



Plant diversity and agroecosystem services provision in olive orchards, in Crete, Greece. The effect of agricultural management system and agroecological zone

I.Zografakis¹, E. Avramakis², T. Vrachnakis¹, I. Chasourakis¹, A. Loulakis¹, N. Volakakis¹, A. Stratariadaki¹, E. Kambourakis¹

zografakisioan@hmu.gr



¹Olive, Vine and Agroecological Production Systems Lab, Department of Agriculture, Hellenic Mediterranean University, Estavromenos, 71004 Heraklion, Greece
²Natural History Museum of Crete, University of Crete, Knossou Avenue, 71409 Heraklion, Greece.

INTRODUCTION & AIM

Intensification of farming practices have negatively impacted agricultural land worldwide. Soil degradation and biodiversity decline have been reported in olive orchards (Gomiero et al., 2011). In Crete, one of the main olive oil production regions in Greece, olive orchards contribute in large extend to the island's topography, economy and cultural heritage (Kabourakis, 2001). Organic farming, has been proposed as an alternative, to mitigate the negative effects of conventional farming by prohibiting the use of synthetic chemicals and applying agroecological practices. The proper management of spontaneous vegetation, enhances organic matter and nutrient recycling and can be an important measure for improving agroecosystems' functioning. It can increase agroecosystem services such soil fertility, water quality and quantity, pest management, landscape conservation, outdoor recreation, climate regulation and resilience to climate change. Agroecological zone, which is defined by altitude, slope, soil properties and climatic conditions, also affects floristic diversity (Gkisakis et al., 2020). The aim of this study is to assess the effect of a) management system (MS) and b) agroecological zone (AZ) on olive orchards': 1) flora species richness, 2) functional species richness, 3) floristic diversity.



Figure 1: *Gladiolous italicus* (left) and *Ophrys cretica* (right) in olive orchards in the study area.

METHODS

The flora was surveyed in 6 paired conventionally and organic olive orchards, in two agroecological zones, hilly and plain, for a one-year period, in Messara region, Crete, Greece (Figure 2). The orchards are located equally, in two agroecological zones (hilly and plain). In each orchard, 3 sampling stations / ha, 64 m² area, were surveyed for the number of species, the population size of each species and the floristic diversity (Shannon index). The effects of management system and agroecological zone on species richness and floristic diversity were determined by univariate comparative analyses. Daily precipitation and temperature were monitored by Davis meteorological stations, one in the hilly and one in the plain agroecological zone.

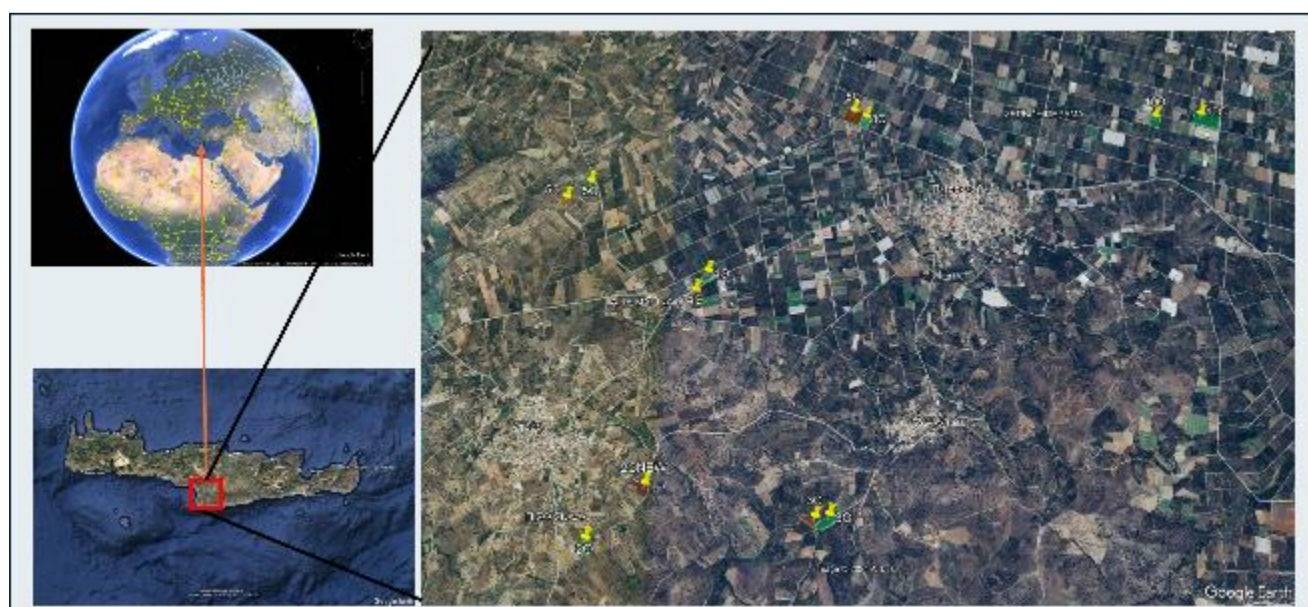


Figure 2: The study area and the specific locations of the surveyed orchards.

RESULTS & DISCUSSION

- Regarding the functional flora groups, 50 edible species, 44 composites, 40 legumes, 39 grasses and 10 umbellifers were found.
- Tendency for higher number of functional flora species in the organically managed olive orchards, in comparison to the conventionally managed ones (Figure 3). The agroecological practices and the prohibition of synthetic chemical inputs use in organic farming, may explain this pattern.
- In terms of the agroecological zones, a tendency for higher number of functional flora species was found in the hilly zone, compared to the plain zone (Figure 3). This can be attributed to the higher annual precipitation and the soil properties in the hilly zone.

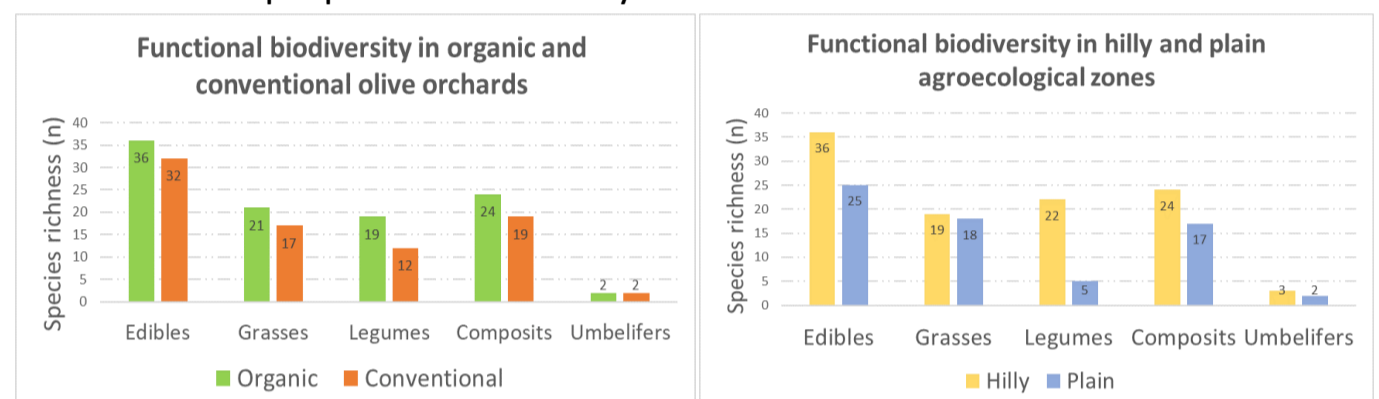


Figure 3: Functional species richness in organic and conventional olive orchards

- Species richness and diversity did not statistical significantly differ between the organically and conventionally managed orchards. This is due to the wide range of farming practices applied.
- Regarding agroecological zone, hilly zone presents significantly higher species richness and diversity, during the wet period, probably due to higher precipitation in the hilly zone, compared to the plain zone (Figure 4).

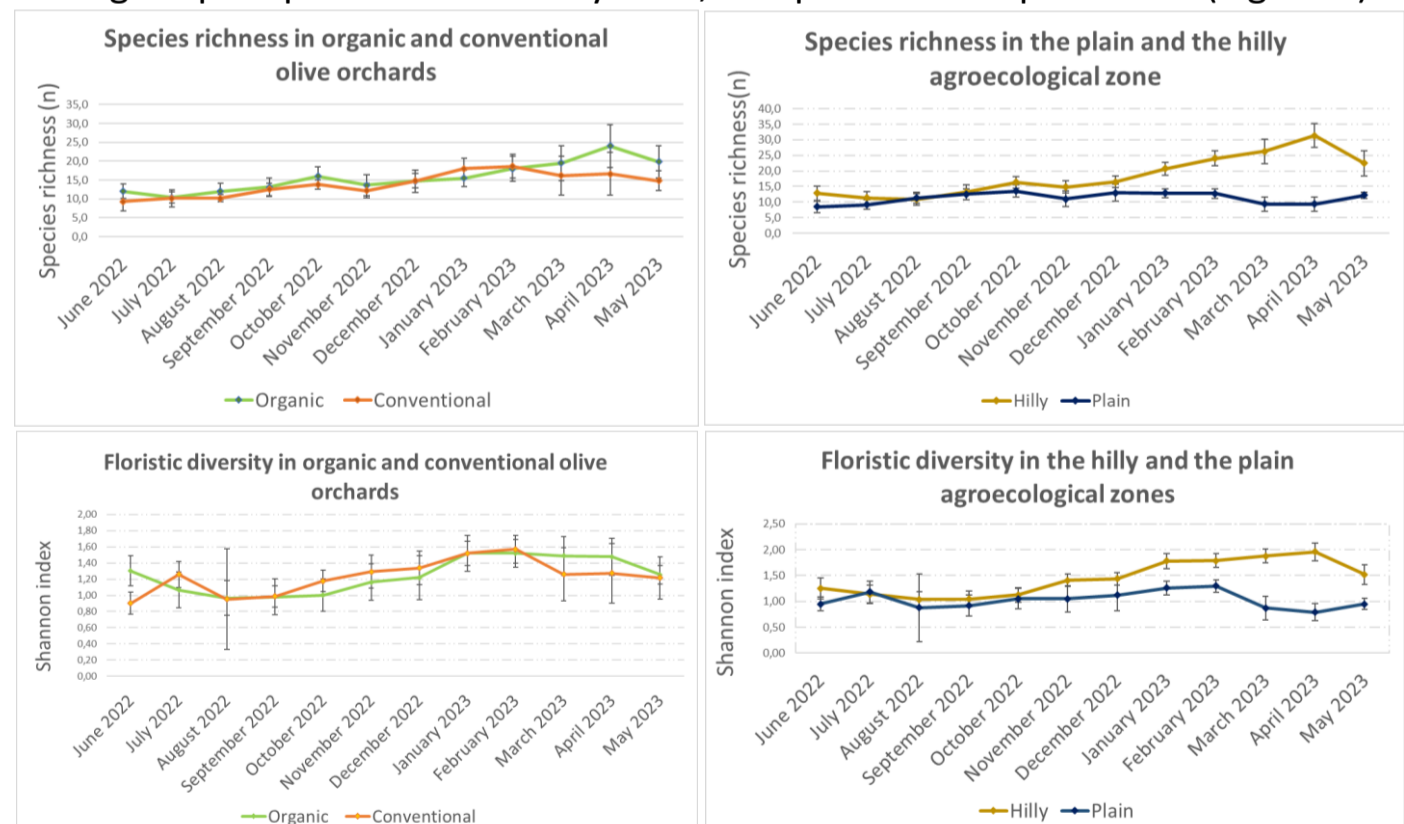


Figure 4: Floristic richness and diversity between MSs and AZs

CONCLUSIONS

- Olive orchards can host several flora species that are related to agroecosystem functioning and agroecosystems services provision.
- Agroecological practices have a positive impact on olive orchards biodiversity and agroecosystem services provision.
- Agroecological zone should be considered as an important driver of floristic diversity in survey studies.

REFERENCES

- Gkisakis, V., Volakakis, N., Kollaros, D., Bärberi, P., & Kabourakis, E. M. (2015). Soil arthropod community in the olive agroecosystem: Determined by environment and farming practices in different management systems and agroecological zones. *Agriculture Ecosystems & Environment*, 218, 178–189.
- Gomiero, T., Pimentel, D., Paoletti, M.G.(2011). Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture. *Critical Reviews in Plant Sciences*,30(1–2), 95–124.
- Kabourakis, E. (1996). Prototyping and dissemination of ecological olive production systems : a methodology for designing and a first step towards validation and dissemination of prototype Ecological Olive Productions Systems (EOPS) in Crete. <http://library.wur.nl/WebQuery/wurpubs/34091>