

FICHE – AGROFORESTRY CASE

“ORANGE AND OLIVE TREES INTERCROPPED WITH PULSES AND CEREAL IN GREECE”

Data extracted in May 2021

Note to the reader: This set of *fiches - agroforestry case* is offering additional information to the meta analysis literature review summarised in *general fiche* and set of *fiches* of the environmental aspects of AGROFORESTRY. Each individual case describes an agroforestry system within the European Union, delivering more detailed information on application and management practices.

1. DESCRIPTION OF THE AGROFORESTRY SYSTEM

Geographical location	Greece
Climate zone	Mediterranean
Geographical level	Farm
Description	In Chania, Crete, crops have been cultivated between the citrus trees from pollarding until the trees achieve a full canopy. Farmers also use cypress trees as windbreaks to protect the citrus trees from wind. In northern and central Greece, farmers have combined olive production with arable crops to ensure a steady economic return.
Key descriptors	<ul style="list-style-type: none"> • Increased agricultural and landscape biodiversity • Soil conservation with trees as wind break, and natural N-fixation • Carbon sequestration • Increased crop quality of arable component due to favourable microclimate and protection from extreme temperatures • Additional income
Agroforestry system	Silvoarable (some areas with silvopastoral)
Production system	Permanent crops: Olive tree; fig trees; grape vine, lemon and orange trees; Annual crops: Chickpeas, oregano, potatoes, barley, vetch; (livestock: sheep). The yield of the chickpeas was very successful with production reaching 2600 kg/ha. Both orange and olive production met the farmer’s expectations.
Actors involved	Individual family farms; approx.. 13 ha olives and 1 ha orange grove in total.
Project type	Part of the AGFORWARD research project funded by the European Union’s Seventh Framework Programme for research (No 613520)
Project status/ date of report	November 2017

2. LAYOUT OF THE AGROFORESTRY SYSTEM



3. AGROFORESTRY PRACTICES AND THEIR SUSTAINABILITY TRADE-OFFS

Cypress trees as windbreak hedgerows to protect citrus trees	
Trade-off/ barriers	No detailed information
Introducing chickpeas and cereals into orange and olive groves	
Sustainability trade-off	Depite chickpeas being adapted to dryer climate, rain mainly determined the yield. Although germination reached approximately 90%, the rain during the spring affected flowering, and there were additional losses due to rodent damage. Due to this, chickpea yield can fluctuate year to year.
Key barriers	Oregano did not perform well, as it was more sensitive to the limited water availability after planting. Early establishment might avoid this. Plants which were able to survive the first year have since been doing well.
Success factors	<ol style="list-style-type: none"> 1) The intercropping of olive trees with cereals (barley) and leguminous crops (common vetch) had positive effect on overall system productivity. Understory treatments (sowing, the mixture of barley and common vetch and fertilizer application) had positive effects on olive trees which became apparent after the second year of the experiment. The leaves were greener and the branches stronger. Comparing yields from N-fertilized plots with the agroforestry system showed no difference in yield. Positive synergies might therefore outweigh yield fluctuation. 2) Chickpeas are a high quality food for humans and an excellent source of protein for animal feed. They are easy to cultivate, requiring little management and, in general, have low treatment costs. One of the important characteristics of chickpeas is their low water demand, making them ideal for intercropping in Mediterranean and other dry ecosystems. 3) Additionally, chickpeas have high monetary value, so a farmer can gain considerable additional income from cultivating chickpeas among trees. Market-focused farmers manage orange tree (<i>Citrus sinensis</i>) varieties by pollarding and crafting. This procedure can take up to 15 years for the tree to reach maturity and attain maximum fruit yields. During this phase, chickpeas can be an additional income, while providing N-fertilization.

4. SOURCES, PROJECT WEBSITE OR DATA COLLECTION ON THE CASE STUDY

[Intercropping of olive groves in Greece - Agforward - en](#)

[Intercropping of Orange Groves in Greece - Agforward - en](#)

Wheaton TA, Whitney JD, Castle WS, Muraro RP, Browning HW, and Tucker DPH (1995). Citrus Scion and Rootstock, Topping Height, and Tree Spacing Affect Tree Size, Yield, Fruit Quality, and Economic Return. *J. Amer. Soc. Hort. Sci.* 120(5):861-870.

Papanastasis VP, Mantzanas K, Dini-Papanastasi O, Ispikoudis I (2009). Traditional agroforestry systems and their evolution in Greece. *Agroforestry in Europe. Advances in Agroforestry* 6: 89-109.

Vossen P (2007). Olive oil: history, production, and characteristics of the world's classic oils. *HortScience* 42(5): 1093-1100.