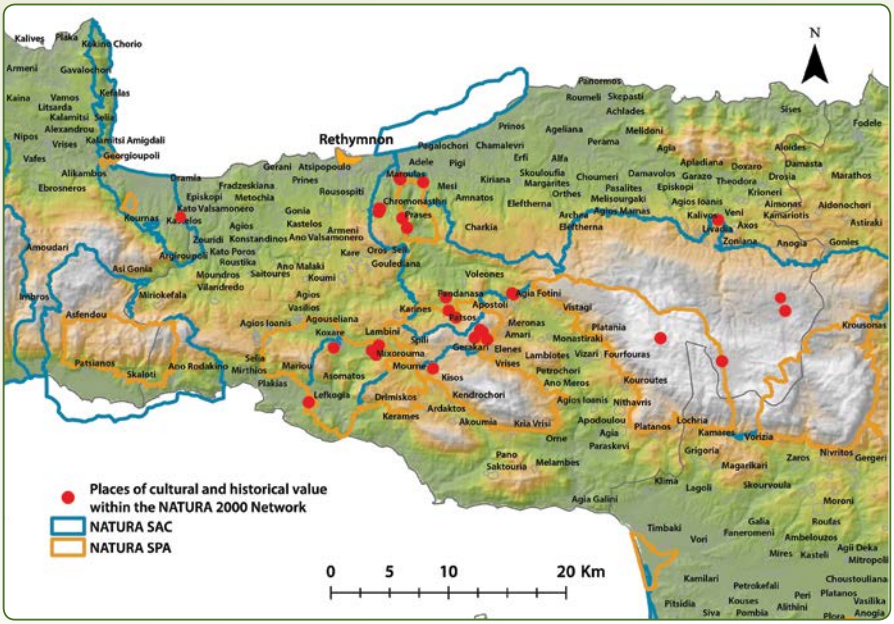
The Aqueduct of Agia Irini, Spilia.



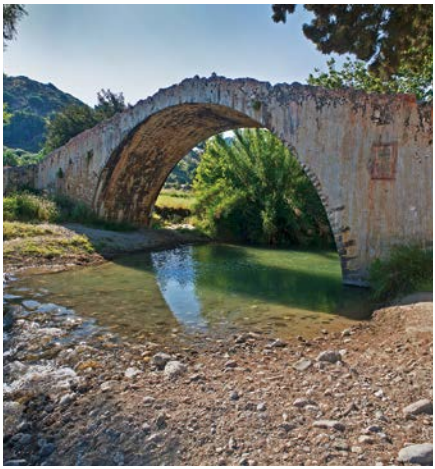
Plane tree in the Sanctuary of Hermes and Aphrodite, Kato Simi.

Harakas, Asterousia.

MAP 13. Indicative sites of cultural and historical value, inside the areas of the NATURA 2000 Network in the Regional Unit of Rethymnon.



Indicative sites in the Rethymnon Regional Unit are the following: the ancient city of Svitritos, the archaeological site of Zominthos, Idaeon Cave, the Koules Castle in Koksare, the Fountain in Lefkogia, the Minoan and Classical settlement in Kastri, the Minoan settlement of Elenes, the Minoan settlement of Patsos, the Shepherds' Huts (mitata) of Nida, the prehistoric settlement of Agios Onoufrios, the Roman settlement in the village of Lambini, the Gorge of the Mills and the Krataigos in Zominthos (monumental tree).



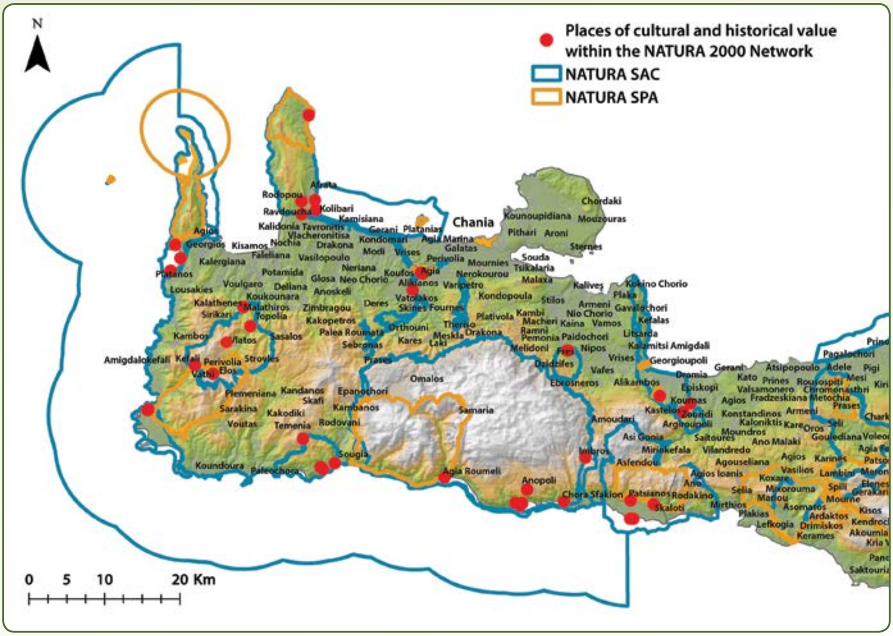
An old bridge in the area of Preveli's Kato monastery.

Area of Apostoloi, Amari.

Settlement inside the gorge of Miloi.

The historic Arkadi Monastery.

MAP 14. Indicative sites of cultural and historical value, inside the areas of the NATURA 2000 Network in the Regional Unit of Chania.



Indicative sites in the Regional Unit of Chania are the following: the windmill in Aspra Nera, the ancient city of Anopolis, the ancient city Phoenix in Loutro, the ancient city of Tarra, the Venetian villa Rotonda in Kalathenes, the Keritis river bridge in Alikianos, the Venetian villa in Rodopos, the Big Olive Tree of Aerinos in Felesiana, the Minoan settlement of Chrysoskalitissa, the Monastery of Chrysoskalitissa, the Monastery of Odigitria in Kolympari, the Church of Agios Ioannis, the old irrigation network of Agia-Kolimbari, the Plane tree of Ai Giannis Gionas in the monastery by the same name, the Plane tree in Vlatos, the Tower of Kallergis in Kefali, the Roman fortress in Kastri, the Turkish fortress in Loutro, Frangokastello, the old village of Samaria and the fortress of Imeri Gramvousa.

Finally, many places of a particular cultural and historical value are located very close to NATURA 2000 Network areas across the whole of Crete. Some of these are the ancient city of Zakros and the Monastery of Arkadi.

Traditional settlement in the area of Agios Dikaios.

Lake Kournas.

Frangokastello.

Monumental plane tree in Vlatos.

Chrysoskalitissa Monastery.

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7 GLOSSARY

Biodiversity or biological diversity: The diversity of all living organisms at all levels of life organization, from genes to ecosystems [Law 2204/1994 (GG A 59) (Ratification of the Convention on Biological Diversity, Article 2 Terminology)].

Ecology: The study of the abundance and distribution of organisms, and the interactions between organisms and their biotic and abiotic environment.

Ecosystem: A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit [Law 2204/1994 (GG A 59) (Ratification of the Convention on Biological Diversity, Article 2 Terminology)].

Ecosystem services: Services provided by the natural environment that benefit humans.

Habitat: Position with a suitable environment (e.g., appropriate vegetation or food sufficiency) for an organism (Gillespie, R.G. & Clague, D.A [Eds], 2009. Encyclopedia of Islands).

Natural capital: All the elements nature provides to man for his completion and survival. It includes the basic building blocks of a society such as soil, raw materials, water and air (Source: http://ec.europa.eu/environment/basics/natural-capital/index_en.htm).

Natural resources or natural goods: All natural substances available on earth and used by humans for their survival and development. They may be non-renewable (e.g. minerals, plant/animal species) or renewable (e.g. sun, air) (Source: http://www.eea.europa.eu/el/ themes/natural).

Olive groves in Simi, Viannos.

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p. 4: Harvesting olives on the foothills of Psiloritis.

p. 6: Exploring a path in the Geopark of Sitia, area of Toplou.

p. 54: Traditional olive cultivation in terraces with drywalls.

p. 56: The plain of Zakros with the olive groves and the Zakros Mountains in the background.

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