

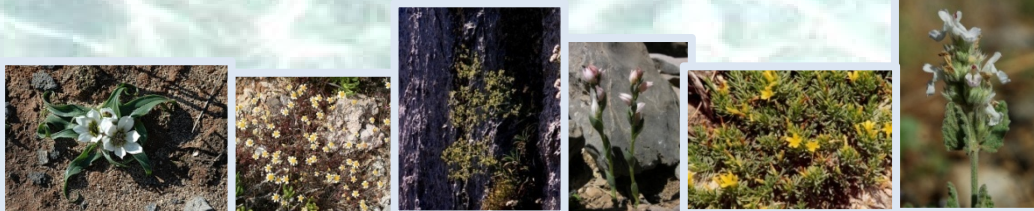


**LIFE NATURE 2004 PROJECT  
(LIFENAT\_GR\_000104)**

# **A Pilot Network of Plant Micro-Reserves in Western Crete**

**After-LIFE Conservation Plan**

**Beneficiary:** National & Kapodistrian University of Athens (NKUA)  
**Partners:** Mediterranean Agronomic Institute of Chania (MAICH)  
Forest Directorate of Chania (FDC)  
Regional Development Fund of Crete (RDFC)  
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## PREFACE

This report constitutes one of the final deliverables of the LIFE-Nature Project (LIFE04 NAT/GR/000104) “CRETAPLANT: A Pilot Network of Plant Micro-Reserves in Western Crete”. Its objective is a brief presentation of the Project outputs and a more extended one of the actions that will be taken following the end of the Project. These actions aim to maintain the operational character of the Plant Micro-Reserves (PMR) network in Western Crete and capitalize the profits gained from the work that was produced during the LIFE Project, both at the scientific and the communication level. This document in particular consists of:

- a presentation of the partners who are responsible for each ‘after LIFE’ action
- a presentation of the management actions that are important for the maintenance of the operational role of the PMRs
- a presentation of the conservation actions required for the effective protection of the target plant species
- a presentation of the communication actions planned towards enhancing public awareness regarding the PMR network in Western Crete, but also the promotion of the concept of the PMR establishment as a management tool for plant (and nature, in general) conservation.

As illustrated in this document, the ‘after LIFE’ management plan requires the involvement and cooperation of many different parties. The successful and effective maintenance of the established PMR network in Western Crete represents a great responsibility but also a major challenge for all the partners of this Project.

## INTRODUCTION

The island of Crete is situated in the southernmost part of Greece (and Europe, in general) and hosts an amazingly large part of the Greek endemic flora. The western part of the island (Prefecture of Chania), in particular, constitutes a plant biodiversity 'hotspot', as within its boundaries 6 of the 28 Community priority (Directive 92/43/EEC) plant species of Greece occur (*Androcymbium rechingeri*, *Anthemis glaberrima*, *Bupleurum kakiskalae*, *Cephalanthera cucullata*, *Hypericum aciferum*, *Nepeta sphaciotica*) as well as 4 Community priority habitats (1120 *Posidonia* beds - *Posidonion oceanicae*, 2250 Coastal dunes with *Juniperus* spp., 3170 Mediterranean temporary ponds, 9370 Palm groves of *Phoenix*). In 2004, the National and Kapodistrian University of Athens (**NKUA**), the Mediterranean Agronomic Institute of Chania (**MAICH**), the Forest Directorate of Chania (**FDC**) and the Regional Development Fund of Crete (**RDFC**) undertook the mission to set up a network of 7 reserves, 6 for the above mentioned plant species and 1 for the Community priority habitat 9370 – Palm groves of *Phoenix*, within the framework of the EU-funded LIFE Project (LIFE04NAT\_GR\_000104 - CRETAPLANT).

The establishment of Plant Micro Reserves (PMRs), as a tool for protecting threatened plant species, is a conservation approach that was firstly applied in Valencia in 1994 by Emilio Laguna and his research team and has proven quite successful since. Given that, by definition, PMRs have a relatively small size (less than 20 ha), they are ideal for the conservation of those plant species that form small and spatially limited populations. The CRETAPLANT Project is the first attempt in Greece to apply this innovative conservation method, which might become a highly suitable and powerful tool for the environmental policy of a country like Greece that hosts hundreds of local endemic (stenoendemic) plants.

The populations of the plants selected in the framework of the Project fall within the boundaries of 4 SCI (Natura 2000 sites), namely: Gramvousa etc (GR4340001), Elafonisos etc (GR4340002), Lefka Ori etc (GR4340008) and Chrysoskalitissa etc (GR4340015). The establishment of PMRs contributes to the enhancement, on a more localized level, of the conservation efforts for these 6 priority species and the priority habitat. Besides the key goal of ensuring the survival of these specific plant species and the viability of their populations, the establishment of PMRs targets to a wider range of objectives:

- Protection of the plants and habitats as well as other important species of fauna and flora that occur within the 7 PMRs.
- Involvement of local authorities (municipalities etc.) in the environmental management of the protected areas (currently practiced by the central government, universities and NGOs).
- Awareness of local people regarding the biodiversity treasures and the protection of natural environment.
- Promotion of the PMR concept on a national level, as a complementary management tool that can become part of the national conservation policy and, potentially, be adopted by the Management Authorities of the Protected Areas.
- Dissemination of the scientific work produced both during and after the end of the Project.
- Contribution to a wider planning towards a more sustainable tourism model (through green tourism and ecotourism), in an area where the local economy is already heavily dependent on tourism.

## **Authorities and partners involved in the ‘after LIFE’ management of PMRs**

The partners who participated, in the first place, in the designation and implementation of the CRETAPLANT Project, i.e. the National and Kapodistrian University of Athens (**NKUA**), the Mediterranean Agronomic Institute of Chania (**MAICH**) and the Forest Directorate of Chania (**FDC**) will continue playing key roles in the management of the PMRs in the ‘after LIFE’ period. Moreover, significant contribution to this effort can be provided by local authorities (Municipalities of Inahorion, Sfakia, Kissamos and An. Selino) and the newly formed Management Authority of Lefka Ori (MALO). Regarding specific fields of responsibility, each partner will undertake:

### **NKUA**

- a) Monitoring the population dynamics for each of the 7 plant species in the corresponding PMRs.
- b) Collection and elaboration of the meteorological data from the meteorological microstations located in each PMR.
- c) *Ex situ* conservation: seed storage of duplicates from the targeted plant species
- d) Dissemination and promotion of the scientific experience gained during the CRETAPLANT Project.
- e) Promotion of the PMR concept as a conservation tool on national and European level.
- f) Dissemination of the objectives and results of CRETAPLANT Project to the public.
- g) Continued administration and updating of the CRETAPLANT website.

### **MAICH**

- a) *Ex situ* conservation: Seed storage, performance of seed germination tests, maintenance of the Botanical Garden in MAICH facilities.
- b) Dissemination of the objectives and outputs of CRETAPLANT to the public through the continued operation of the Visitors Centre and the Project permanent exhibition.
- c) Promotion of the role of PMR network in the environmental education.

### **FDC**

- a) Wardening and infrastructure maintenance (fencing, information boards, borderline signs) in 5 PMRs (in cooperation with MALO).
- b) *Ex situ* conservation: management and maintenance of the two Alpine Botanical Gardens.

### **MALO**

- a) Wardening of 4 PMRs (in cooperation with FDC).
- b) Scientific and financial support of ‘after LIFE’ conservation plans.

### **Municipality of Inahorion**

- a) Wardening and infrastructure maintenance of 2 PMRs.
- b) Financial support of ‘after LIFE’ conservation plan.

The Municipalities of Sfakia, Kissamos and An. Selino are also willing to contribute (in collaboration with the Project partners) to the ‘after LIFE’ management of the PMRs located in their respective region.

## **‘After LIFE’ Management Plan and prospects for the PMR network in W. Crete**

The sustainability of the management and monitoring plan, carried out during the CRETAPLANT Project, is a critical issue in the ‘after LIFE’ period and all partners are bound to serve this objective in their best possible way. The management plan consists of four separate but interdependent fields.

### **1. Establishment of a new legal status for PMRs**

The Project has investigated the legal status perspectives for PMRs according to the extant Greek legislature, along with the relevant ones for the Natura 2000 sites, and has filed a petition to the Region of Crete for the proclamation of PMRs as “wildlife refuges”, a process hopefully to be concluded within 2008 (according to the commitment of FDC). Three of the PMRs fall already within 2 “wildlife refuges”, the statutes of which will have to be reformed to include the target plant species of each PMR while three additional PMRs will be declared as new “wildlife refuges”. Finally, one PMR falls entirely within the borders of the Samaria Gorge National Park; thus it is already adequately protected by the existing legislation and there is no need for its proclamation as a “wildlife refuge”.

### **2. Wardening and maintenance of infrastructure**

During the CRETAPLANT Project implementation, wardening and maintenance of the infrastructure installed on the 7 PMRs was the responsibility of FDC that hired seasonal personnel. Apart from regular inspections by FDC staff, in the ‘after LIFE’ period, two more authorities will be involved in this important task:

- The Municipality of Inahorion has expressed interest to undertake the maintenance and promotion of the 2 PMRs (*Androcymbium rechingeri*, *Phoenix theophrasti*) that fall within the boundaries of the Municipality area.
- The newly formed Management Authority of Lefka Ori will be responsible for 4 PMRs (*Bupleurum kakiskalae*, *Cephalanthera cucullata*, *Hypericum aciferum*, *Nepeta sphaciotica*) situated in the wider area of Lefka Ori. The foundation of MALO creates new perspectives for conservation planning in the area, since the Management Authority is currently funded by the 3<sup>rd</sup> Community Support Framework (“Environment 2000-2006” Project) in order to implement a specific monitoring action for the most important plant species of Lefka Ori.
- Finally, the PMR of *Anthemis glaberrima* can be spared of wardening since the entire Agria Gramvousa islet is uninhabited; however FDC personnel will pay regular visits.

### **3. Conservation and monitoring plan**

The ‘after LIFE’ conservation plan includes both *in situ* and *ex situ* conservation actions that can be further divided into two categories:

- Specific conservation actions according to the characteristics of each PMR.
- Conservation actions common to all PMRs or implemented in the entire PMR network, such as climatic data monitoring and maintenance of the Botanical Gardens.

## In situ conservation

### Specific conservation actions for each PMR

During the LIFE Project implementation, on the basis of biological and ecological peculiarities, a specialized monitoring plan for each of the 7 plant species was adopted and followed. The 'after LIFE' conservation plan foresees that PMRs will be visited every year and, after 4-5 years of long-term monitoring, this work will offer valuable results on population dynamics, conservation status and PMR sustainability.

#### *Androcymbium rechingeri* PMR

The PMR of *Androcymbium rechingeri* is located on the islet of Elafonisos. *Androcymbium rechingeri* is a bulbous geophyte that flowers in the winter (December-February) and its aboveground parts dry out in summer. Permanent plots have been placed in the PMR in order to record the main monitoring parameters which are:

- population density
- vegetative growth (for tagged representatives of the population)

Key management objective: To protect the site of the PMR from the intense tourist activities that Elafonisos islet faces during the summer period.

#### *Anthemis glaberrima* PMR

The PMR of *Anthemis glaberrima* is located in the islet of Agria Gramvousa. *Anthemis glaberrima* is an annual plant that grows in small cavities of the coastal calcareous rocks. Permanent plots have been established in the PMR in order to record the main monitoring parameters which are:

- population density
- annual population fluctuations

Key management objective: This PMR is probably the 'safest' among the seven PMRs, as it is located on an uninhabited islet.

#### *Bupleurum kakiskalae* PMR

The PMR of *Bupleurum kakiskalae* is a steep calcareous cliff in the locality Linoseli, Lefka Ori. Its geomorphology does not allow the actual establishment of monitoring plots, thus monitoring takes place with the use of a telescopic camera and virtual monitoring plots. A distinctive character of the species is that it is monocarpic, i.e. it flowers only once in its life cycle and then dries out. The main monitoring parameters are:

- annual fluctuations of flowering plants (reproductive population)
- population density
- regeneration rate (number of seedlings)

Key management objective: The natural enhancement of population size by protecting (through fencing) seedlings and juvenile plants from grazing.

#### *Cephalanthera cucullata* PMR

The PMR of *Cephalanthera cucullata* is located at the site Koukouli of Lefka Ori. This orchid has the unique feature of the occasional reproductive growth and flowering. The main monitoring parameters are:

- annual fluctuations of the reproductive population
- vegetative growth (for tagged representatives of the population)
- other reproductive features, such as number of flowering stems per individual and number of fruits per flowering stem/individual

Key management objective: The natural population enrichment by protecting the plants from grazing.

#### *Hypericum aciferum* PMR

The PMR of *Hypericum aciferum* is located on the coastal site of Fournoti, in the southern part of the Prefecture of Chania. *Hypericum aciferum* is a perennial chasmophyte and the monitoring of its population takes place through the establishment of monitoring plots. The main monitoring parameters are:

- population density
- vegetative growth (for tagged representatives of the population)

Key management objective: To protect the site of the PMR from intense tourist activities during the summer period.

#### *Nepeta sphaciotica* PMR

The PMR of *Nepeta sphaciotica* is located on the northern slope of Svoirichti summit in Lefka Ori, at an altitude of 2250 m. *Nepeta sphaciotica* is a perennial aromatic shrub that is known to grow only in this single location. The main monitoring parameters are:

- population density
- annual fluctuation of the number of vegetative and reproductive plants
- vegetative growth (for tagged representatives of the population)

Key management objective: The exclusion of grazing animals from the PMR especially during the flowering and fruiting season (July - August).

#### *Phoenix theophrasti* PMR

The PMR of *Phoenix theophrasti* is located on the coastal area of Aspri Limni, near Elafonissos. The population of *Phoenix theophrasti* in Aspri Limni is the westernmost population of the species, comprised by only 42 individuals that grow under dry and rather unsuitable conditions, for the species; small population size and adverse conditions may both account for the complete lack of seed production and population regeneration. The main monitoring parameters are:

- vegetative growth (for all individuals of *Phoenix theophrasti* population)
- vegetative growth of the offshoots that were planted in the PMR on November 2007
- reproductive characteristics

Key management objective: The short-term population enrichment with clonal offshoot planting and the induction of seed production (through artificial pollination) for the long-term regeneration and sustainability of the palm population.



### **Collection and elaboration of meteorological data**

Living in the era when the effects of climate change on natural habitats are being visible even to the non experts, recording and elaborating climatic data becomes a highly valuable tool for environmental management and biodiversity conservation. For the 'after LIFE' period, the meteorological microstations and dataloggers installed in each PMR will remain on site. A regular (annual at least) data downloading from each meteorological microstation is planned. This will allow the detection of possible changes in the microclimate of each PMR, probably during a 10-year period and also the observation of any correlations between possible changes in the microclimatic conditions of each PMR and the climatic conditions of the wider area of Western Crete.

### **Ex situ conservation**

#### **Seed storage**

The already collected seed samples are preserved under optimal storage conditions that safeguard (for decades and probably centuries to come) the long-term *ex situ* conservation of genetic resources (for the 7 target plants and additional endangered plants growing in PMRs). Seed samples are stored in the Seed Bank of MAICH; some duplicates are already hosted in the Seed Bank of NKUA. The stored seeds have been collected from the populations in the PMRs, except for the seeds of *Phoenix theophrasti* that were collected from 2 other populations (Vai, Preveli) since the plants of the PMR do not produce seeds. This effort will continue with additional seed collecting (of the target species and several supplementary taxa) in the following years in order to encompass the maximum representation of the genetic diversity of the species (more individuals, more localities and more years of seed production) and PMR plant diversity.

Seed germination experiments will carry on, especially for the species with a highly demanding germination behavior, such as the orchid *Cephalanthera cucullata*.

#### **Cultivation of seedlings/entire plants in Botanical Gardens**

Two Alpine Botanical Gardens have been established during the CRETAPLANT Project in Omalos and Poria, within the Samaria Gorge National Park. The establishment of the Alpine Botanical Gardens was essential for the cultivation of the 2 mountainous plant species *Nepeta sphaciotica* and *Bupleurum kakiskalae*, as these two plants do not flower in the Botanical Garden of MAICH. Plants from all 7 species (along with other Cretan endemics) grow in the Botanical Garden of MAICH.

#### **4. Communication plan**

One of the most important aspects of the role of protected areas is to show the necessary 'extroversion', meaning that, apart from the conservation work itself, the information and the results produced from this work should be communicated to large parts of the society. In respect to this objective, protected areas can contribute to:

- Dissemination of the scientific knowledge and experience applied and produced regarding the management of protected areas.
- General environmental and conservation policy.
- Layman's information and awareness.
- Sustainable local development, through ecotourism for example.
- Environmental education.

The partners of CRETAPLANT strongly believe that the PMR network established in Western Crete should meet the above goals. For the 'after LIFE' period, the continuation and reinforcement of the targeted and coherent communication plan applied during the LIFE Project is foreseen, with specialized actions towards every one of the above mentioned fields of interest.

##### ***Diffusion of scientific knowledge - Environmental and conservation policy***

The establishment of Micro-Reserves as a tool for conservation of plant biodiversity is a relatively new approach (conceived in the early 1990s) and is applied, for the first time in Greece, as an environmental tool. Given that Greece, due to its geomorphology (thousands of small islands and hundreds of high summits), exhibits an amazing number of local endemic plant species, the application of PMRs seems a quite appealing and suitable practice for the conservation of threatened plants. Actions to be taken towards this goal include:

- Presentation of the methods and the results of the overall scientific work produced by the CRETAPLANT Project in scientific meetings throughout Greece and Europe.
- Distribution of outplanting protocols and guidelines for seedling propagation and cultivation (use in dissemination – botanic gardens, ornamental purposes, scientific research and future programs of population enrichment and/or reintroduction into nature).
- Establishment of communication channels with the Management Authorities of Protected Areas, Universities and NGOs involved in biodiversity conservation.

##### ***Public/layman information and awareness***

- CRETAPLANT website: The site is hosted in a server provided by the National and Kapodistrian University of Athens, the authorities of which have conceded to maintain it for at least 5 years. The administrator of the site is the manager of CRETAPLANT Project (Assoc. Prof. Costas A. Thanos) and his team. The site is updated regularly with news and events related to developments on the application of the Micro-Reserve concept in Greece, Europe and world-wide. The site will include new data on the biology and ecology of plants as well as data obtained from population monitoring of

the targeted plants, PMR meteorological microstations, new publications related to PMRs and the plants involved, presentations (both scientific and popularized) by the Project partners and others in conferences and layman events, items of publicity in newspapers and magazines.

- Reproduction of information leaflets: Information leaflets for each of the 7 plant species and its corresponding PMR have been designed and will be reproduced and distributed by Municipalities and Local Authorities. The leaflets contain essential information about the plant species and their PMRs, while the conservation work that takes place in each of the 7 PMRs is also summarized.
- Visitors Centre and Botanical Garden of MAICH: These facilities will remain open to the public and will continue to operate regularly. The Visitors Center hosts a permanent exhibition with information related to the 7 plant species and their PMRs, while projections of the CRETAPLANT movie will be scheduled for organized group visits.
- Presentations of CRETAPLANT and projections of CRETAPLANT movie on special occasions (cultural festivals etc.) will continue to take place throughout the Prefecture of Chania and the island of Crete.
- Articles presenting the CRETAPLANT Project in popularized science magazines and newspapers are planned on local and national level.

### ***Sustainable local development***

The maintenance and possible future expansion of the PMR network in Western Crete is considered to perform best within a framework of sustainable local development, a framework that would be friendlier both to local communities and natural habitats. The CRETAPLANT Project aims to promote alternative, mild economic activities in the area, especially in the sector of tourism. Efforts towards this goal have already started during the first phase of the Project:

- Cooperation with tourist agents, groups of alternative tourism (hikers, alpinists, cyclists) in order to enhance tourists' interest and awareness regarding the natural environment of Western Crete and the conservation actions taken.
- Cooperation with municipalities for the distribution of information leaflets in tourist points.
- Information meetings with other professional groups (stock breeders, farmers, trade associations) towards achieving the widest possible social consensus.

### ***Environmental education***

- Scheduled visits of schools at the Visitors Centre and the Botanical Garden of MAICH.
- Presentations of CRETAPLANT and projections of CRETAPLANT movie in schools and Environmental Education Centers throughout the Prefecture of Chania and the island of Crete.
- Presentation of CRETAPLANT Project in seminars for environmental education tutors.
- Presentation of CRETAPLANT Project to the students of the Department of Biology of NKUA (and other Universities).
- Recruitment and training of volunteers (mainly among university students) to serve as field researchers both in PMR maintenance activities and other nature conservation projects.