

**Work-package 3:** Agroforestry with high value trees

**Specific group:** Intercropping of orange groves in Greece

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**Author of report:** Anastasia Pantera, TEI Stereas Elladas, 3 Agiou Georgiou, Karpenissi 36100, Greece

**Contact:** [pantera@teiste.gr](mailto:pantera@teiste.gr)

The report contains additions and comments from team members.



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## 1. Context

The AGFORWARD research project (January 2014-December 2017), funded by the European Commission, is promoting agroforestry practices in Europe that will advance sustainable rural development. The project has four objectives:

- 1) to understand the context and extent of agroforestry in Europe,
- 2) to identify, develop and field-test innovations (through participatory research) to improve the benefits and viability of agroforestry systems in Europe,
- 3) to evaluate innovative agroforestry designs and practices at a field-, farm- and landscape scale, and
- 4) to promote the wider adoption of appropriate agroforestry systems in Europe through policy development and dissemination.

This report describes one of about 40 initial stakeholder workshops to address objective 2. Further details of the project can be found on the AGFORWARD website: [www.agforward.eu](http://www.agforward.eu)

## 2. Description of system

Of the global annual production of 80 million tonnes of citrus fruit, 19 million tonnes come from the Mediterranean and 1.1 million tonnes from Greece. The Greek production came from an area of about 50,000 ha (500,000 stremma). Of this, there are about 45,000 ha of oranges, with the rest being tangerines, lemon and grapefruit. In Crete, citrus cultivation covers 4500 ha, comprising 3300 ha of oranges, 340 ha of tangerines and about 300 ha of lemons and 70 ha of grapefruits.

In the past, farmers in the Chania area of Crete used to cultivate crops in between citrus trees after pollarding. They also used cypress trees as windbreaks to protect the citrus trees from wind. However many farmers have removed the cypress trees from the windbreaks and have uprooted the citrus trees and replaced them with an avocado monoculture for higher profit. Only a few farmers still practice the agroforestry system of citrus trees with intercrops. This practice can help ensure an economic return each year until the tree canopy fully develop and excludes any form of intercropping. Most of the intercrops are vegetables. After crown development the intercrops are sometimes replaced by poultry production.



Fig 1. Map of Greece; red dot shows location of meeting



Fig 2. General photo of the system





Figures 3, 4, 5, and 6. Orange trees are pollarded prior to the grafting of new varieties and, until full crown development, farmers intercrop with vegetables such as maize, vines, cucumbers, and pumpkins.



Figures 7 and 8. At full canopy development, the crown density means that the only possible agroforestry practice is chicken grazing

### 3. Participants

Two separate meetings were held: one for intercroops and one focused on hedgerows. The first meeting, included five people, took place during a local festival for orange trees on 2 August 2014. Four described themselves as farmers, there was one policy maker, and two AGFORWARD researchers. The second meeting on cypress hedgerows took place on 4 August 2014 and comprised two local agronomists and two AGFORWARD researchers. The festival took place in the village of Skine, which is at the centre of this system so no field trip took place.



Figure 9. The use of cypress trees as hedgerows (windbreaks) is a popular system that is gradually declining. Farmers remove the trees as they consider that they affect orange trees production

### Introduction session

Dr A. Pantera opened the discussion with an explanation of agroforestry, a description of various agroforestry systems throughout Europe and some key advantages and disadvantages. She also introduced the objectives of the AGFORWARD project. She provided a short presentation on why trees could be intercropped and the importance of stakeholder input. She mentioned that EU agricultural policy is tending to support more sustainable land use systems and this can encourage a change from monocultures to polyculture systems. Experimental results suggest the use of multiple species on the same land has the potential to generate higher income than monocultures, while simultaneously protecting the environment.

Dr A. Papadopoulos referred to the environmental dimension of the new CAP and the problems caused by soil degradation and climate change. He suggested agroforestry may contribute to reducing desertification and mitigate climate change effects on agricultural production. He referred to the role and value of trees as windbreaks. He noted that whilst the traditional cypress hedges were a common practice to protect citrus trees from wind, they were not widely used for timber production.

Mr Voulgarakis was an invited speaker to the festival. During the festival, he suggested that citrus intercropping dates back to the end of 19<sup>th</sup> century. Farmers have switched from local orange varieties to varieties from California and lately the “Falofo” and “Merlin” varieties. Farmers find themselves in a difficult position due to the low product prices, due to high transport costs to the mainland and competition from oranges imported from the North Africa. Farmers were replacing orange trees with avocado monocultures which currently achieve higher prices. Mr Voulgarakis suggested a solution may be to promote local products using the brand-name “Crete”. An agricultural festival would contribute to the promotion of local products to Greek consumers, but also to foreign markets thus increasing exports. The principal organizer of the festival (Mr Ioannis



Kasselakis) indicated that another option to advertise local products was to organize an orange-day, where participants would be offered freshly-squeezed orange juice and appreciate the high quality of the product.

At the festival, an agronomist called Mr Dountounakis explained the importance of citrus production to the economy in Crete and specifically in the region of Chania. He explained that approximately 15-20 million Euros come from this cultivation. He explained that the climate, the soil conditions, the availability of relatively cheap irrigation water, and an excellent market reputation gave Crete a comparative advantage for growing citrus. The climate meant that it was possible to grow early and late varieties, and there was the possibility of combining the citrus cultivation with tourism.

He noted that Greek citrus usually receive the best prices in the Balkan and central European countries. However increased global competition had adversely affected high cost countries like Greece. He thought that the EU could protect community citrus suppliers from unfair competition from outside of the EU. Supermarket chains are constantly pressing to reduce prices whilst improving citrus quality and certification in terms of minimising the use of pesticides. He felt that Crete lacked a rural development policy for citrus production, and the future of the industry looked uncertain because of the absence of government action.

He explained that a second difficulty of the citrus industry in Crete was the inability to create a strong group of producers. Increasing quality criteria was resulting gradually in their being insufficient quantities to supply key markets. Other issues were poor links between the farming and tourism sectors, high taxes, cash flow problems, some inconsistent merchants, and the removal of aid to citrus fruits since January 2010 to date. However this situation had changed as single farm payments became payable on oranges (although not other citrus fruits).

He also explained that there were also the structural problem of small and fragmented land ownership, and the relatively high price of land where citrus cultivations occur. Agricultural land was also often poorly protected. There was also the presence and gradual spread of damage from diseases such as the Tristeza virus. Other issues included minimal applied research, high certification costs for small enterprises, and high transport and port costs.

#### **4. Positive and negative aspects of olive intercropping systems**

Dr. Pantera forwarded a questionnaire to Mrs Kasselaki, a local stakeholder and agronomist. In the discussion that took place, the group identified the key issues and challenges that were related to agroforestry. The participants were asked to complete a brief questionnaire, which sought to highlight the key positive and negative aspects of orange intercropping systems. The rankings were ordered according to a scoring system described by Crous-Duran et al (2014) (Table 1)

Table 1. Scores assigned to the ranking scale

Rank	1	2	3	4	5	6	7	8	9	10
Points	25	18	15	12	10	8	6	4	2	1

### Positive aspects

The most positive aspects of orange intercropping included runoff and flood control, soil conservation, and the general environment (Table 2). Product quality, and diversity of products and income was also of great importance to respondents. Respondents are environmentally aware and sensitive since land preservation and value is high and important in the area. As also indicated in the qualitative answers, respondents are concerned with high land and product taxation.

Table 2. Positive aspects of orange intercropping as ranked by five respondents

Aspect	Ranking by five respondents					Σ
Runoff and flood control	1	1	1	1	1	125
Soil conservation	1	1	1	1	1	125
Crop quality/food safety	1	1	1	1	2	118
Diversity of products	1	1	1	1	2	118
General environment	1	2	1	1	1	118
Income diversity	1	1	2	1	1	118
Landscape aesthetics	1	2	2	1	1	111
Farmer image	1	2	2	1	1	111
Profit	1	2	2	1	1	111
Disease and weed control	1	3	1	1	2	108
Originality and interest	1	2	1	2	2	104
Carbon sequestration	2	2	2	1	1	104
Climate moderation	2	2	1	2	1	104
Biodiversity and wildlife habitat	3	1	2	1	2	101
Control of manure/noise/odour	1	2	1	2	2	95
Change in fire risk	2	2	3	2	1	94
Tree regeneration/survival	2	1	5	1	3	93
Timber/wood/fruit/nut quality	2	2	2	2	2	90
Business opportunities	3	1	3	3	2	88
Timber/wood/fruit/nut production	2	2	1	2	9	81
Cash flow	3	3	2	3	2	81
Rural employment	3	3	2	4	2	78
Mechanisation	2	3	2	5	3	76
Project feasibility	2	2	5	2	4	76
Complexity of work	3	2	2	5	4	73
Labour	3	5	3	3	2	73
Management costs	4	4	4	4	2	73
Local food supply	2	2	1	2	2	73
Reduced groundwater recharge	4	8	3	6	5	59
Market risk	4	5	4	6	3	57
Administrative burden	6	6	4	5	2	56
Water quality	3	7	4	5	4	55
Marketing premium		4		7	5	28
Subsidy and grant eligibility				4		12
Inheritance and tax					5	10
Regulation					5	10

## 5. Issues and challenges

In the questionnaire, the key qualitative issues was trying to find new markets that would enhance the price of oranges. In the discussion that followed, the group identified the key issues and challenges that were related to agroforestry. The following nine key topics and subtopics were identified:

### Intercropping

- Do we still want this system?
- If we decide to intercrop, which crop species should we use?
- Intercropping with aromatic herbs may positively affect production. Which herb to intercrop?
- Vegetables (potatoes, watermelons and beans) are presently used as intercrops.

### Cultivation-production techniques

- Does tree shade affect crop production?
- What is the effect of living fences (mostly cypress trees) on production? Orientation of the fence?
- Farmers should be self-organized, products should be accurately priced
- New markets must be found for this product
- What is the more effective way to enhance farmers' income?

## 6. Possible innovations

The group identified the intercropping of aromatic herbs between orange trees as a potential best practice. Looking forward, the group proposed as a potential innovation to investigate new intercrops with aromatic plants. Two farmers responded positively to the possibility of collaborating with the AGFORWARD team on the experiments in the area.

## 7. Reference

Crous-Duran, J., Amaral Paulo, J., Palma, J. (2014). Initial Stakeholder Meeting Report Montado in Portugal. Instituto Superior de Agronomia (ISA), Universidade de Lisboa, Portugal.

## 8. Acknowledgements

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