Soggetto promotore: **Gruppo Marseglia**

Soggetto proponente: **Masserie Salentine S.r.l. Società Agricola** (componente agricola*)*

Soggetto proponente: **Energetica Salentina S.r.l.** (componente fotovoltaica)

IMPIANTO AGRIVOLTAICO

SITO NEI COMUNI DI NARDÒ, SALICE SALENTINO E VEGLIE

IN PROVINCIA DI LECCE

Valutazione di Impatto Ambientale

(artt. 23-24-25 del D.Lgs. 152/2006)

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Idea progettuale e coordinamento generale: **AG Advisory S.r.l.**

Paesaggio e supervisione generale: **CRETA S.r.l.**

Programma di ricerca "Paesaggi del Futuro", Responsabili scientifici: **Prof. Arch. Paolo Mellano, Prof.ssa Arch. Elena Vigliocco** (Politecnico di Torino)

Programma di ricerca "Ottimizzazione dell'agrivoltaico con oliveti a siepe: analisi numerico matematica", Responsabili scientifici: **PhD Cristiano Tamborrino** (Università degli Studi di Bari), **PhD Elisa Gatto** (Biologa ambientale)

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Progettisti:

Progetto agricolo: **Prof. Massimo Monteleone** (Università degli Studi di Foggia)
Dott. Agr. Barnaba Marinosci

Progetto impianto fotovoltaico: **Ing. Andrea D'Ovidio**

Progetto strutture: **Ing. Giovanni Errico**

Progetto opere di connessione: **Ing. Andrea D'Ovidio**

Contributi specialistici:

Acustica: **Ing. Massimo Rah**

Agronomia: **Dott. Agr. Barnaba Marinosci**

Approvvigionamento idrico: **Geol. Massimilian Brandi**

Archeologia: **Dott.ssa Caterina Polito**

Clima e PMA: **Dott.ssa Elisa Gatto**

Fauna: **Dott. Giacomo Marzano**

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Rilievi: **Studio Tafuro**

Risparmio idrico: **Netafim Italia S.r.l.**

Vegetazione e microclima: **Dott. Leonardo Beccarisi**

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Conferenza AgriVoltacis2024

Descrizione Atti di conferenza AgriVoltacis2024 - Presentation of the "Borgo Monteruga" agrivoltaci park project

Nome del file:	***Tipologia***	***Scala***
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Autori elaborato: Masserie Salentine srl Società Agricola
Energetica Salentina srl

Rev.	***Data***	***Descrizione***
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01		
02		

Spazio riservato agli Enti:

THE WORLD CONFERENCE
AgriVoltaics2024
June 11-13 Denver, CO, USA

PRESENTATION OF THE "BORGO MONTERUGA" AGRIVOLTAIC PARK PROJECT

Enhancing olive production in Mediterranean agrivoltaic systems: a microclimatic analysis using Computational Fluid Dynamics modeling Insights from the “Borgo Monteruga” project in Southern Italy

ID 113

None

Elisa Gatto
Order of Biologists of Puglia and Basilicata, Lecce, Italy

“Return to the Future” with a systemic agrivoltaic strategy

ID 93

This study examines an AgriVoltaic (AV) project as a case study, focusing on its integration into a defined land context, considering social, economic, environmental, ecological, landscape and architectural implications in the restoration of historic rural buildings. It proposes a comprehensive spatial planning process that integrates AV with other relevant components and promotes rural innovation through renewable energy production. The temporary leverage effect of the AV project supports overall rural processes that need time to become self-sustaining.

Massimo Monteleone

THE WORLD CONFERENCE
AgriVoltaics2024
June 11-13 Denver, CO, USA

Spreading over all five continents, the AgriVoltaics World Conference 2024 marks its 5th edition, providing high-level scientific exchange and unparalleled networking opportunities. It unites the global community working on dual-use solutions, underpinned by the belief that agrivoltaics at multiple scales can help build food-energy-water resilience.

In 2024, the AgriVoltaics World Conference program will focus on the following topics:

1. Plant and crop physiology
2. PV system technologies
3. Environmental modeling
4. Policy and regulatory issues
5. Industry perspectives
6. Grazing and animal welfare
7. Optimization and economic modeling
8. Social sciences
9. Equity issues
10. Best practices

“Return to the Future” with a systemic agrivoltaic strategy

a path to regenerate an abandoned rural village and revive agriculture after the *Xylella* olive tree disease in the Apulia region (Southern Italy)

Elisa Gatto [1], Leonardo Beccarisi [1], Barnaba Marinosci [2], Caterina Polito [3], Cristiano Tamborrino [4], Arcangelo Taddeo [5], Massimo Monteleone [6 (a)]

[1] Order of Biologists of Puglia and Basilicata, Lecce, Italy; [2] Order of Agronomists and Foresters of Lecce, Italy; [3] Archaeologist PhD, Lecce, Italy; [4] Department of Computer Science, University of Bari, Italy; [5] Project Coordinator, Masserie Salentine, Lecce, Italy; [6] Department of Agriculture, Food, Natural Resources and Engineering, University of Foggia, Italy.

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1. Introduction

This study examines an AgriVoltaic (AV) project as a case study, focusing on its integration into a defined land context, considering social, economic, environmental, ecological, as well as landscape and architectural implications in the restoration of historic rural buildings. It proposes a comprehensive spatial planning process, integrating AV into other relevant components and promoting rural innovation through renewable energy production. The project's temporary leverage effect supports the whole rural processes that need time to become self-sustaining.

2. Briefing about the rural village of “Monteruga”

In the 1920s, the Arneo area underwent reclamation, leading to the foundation of a rural community in a newly built settlement. Thus Monteruga was born, in the province of Lecce. After the first decades of flourishing activities, a progressive marginalization occurred. The 1980s saw the abandonment of the rural village and the decay of buildings and infrastructure. The area is now a "ghost town" also due to the recent destruction of the olive groves due to the bacterium *Xylella* epidemic disease.

3. Briefing about the AV case study

The "Monteruga" photovoltaic park will provide 291.33 MWp of peak power, with double-sided 600 W modules and a 50 MW storage. The total area available is 588 hectares, while the total area of the AV plant is about 420 ha. The project focuses on intercropping high-density olive groves with fodder crops and medicinal crops. Beekeeping will also be carried out and 75 hectares of scrubs and trees of the Mediterranean maquis will be planted.

4. The Planning Approach

The project's strategic vision is based on agricultural "multifunctionality". The goal is to promote farm reactivation by stimulating "reterritorialization". This involves recomposing and reorganizing territorial space through innovative processes. Diversification and pluriactivity are used to revitalize the rural environments. The project implements three lines of rural development: *deepening* agricultural production, *broadening* farming functions, and *regrounding* farm processes. A "land sharing" approach is proposed for conservation of wild biodiversity. A SWOT analysis and DPSIR model are used to guide strategic planning and identify the best actions to fulfill project aims.

5. The diversified components of a comprehensive strategy

The project aims to produce renewable energy and renew agricultural practices in synergy, avoiding land use change, improving soil fertility and soil carbon stocks, and applying an agro-ecological approach to farming. It also includes an innovative fodder value chain, beekeeping and bee products, and localized agro-industrial processing facilities. The natural ecological network inside and outside the farm will be strengthened and the ecological restoration of adjacent land will be carried out, with particular reference to the resting area of the ancient system of sheep paths. Cultural and educational activities will be developed, with particular attention to the training of qualified agrivoltaic technicians certified by the Apulia Region. These interventions will be planned with a specific scale of priorities and a coherent regeneration strategy.

The Monteruga olive groves before the *Xylella* epidemic desiccation disease.

All the Monteruga olive groves were explanted after the *Xylella* epidemic disease.

The “forgotten” Monteruga rural village today … a desolated ghost town.

The main entrance to the rural village of Monteruga; all the buildings are abandoned and decayed.

Monteruga rural village in the 1960’: a school, a church, houses for farmers, warehouses, silos, etc. A large community teeming with life.

The flourishing of agricultural production and processing activities made it possible for farm workers and their families to settle in the area.

Enhancing olive production in Mediterranean agrivoltaic systems: a microclimatic analysis using Computational Fluid Dynamics modeling

Insights from the “Borgo Monteruga” project in Southern Italy

Elisa Gatto [1 (a)], Leonardo Beccarisi [1], Barnaba Marinosci [2], Caterina Polito [3], Cristiano Tamborrino [4], Arcangelo Taddeo [5], Massimo Monteleone [6 (a)]

[1] Order of Biologists of Puglia and Basilicata, Lecce, Italy; [2] Order of Agronomists and Foresters, Lecce, Italy; [3] Archaeologist PhD, Lecce, Italy; [4] Department of Computer Science, University of Bari, Italy; [5] Project Coordinator, Masserie Salentine srl, Lecce, Italy; [6] Department of Agriculture, Food, Natural Resources and Engineering, University of Foggia, Italy

[(a)] corresponding author: dottelisagatto@gmail.com

1. Introduction

Agrivoltaic Systems (AVs), combining agriculture and solar power generation, represent a sustainable land use method. This research is conducted for the “Borgo Monteruga” agrivoltaic project, located in Southern Italy. The project is characterized by the intercropping of high-density olive groves, arranged in hedgerows between solar trackers, with fodder crops on either side or, alternatively, medicinal crops, depending on the soil quality. The park boasts a peak power capacity of 291.33 MWp, achieved through the installation of double-sided 600 W photovoltaic modules and a 50 MW storage system. The novelty aspect of this project is the proactive assessment of microclimatic parameters to optimize the AVs layout, aiming to reduce shading on crops and enhance the efficiency of both agricultural and solar energy production. The photovoltaics modules in AVs significantly impacts the local microclimate, influencing aspects such as solar radiation, air and soil temperatures, wind speed, and groundwater retention. Understanding these microclimatic shifts is essential not only for the effective management of AVs and strategic crop selection but also for choosing optimal adaptation solutions to climate change. Additionally, this knowledge is key to establishing a tailored monitoring system with innovative and targeted strategies, ensuring the agrivoltaic system's resilience and productivity in the face of evolving environmental conditions. This study sets a new benchmark in AVs design and optimization by implementing advanced computational fluid dynamics (CFD) modeling for its microclimatic analysis, thereby contributing significantly to the field of sustainable agricultural practices.

2. Material and methods

The study employs a dual-methodological approach:

- Comprehensive mathematical simulation: by applying mathematical methodologies from established research, the optimal height of olive hedges that avoids shading of solar trackers and the ideal inter-row spacing to maximize solar irradiance have been determined.
- Advanced microclimate modelling: numerical simulations were performed with ENVI-met [1], a prognostic non-hydrostatic model for the simulation of surface-plant-air interactions composed by a 3D main model and in addition a one-dimensional atmospheric boundary layer model which extends from the ground surface up to 2500m. The 3D simulation area was 100m by 100m, with a grid resolution of 1m (x,y,z), except the lowest five cells which had a 0.4m resolution vertically. Five nesting grids were used to enhance accuracy and stability. The simulation, driven by hourly air temperature and relative humidity data from

ERA5 for a typical summer day, analysed thirteen agrivoltaic configurations varying in panel height, inter-row spacing, and module width. An "Alternative 0" scenario, representing the current situation without the AVs, was also evaluated for environmental impact. Several microclimatic variables such as air and soil temperature, relative humidity, ventilation, etc. are simulated.

3. Results and Conclusions

The study revealed that in AVs, particularly with a panel height of 2.38m, there was a decrease in air temperature of about 0.60°C, a slight variation in relative humidity, and a minimal impact on wind speed compared to the Alternative 0 scenario. In the configuration with 8m inter-row spacing, a marked localized shading phenomenon was observed, which substantially altered direct radiation patterns and the duration of sunlight exposure, resulting in a decrease in soil temperature by approximately 5°C. This effect was more pronounced under the panel surface. The study favoured the 12m spacing and a panel height of 2.3m configuration for its benefits in maximizing sunlight exposure and facilitating agricultural operations. To illustrate these variations, spatial temperature maps at 15:00 were analysed for several parameters (as exemplified in Figure 1 below).

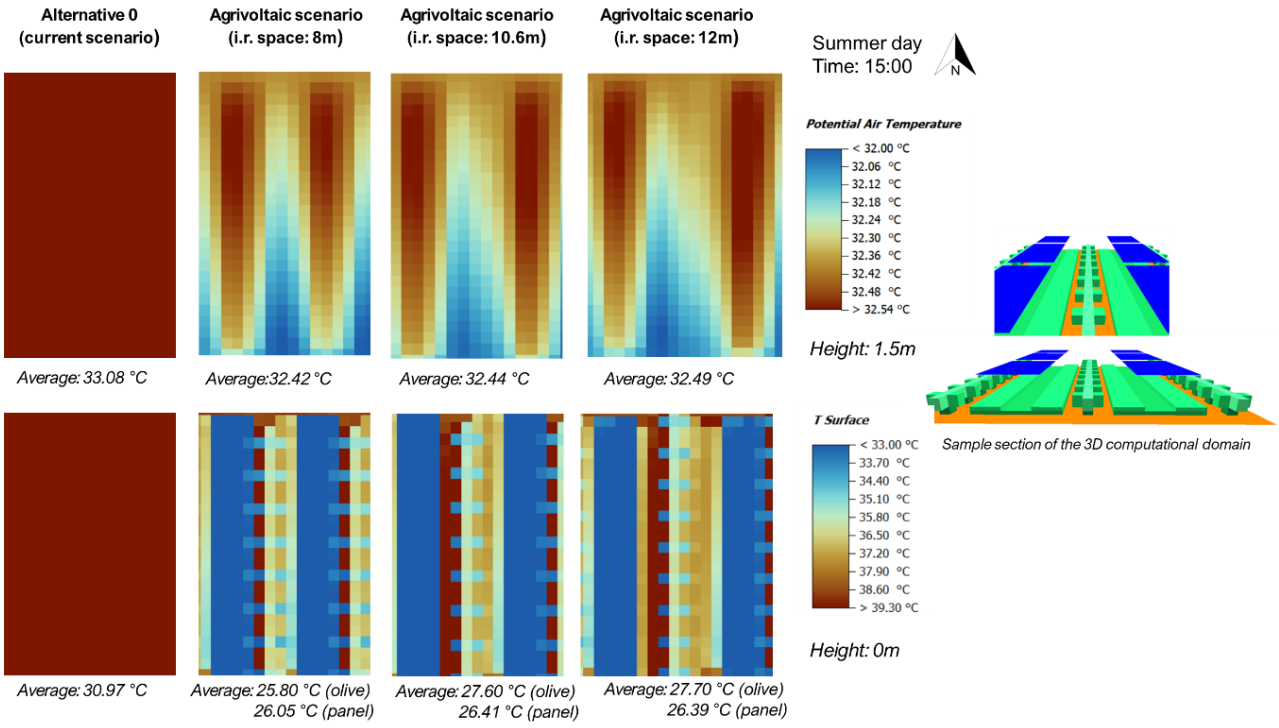

Figure 1. Spatial Potential Air Temperature and Surface Temperature (T surface) maps at 15:00 for all the scenarios investigated (abbreviation: i.r.: inter-row).

This study represents a significant innovation in sustainable land use, pioneering advanced modeling techniques to optimize the interplay between agriculture and solar power generation.

3. References

[1] M. Bruse, H. Fleer, “Simulating surface-plant-air interactions inside urban environments with a three dimensional numerical model,” Environ. Modell. Softw., vol. 13, pp. 373–384, 1998, doi: 10.1016/S1364-8152(98)00042-5

AgriVoltaics World Conference 2024 – Abstract Accepted

AgriVoltaics World Conference 2024 <organizer@fourwaves.com> 12 marzo 2024 alle ore 14:33
Rispondi a: info@agrivoltaics-conference.org
A: dottelisagatto@gmail.com

AgriVoltaics World Conference 2024 – Abstract Accepted

Dear Elisa,

On behalf of the AgriVoltaics World Conference 2024 Scientific Committee, we are pleased to inform you that your abstract with the title

Enhancing olive production in Mediterranean agrivoltaic systems: a microclimatic analysis using Computational Fluid Dynamics modeling Insights from the “Borgo Monteruga” project in Southern Italy

has been accepted for **oral presentation** at the AgriVoltaics World Conference 2024, to be held June 11-13, 2024, in Denver, CO, USA.

Please note that all presentations must be held on-site at the conference. If you or a co-author are unable to present on-site, please let us know as soon as possible at info@agrivoltaics-conference.org.

In addition, all presenters must register for the conference by May 14. If you or a co-author have not registered by then, your presentation will be removed from the program.

Each oral presentation will consist of 10 minutes of presentation time and 2 minutes of Q&A time (12 minutes total). In addition, there will be Q&A time at the end of the session. Further details and instructions regarding your presentation will be provided at a later date.

Submitting a paper for the conference proceedings

All presenters at AgriVoltaics World Conference 2024 are encouraged to submit a full paper for publication in the conference proceedings with TIB Open Publishing. Papers will be peer-reviewed by the Scientific Committee. The manuscript must be uploaded to the TIB platform as a PDF file and as a Word document using the paper template. TIB-OP's open access policy means that authors retain copyright and all content is freely reusable under CC-BY 4.0.

Papers that do not meet the requirements or are not submitted on time will not be considered for the conference proceedings. Please note that only papers that have been presented at the conference will be considered for publication in the proceedings.

We look forward to seeing you at the conference!

Kind regards,

The AgriVoltaics World Conference Organizing Committee

Gmail

Elisa Gatto <dottelisagatto@gmail.com>

Fwd: AgriVoltaics World Conference 2024 – Abstract Accepted

---------- Forwarded message ---------
Da: **AgriVoltaics World Conference 2024** <organizer@fourwaves.com>
Date: Mar 12 Mar 2024, 14:33
Subject: AgriVoltaics World Conference 2024 – Abstract Accepted
To: <massimo.monteleone@unifg.it>

AgriVoltaics World Conference 2024 – Abstract Accepted

Dear Massimo,

On behalf of the AgriVoltaics World Conference 2024 Scientific Committee, we are pleased to inform you that your abstract with the title

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We look forward to seeing you at the conference!

Kind regards,

The AgriVoltaics World Conference Organizing Committee