
PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION
IN THE MEDITERRANEAN AREA
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ADVancedAGROecological approaches based on the integration of insect farming with local field practices in MEDiterranean countries

SUMMARY

GREETINGS FROM WP4 COORDINATOR

Angelo Parente is a senior researcher at the Institute of Sciences of Food Production (ISPA) of the National Research Council (CNR). His research focuses on sustainable vegetable production, with key expertise in: cultivation techniques for high-quality vegetables (both fruit and leafy types) in open fields, greenhouses and indoor environments; mineral and organic fertilization strategies; management of abiotic stress to improve crop quality; recovery and reuse of organic waste as amendments and substrates for soilless cultivation

Angelo served as Principal investigator for CNR-ISPA in several international (IR2MA: Large Scale Irrigation Management Tools for Sustainable Water Management in Rural Areas and Protection of Receiving Aquatic Ecosystem. Interreg V-A Greece-Italy; IRMA: Efficient Irrigation Management Tools for Agricultural Cultivations and Urban Landscapes, ETCP Greece-Italy; PRIME: Posidonia Residues Integrated Management for Eco-sustainability, LIFE+; POPRURA: Posidonia oceanica (L.) Del.: protection, seagrass repopulation and residues reutilization in agriculture, Interreg IIIA Italy-Greece) and national research projects (FERTIBIOTEC: High biotechnological organic fertilizers P.O. Puglia FESR 2014-2020; Production, quality, and food safety of vegetables grown with sustainable agronomic techniques) and work packages (BE&SAVE-AQUASYSTEM-SIGLOD: Compost production and evaluation; SIMISA: Vegetable and food safe: compost use and innovative agronomic strategies to reduce heavy metal content in edible fresh vegetables).

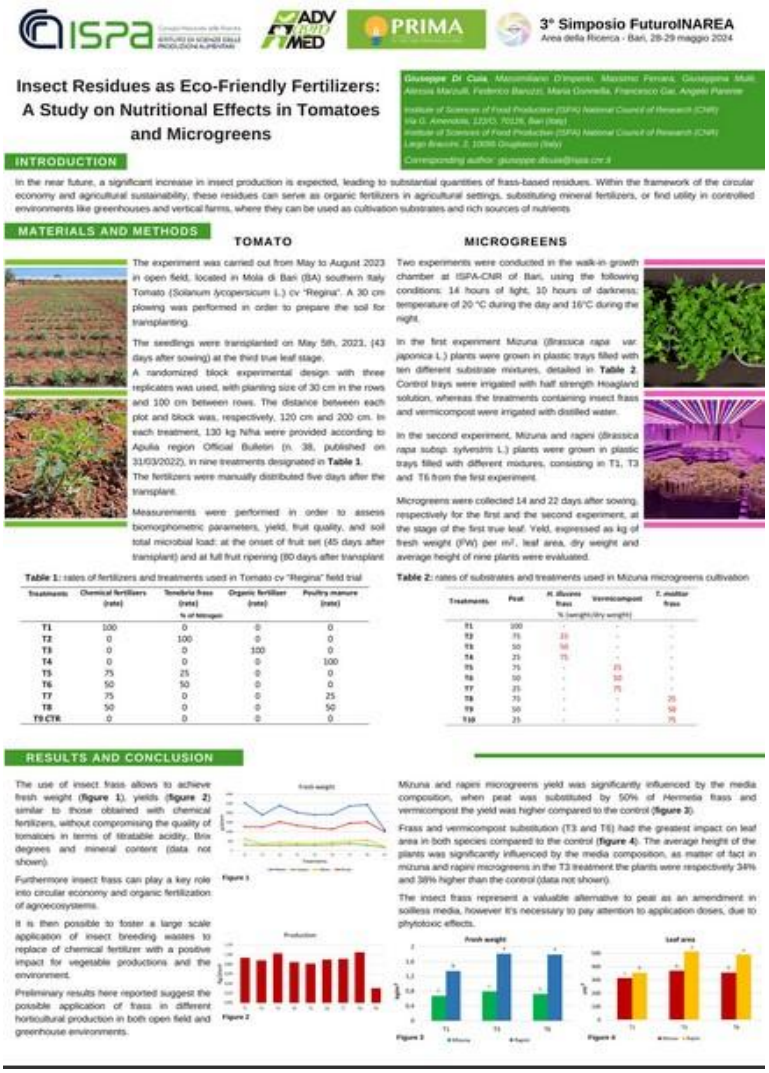
Angelo has also been a tutor and co-tutor for graduate and postgraduate students and has served as scientific supervisor for postdoctoral researchers. He has conducted teaching activities within the framework of various research projects.

As part of the **ADVAGROMED Project**, Work Package 4 (WP4) has involved the use of insect frass derived from *Hermetia illucens* and *Tenebrio molitor* as organic fertilizer on a wide range of local vegetable varieties—including tomato, brassicas, lettuce, eggplant, and pepper—as well as grain crops such as barley and bean. The experimental trials are being conducted both in greenhouse and open-field conditions across several Mediterranean regions, including Italy (Apulia region), Spain, Greece, and Morocco. The results will be disseminated through peer-reviewed scientific publications.

WP DISSEMINATION

Results of an experimental trial titled "**Insect Residues as Eco-Friendly Fertilizers: A Study on Nutritional Effects in Tomatoes and Microgreens**" were presented by the **National Research Council (CNR) in Bari** during the third symposium "**FuturoINAREA" on May 28-29, 2024**.

Dr. Giuseppe Di Cuia described the extraordinary bioconversion capacity of the insect larvae, and their nutritional value. The seminar was an excellent opportunity to compare and share the results obtained within the ADVAGROMED project in terms of **sustainability, nutrient recycling** and **use of agro-food by-products**.



3° Simposio FuturoINAREA
Area della Ricerca - Bari, 28-29 maggio 2024

Insect Residues as Eco-Friendly Fertilizers: A Study on Nutritional Effects in Tomatoes and Microgreens

INTRODUCTION

MATERIALS AND METHODS

TOMATO

MICROGREENS

RESULTS AND CONCLUSION

WP DISSEMINATION

Team members of the German Institute of Food Technology (DIL), University of Thessaly (UTH, Greece), University of Turin (UNITO) and National Research Council (CNR) Italy attended **the Insects to Feed the World** conference held in Singapore in 19-22th June 2024.

Different oral and poster presentations related to the different WP project activities were presented:

INSECT ENVIRONMENTAL SUSTAINABILITY AND ECONOMICS

- Utilization of agri-food side streams in insect-feed-animal chains as a sustainable circularity strategy
- Circular integration of insect bio-converting food waste into protein: a Life Cycle Assessment on black soldier fly
- Influence of feed supplementation with BSFL on the production price of chicken meat
- Decision support system for insect production

WP DISSEMINATION

INSECT DIETS, NUTRITION AND PHYSIOLOGY

- ❖ Iso-nutrient and waste-based diets for yellow mealworm
- ❖ Insect frass enhances yield and improves product quality in a Greek variety of pepper

INSECTS AS FEED INGREDIENTS, IN DIET FORMULATIONS, FOR GROWTH AND HEALTH OUTCOMES

Insects as bioconversion drivers of the alternative protein-based animal feed value chains

- **"Insect residues as eco-friendly fertilizers: a study on nutritional effects in tomatoes and microgreens";**
- **"Untargeted metabolomics of ripened tomato fruits: insect frass fertilizer effects";**
- **"Insect frass enhances yield and improves product quality in a Greek variety of pepper"**

WP DISSEMINATION

All partners of the ADVAGROMED project presented updates and results during a dedicated project session at the European Federation of Animal Science (EAAP) Congress, held in Florence, Italy, on September 1st, 2024.

Recent research outcomes across the Mediterranean highlighted how insects have served as key players in developing more sustainable and circular food systems. One major area of focus was the use of local agricultural by-products to rear insect larvae such as *Tenebrio molitor* (yellow mealworm) and *Hermetia illucens* (black soldier fly). Studies conducted in Greece, Italy, and Portugal demonstrated that region-specific waste streams successfully supported insect growth, reducing reliance on conventional feed sources.

WP DISSEMINATION

In addition to insect rearing, researchers explored the use of live larvae as feed for poultry. Trials with local laying hen breeds showed positive outcomes in productivity and welfare, positioning insects as a promising natural protein supplement in animal diets.

The potential of insect frass—a by-product of insect farming—was also investigated as a biofertilizer. Experiments on crops like peppers, barley, microgreens, and turnips revealed improvements in plant growth, soil quality, and microbial health.

Finally, a social life cycle assessment of small-scale poultry farms that used insect-based feed provided insight into the broader sustainability and social impact of these systems.

Altogether, these studies confirmed that insects could transform agricultural waste into valuable resources—supporting animal nutrition, enhancing soil health, and reinforcing the circular economy in Mediterranean agriculture.

STAKEHOLDER CORNER: ORTI GENERALI

Good morning, **Dr. Stefano Olivari**, and thank you again for agreeing to participate in our interview on behalf of ORTI GENERALI, giving us the opportunity to explore ORTI GENERALI's perspective on agroecology! We, and all our readers, are eager to learn more about your work and ORTI GENERALI's views on the current and future challenges related to the use of agroecological techniques in urban gardening.

The project began in 2018 with the aim of creating a social enterprise model in a city park in the southern Mirafiori suburb of the city of Turin, NW Italy. The transformation of the residual agricultural area required in-depth historical and landscape research and a bottom-up participatory planning process. From the beginning, the intention was to combine a diverse social component, through the involvement of volunteers and third-sector organizations, with scientific commitment and technological innovation. With the aim of returning to the citizens a park abandoned for many years and characterized by illegal building and decay, it has enabled over 250 families to experience urban horticulture as an opportunity for social and cultural integration. Particular attention was paid to the quality of the landscape , preserving traces of pre-industrial agricultural systems, primarily the 17th-century irrigation canals that served as the irrigation system of the gardens of the ancient Mirafiori Castle (now almost completely lost). Organic management, the digitalization of the irrigation system, and the online dissemination of data make **Orti Generali** a model that can hopefully be replicated in other residual agricultural areas. The transformation process, combined with cultural events, educational activities with schools, and social inclusion programs, has contributed to a renewed sense of community and awareness of issues related to combating climate change, particularly the responsible use of land.

How and when was the ORTI GENERALI project born and what are the fundamental issues addressed in this area?

Orti Generali was founded with the goal of building a social enterprise model for the transformation and management of residual agricultural areas in the Turin metropolitan area, based on ecological sustainability and social equity. Its main objectives today are:
- To restore a city park, previously characterized by decay and illegal development, to the public, so that it can be enjoyed and participated in by the local community. To include a diverse range of stakeholders in the regeneration process, particularly those living in conditions of socioeconomic vulnerability. - To propose a landscape structure that enhances the traces of the pre-industrial agricultural landscape, including reintroducing the Po Valley planting system, characterized by rows of willows and mulberry trees along the canals.
Integrate city gardens within green spaces, moving beyond the traditional model of division that involves repetitive honeycomb structures, dedicating a large portion of the park to shared spaces, ensuring visibility and broad access for park users. - Promote self-production of 250 local families and consequently access to healthy, informed, and locally sourced food. - Maintain a scientific approach to managing green spaces and gardens through academic collaborations.

Stefano, can you briefly explain who are the main visitors of the urban gardens that you manage?

Already during the planning step, the need was identified to make the experience of transformation and collective management of spaces an opportunity to include individuals with social and economic vulnerabilities. The allocation of gardens, through precise financial management of the requested contributions, represents an internal redistribution mechanism aimed at granting access to land to citizens of different income levels and ages. Solidarity gardeners are those with fewer financial resources. They pay a nominal fee for the use of the garden and, in exchange, help Orti Generali manage it for 10 hours a month, using a system inspired by time banks. Half of the project's internal resources (staff) are dedicated to supporting vulnerable individuals on specific paths, ranging from social reintegration to employment, from training to positive self-experimentation. Thanks to the group of volunteers, interns, civil servants, solidarity gardeners, and the various users involved in various ways in rehabilitation programs, a vibrant community develops that engages in practical and productive activities. The idea is that the mix itself is a tool for transformation and opportunities to characterize places not with structural factors—such as income and lack of ownership—but with interests such as the social demand for landscape that has long been expressed by the population of the urban periphery.

As part of our ADVAGROMED project, one of the objectives is to use frass derived from insect farming as organic fertilizers for horticultural plants as an alternative to synthetic fertilizers, which tend to have a greater environmental impact. Based on your experience at ORTI GENERALI, would those who grow vegetables in an urban setting be open to the potential use of insect frass to fertilize their gardens? If so, what do you think might be the reasons for using it?

I believe there could be several reasons: practical, because it's a very rich, balanced fertilizer, and easy to transport because it's dry, not wet, as is the case with the humus and manure we normally use; and ecological, because it's non-chemical, non-extractive, and represents the reuse of waste. From a circular economy perspective, this is perfect, and it's what always happened in traditional agriculture, where the animal world and crops were closely intertwined, and what today is largely considered waste was once a precious resource that underpinned soil fertility.

In your opinion, what would be the most effective communication initiatives to inform people interested in the agroecological approaches developed within our ADVAGROMED project?

I think any kind of channel is interesting, preferably analog, such as information panels and explanatory labels on the frass bags themselves.

ORTI GENERALI **Orti Generali**

Thanks to Dr. Stefano Olivari for giving us such an interesting talk, for more information, please visit the website https://www.ortigenerali.it/

Follow them also on:

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UPCOMING EVENT

25-29 AUGUST 2025
INNSBRUCK, AUSTRIA

https://eaap2024.org/

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