2nd Mediterranean Plant Conservation Week
"Conservation of Mediterranean Plant Diversity: Complementary Approaches and New Perspectives

An update on the *in situ* conservation of *Zelkova abelicea* on Crete

Salvatore Pasta

In collaboration with: L. Fazan, D. Ghosn, I. Remoundou, P. Gotsiou, P. Sklavaki, H. Kargiolaki, E. Flouris, E. Siligardos, P. Petrakis, C. Thanos, G. Garfì, G. Kozlowski

Supported by:

Outline

- Introduction to the species
- Conservation project
- Local context
- *In situ* actions
- Outputs of *in situ* actions

The *Zelkova* gen(i)us

- **Ulmaceae**
- 6 extant species with a disjunct distribution
- Relict species from the Paleogene (66-23 Ma B.P.) – important component of forests in the Northern Hemisphere
- Living fossils

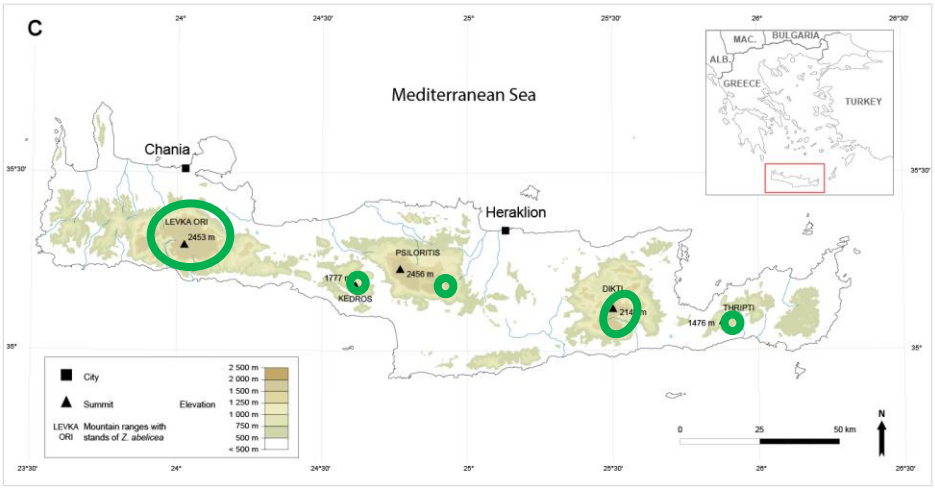
Zelkova abelicea

Relict, deciduous tree of the elm (Ulmaceae) family

Distribution



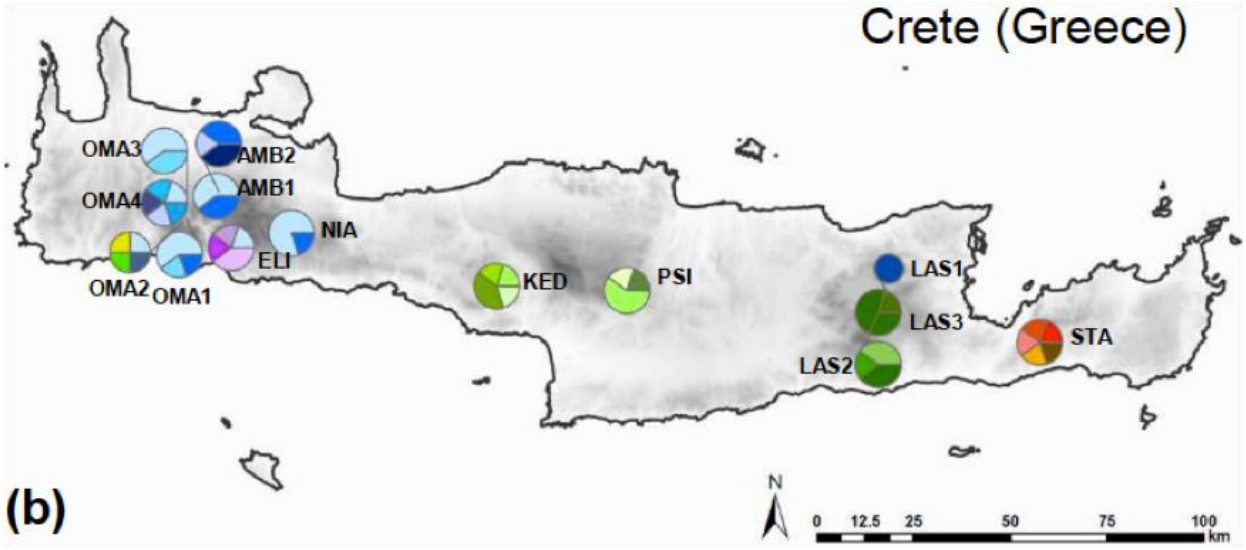
- Endemic to Crete
- Grows between 800-1800 m a.s.l.
- Fragmented distribution with 5-6 spatially and genetically distinct populations
- Co-occurs with *Acer sempervirens*, *Quercus coccifera* and occasionally *Cupressus sempervirens*



Genetic diversity

High genetic diversity
- within the populations
- between populations
- between mountain ranges

→ Attests of the ancient origin of the species in the area, the isolation by distance of the species & populations, and a limited genetic drift.



Chloroplastic haplotype variability and geographical structuration Christe et al. 2014a

Morphology

Tree habit

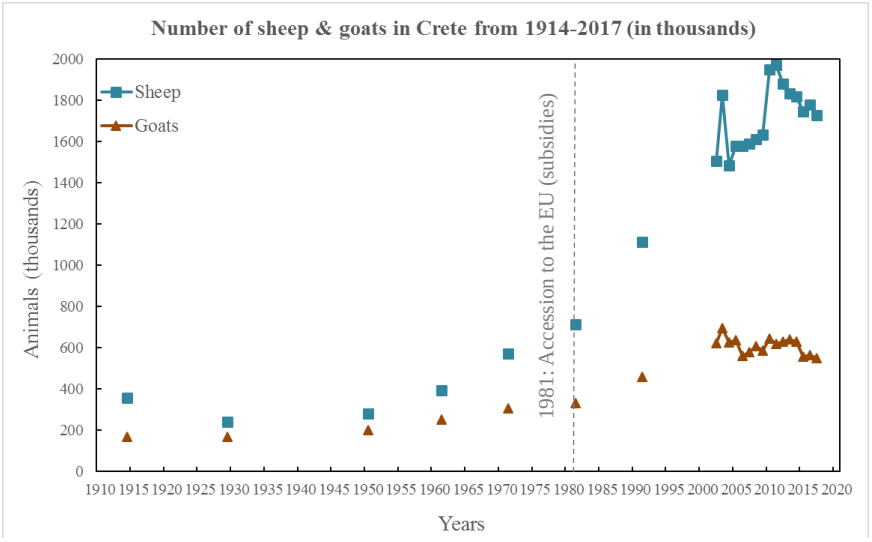
- Can produce fruit
- ~5% of individuals

Dwarf habit

- Do not flower
- ~95% of individuals
- Mainly resulting from overbrowsing

Threats

- Intensive pastoral activities
  - → overbrowsing
  - → trampling
  - → habitat degradation (erosion)
- Drought stress
- Habitat transformation
- Changes in pastoral practices & animal numbers



Zelkova abelicea conservation project

Goals: promote and enable the long-term conservation of natural populations of *Zelkova abelicea* by combining *in situ* and *ex situ* conservation actions with communication and outreach activities

Duration: 2014-2021

Project actions

- *In situ* conservation actions
  - Protect *Z. abelicea* individuals from browsing with **fenced** plots
  - Examine the effect of excluding browsing on the growth of *Z. abelicea* and local vegetation dynamics
- *Ex situ* conservation actions
  - Seed collection, curation and germination for propagation
  - Vegetative propagation
- Communication and outreach activities
  - Activities with schools
  - Information events in local communities
  - Development of a dedicated website www.abelitsia.gr
  - Leaflets with information for dissemination
  - Articles in local media
  - Information panels
  - Participation in congresses

Project partners

Carried out by

- CIHEAM – Mediterranean Agronomic Institute of Chania
- The 4 Forest Directorates of Crete (Lassithi, Iraklio, Rethymno, Chania)

Scientific support

- National Kapodistrian University of Athens
- Hellenic Agricultural Organization – Demetra – Institute of Mediterranean Ecosystems
- Italian National Council of Research
- University of Fribourg (Switzerland)

Financial support

- Foundation Franklinia

Collaborations

First time that such a project exists, involving and with collaboration between the 4 Forest Directorates of Crete and the MAICh and with actions carried out throughout Crete.

The Cretan context

- *Zelkova abelicea* is protected by the Greek legislation (Presidential Decree 67/1981) forbidding the collection and use of any plant parts
- Other laws regulate (over)browsing (mostly if "severe" disturbance/destruction occur
- All forested areas where *Z. abelicea* grows are legally considered as public land belonging to the Greek state (law established during the Ottoman rule)
- Shepherds have the right to use public land as grazing areas but often consider these areas as their own for historical reasons
- No official cadastre (i.e. land boundaries) in many areas of Crete

→ Open road to potential (unending) conflicts

Challenges for *in situ* conservation

- The absence of an official cadastre
- All areas hosting *Z. abelicea* plants are legally considered as public land
- But the local people consider them as their own for historical reasons

→ Challenging for conservation actions

- Local land users do not own legally the land and thus cannot be paid to compensate for fencing but still consider it as their land
- Fenced plots survive only due to “good will” of the land users

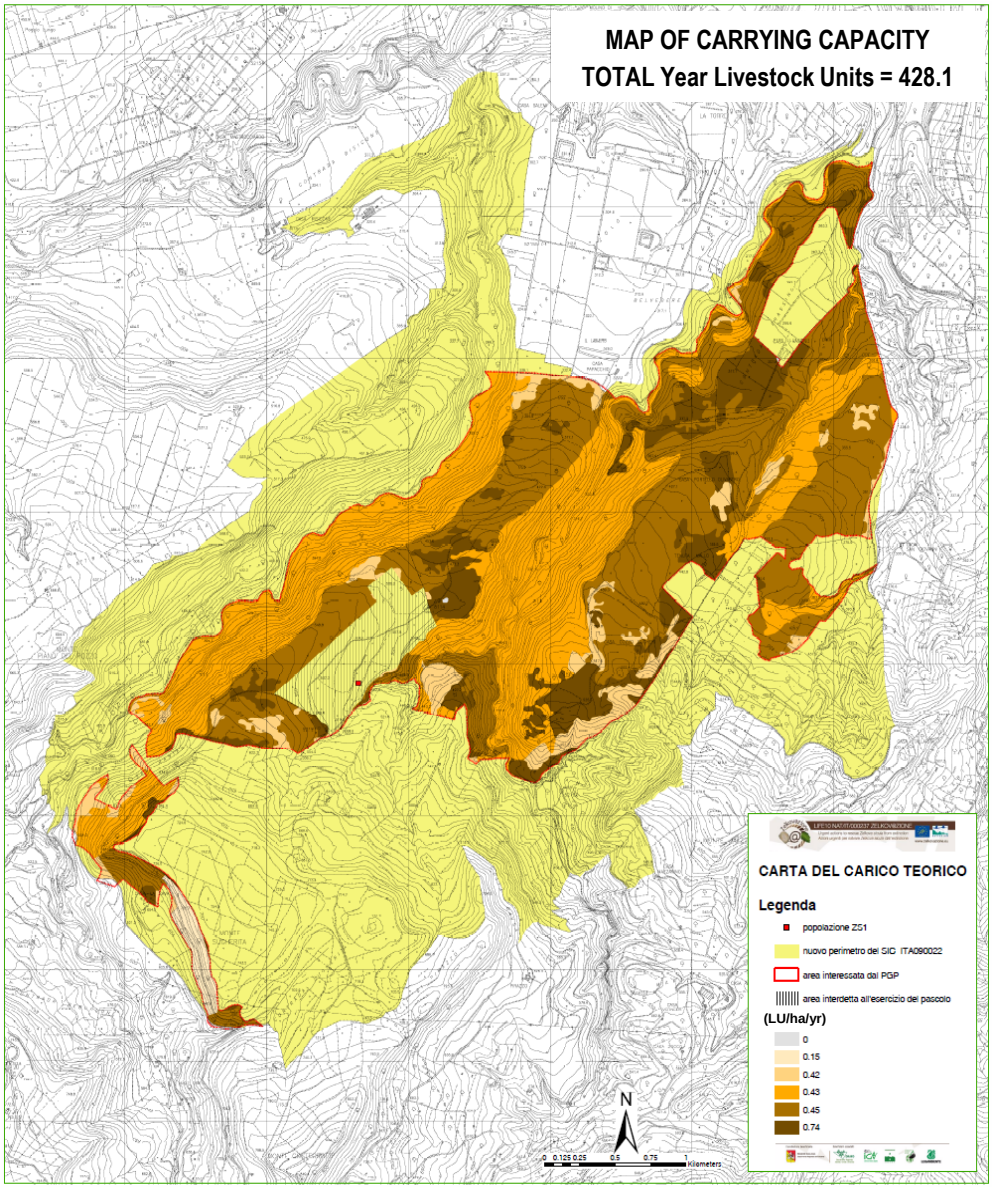
The case of *Zelkova sicula* in Sicily

- Fencing to protect the rare *Zelkova sicula*
- Land owned by the Municipality of Buccheri but conceded for 20 yr to the Regional Department of Forests (DRSRT)
- Shepherds had grazing animals in the area but were there illegally
- Win-Win situation:
  - The DRSRT made a contract with the shepherds to rent the land (could graze in area, but respect fenced area & not surpass the allowed number of animals per area)
  - The presence and activities of the shepherds were legalized thus they can now receive subsidies from the EU

The case of *Zelkova sicula* in Sicily

Sustainable grazing management

Agreement respected by the shepherds → **grazing stopped immediately** in all the project areas



In situ conservation - fencing

- Small scale fencing (25-100 m^2)

Casualties

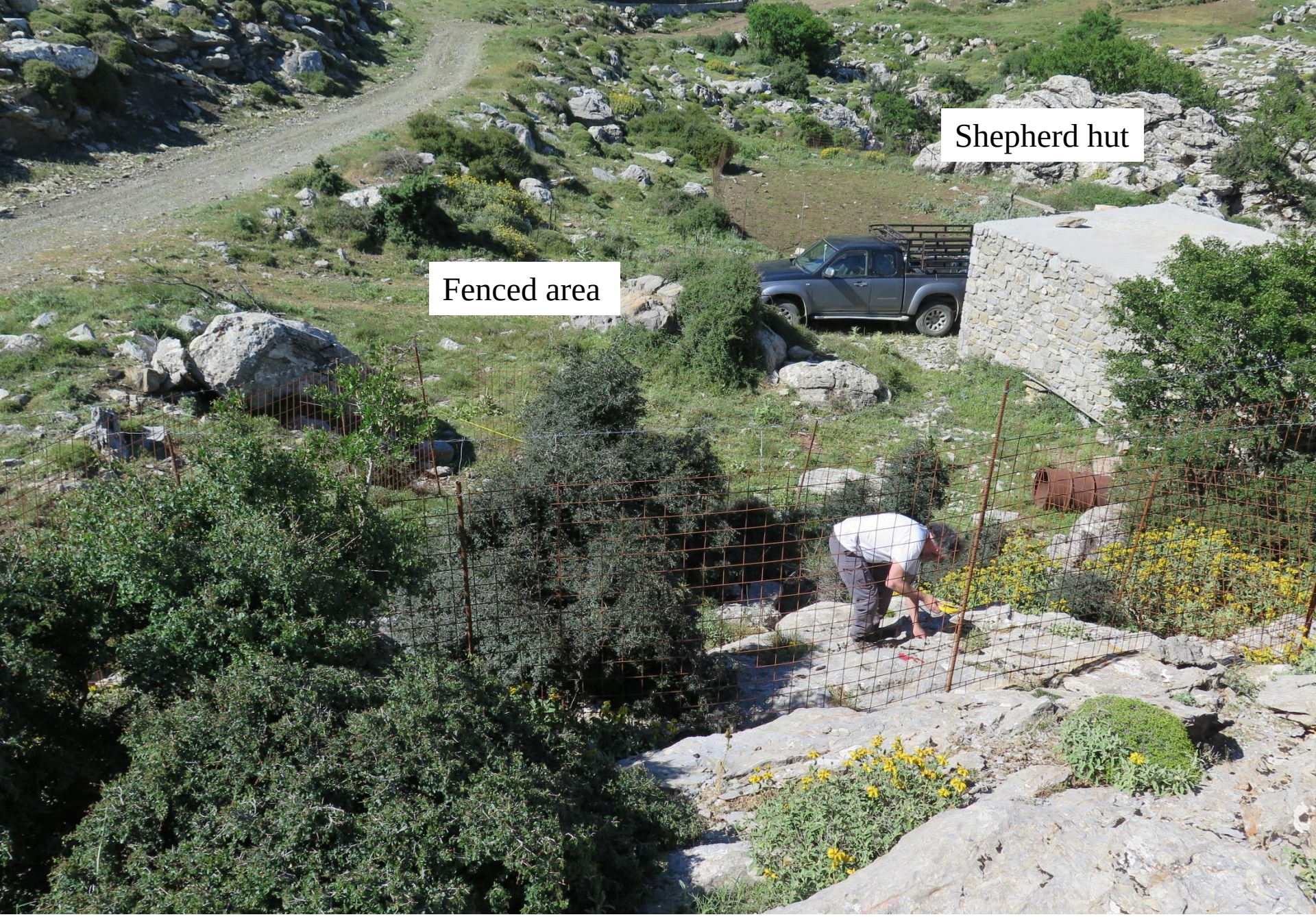
	Year	Nb fences installed	Nb fences damaged		Nb info events
			Human	Natural	
	2014	15	-	-	0
	2015	13	2	1	0
	2016	4	3	1	7 (schools)
	2017	3	4	0	3 (1 school, 2 villages)
	2018	0	0	0	12 (10 schools, 2 villages)
Total	All	35			22
	Not reconstructed	4	3	1	
	Existing	31			

Natural damage

Intentional damage

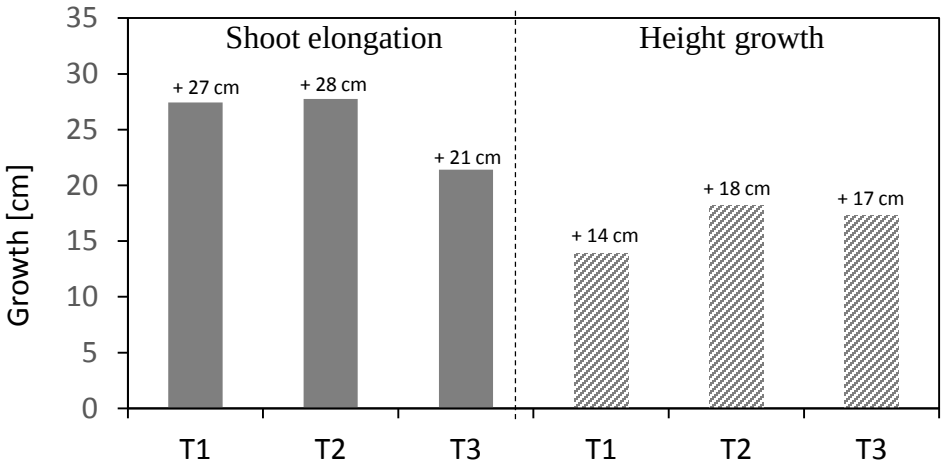
Importance of communicating

- Involving local people
  - Information events at local schools
  - Information events in local communities
- Importance of building personal link with local communities
  - People feel responsible of the fenced areas
  - They look after the fences
- But sometimes we were caught in the middle of local conflicts
  - Land users agreed on plot construction but second party destroyed them because they were against any decision taken by the first party


Shepherd hut
Fenced area

Preliminary observations

- In most cases, dwarfed *Z. abelicea* individuals & vegetation reacted fast and positively to the removal of browsing pressure
- This confirms the strong impact of browsing as major driving force in shaping *Z. abelicea* individuals as well as the local vegetation
- The longest measured *Z. abelicea* shoot was 120 cm in the 1st year after fencing



Average growth (left) and average shoot elongation (right) of *Z. abelicea* dwarfed individuals one (T1), two (T2) and three (T3) years after fencing.

Preliminary observations

2014

Browsed, little annual growth, not fenced

2018

Fenced, no browsing for 4 years, intense annual growth

On-going research

In some areas, the effects of browsing exclusion on *Z. abelicea* seem to be less significant. This suggests other factors such as precipitation, temperature, soil properties, altitude or aspect could be additionally associated with these variations.

→ Collection of data from:

- Online weather data from weather stations
- Soil and air temperature and moisture data from sensors installed within the plots
- Soil properties data

Thank you for your attention!

Questions?

Have a look at
www.abelitsia.gr
www.zelkova.ch