



BioFairNet: Advancing Circular Bioeconomy and Agrifood System Transformation Through Inclusive Biotechnological Innovation

www.biofairnetproject.eu



Name(s) of the Author(s):

Asha Khosravi¹, Piergiuseppe Morone¹, Marina Albanese²

Country: Multi-country (Greece(Lesvos), France (Réunion Island), Kenya, Canada, Quebec)

Affiliation(s)/Institution

¹UnitelmaSapienza University of Rome, Bioeconomy in Transition ResearchGroup, Italy

²Università degli Studi di Napoli Federico II, Italy

Contact Email: asha.khosravi@unitelmasapienza.it

Summary:

BioFairNet supports the transition of high-emission agrifood systems through inclusive, circular biotechnologies. Pilots in Greece and Réunion Island, with validation in Kenya and Canada, apply anaerobic digestion and Photovoltaics (PV)-assisted hydrolysis to transform agricultural waste residues into biochar and biogas and biofuels. These solutions are co-created with stakeholders and assessed through multidimensional life-cycle methodologies. A digital platform supports mapping,optimisation, and replication across value chains, enabling inclusive, locally adapted, and sustainable practices in agriculture and related high-emission sectors.

Introduction:

The transition to sustainable agrifood systems necessitates biotechnological solutions that are both innovative and inclusive. BioFairNet addresses this by implementing circular bioeconomy pathways to reduce emissions in agriculture. Living labs in Lesvos (Greece) and Réunion Island pilot anaerobic digestion and PV-assisted pyrolysis for the valorisation of agricultural waste. Embedded within participatory governance frameworks, these technologies promote locally adapted, socially just transitions that align with climate, environmental, and socio-economic goals across diverse agrifood contexts.

Methods/Approach:

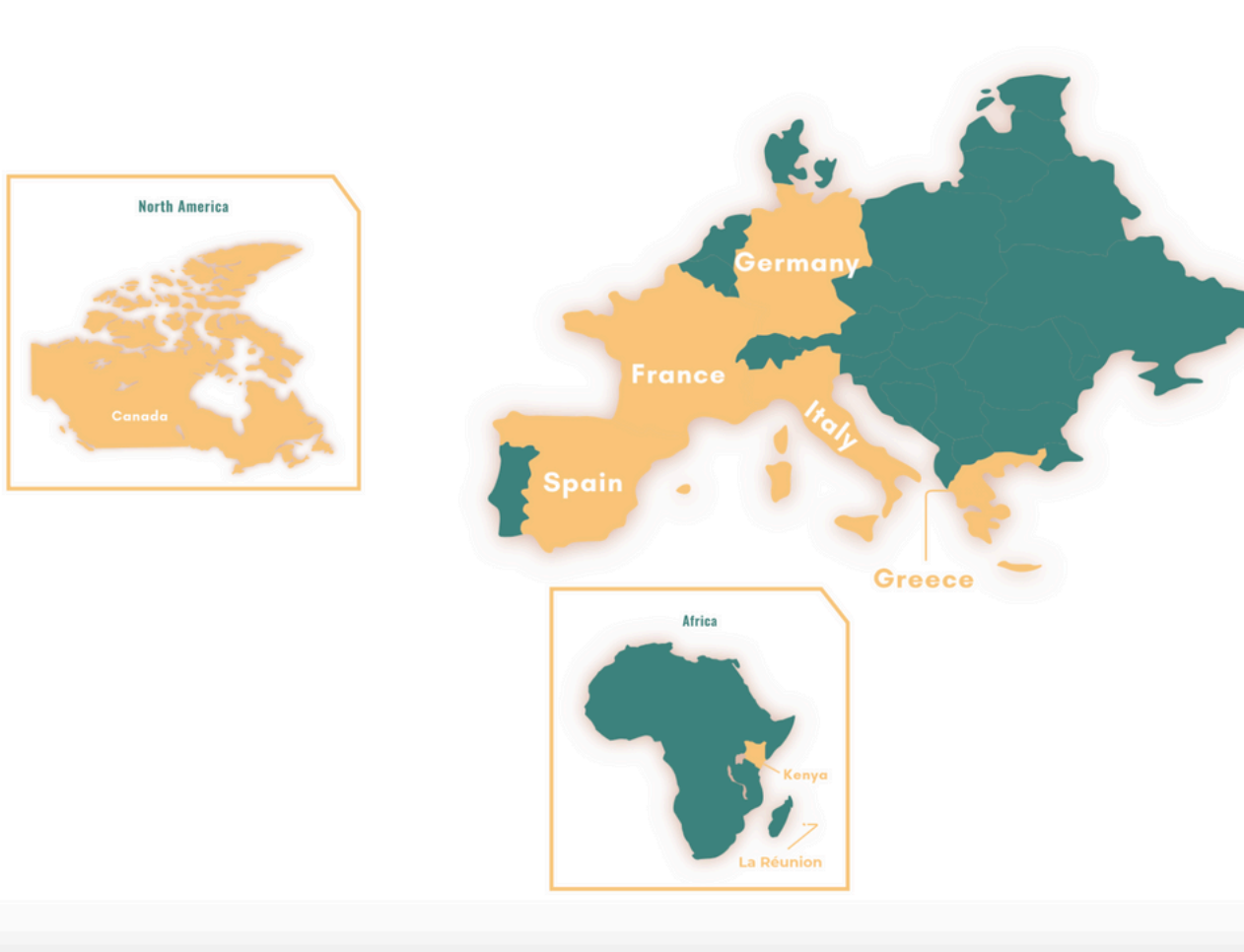
BioFairNet takes a transdisciplinary approach thatintegrates technology deployment, participatory design and sustainability assessments to deliver locally adapted, scalable solutions:

- Anaerobic digestion: Converts organic waste into biogas and digestate
- PV-assisted hydrolysis:Produces biochar and syngas from biomass
- Multidimensionalsustainability: Life CycleAssessment (LCA), Social-LCA, Life-Cycle Costing, and Hotspots mapping
- Stakeholder engagement & co-creation: Structured workshops with farmers, cooperatives, SMEs, value chain actors, and consumers, and public authorities
- Digital platform: Green Information Factory for scenario modelling, utilisingAI for anomaly detection, optimisation, prediction, and circular economy key performance indicators

Results and Impacts:

The project delivers evidence-based, scalable models for equitable biotechnological transitions, promoting global bioeconomy objectives. Anticipated impacts include:

- Reduction in GHG emissions through circular waste valorisation
- Improved soil health and nutrient cycling through biochar and digestate reuse
- Increased inclusion of smallholders by establishing a digital cooperative network
- Open-access digital platform to support industry adaptation and policy planning
- Decentralised green energy solutions



Way forward:

Deploy pilots, validate digital tools, and scale just bio-based transitions in global agrifood systems.

References:

1. European Commission (2023). Horizon Europe Work Programme: Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment.
2. BioFairNet Consortium (2024). Grant Agreement No. 101181568

Acknowledgement:

Funded by the European Union under grant agreement number 101181568. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them. Other Partners: University of Cologne, Trento, Ferrara, La Réunion, Aegean, Kenya; and Eco Imagination, Centre for Research & Technology Hellas, Satec Sistemas Avanzados de Tecnología