

Export of Danish biosolutions to Italy in light of Italy's recovery plan

Learn about new, vast market opportunities for Danish biosolutions in Italy

Italian Best Practices: Biosolutions for the Agri-Food Industry - Recent Developments and Future Focus in light of Investments planned in the Italian Recovery Plan

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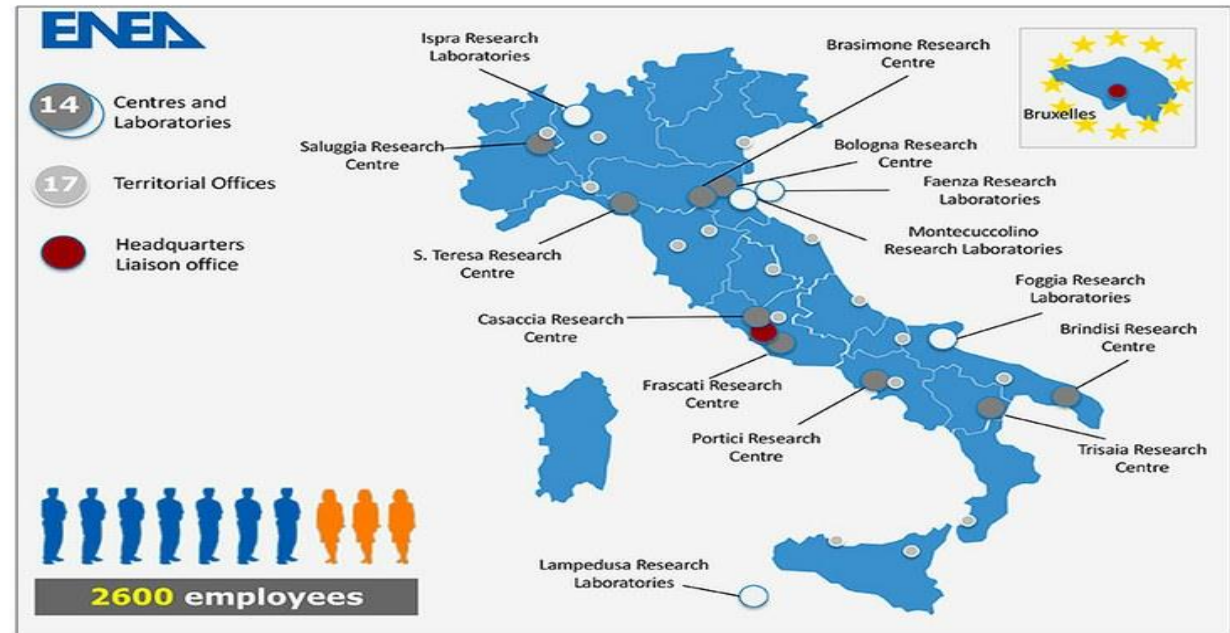
*ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development)
Head of Biotechnologies and Agroindustry Division & Chairman of the Technical Scientific
Committee of Italian AgriFood Technological Cluster CL.A.N*

Webinar 10th of May 2022

ABOUT ENEA



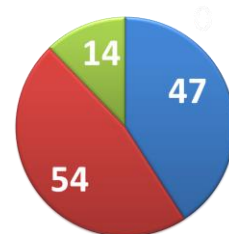
- ENEA is the Italian National **Agency for New Technologies, Energy and Sustainable Economic Development**
- It is a **public body** operating in the fields of energy, the environment and sustainable economic development
- ENEA's mission is **to develop new technological solutions** to meet the societal challenges, fostering transition to a low-carbon economy
- The institutional mandate of the Agency is **to provide advanced services, disseminate and transfer knowledge, innovation and technologies** to industry, institutions and civil society



ABOUT CLUSTER AGRIFOOD N.AZIONALE CL.A.N.

CL.A.N. is a widely recognized multi-stakeholder Association in the agri-food sector that brings together companies, trade associations, universities, research organizations, training bodies and local representatives (more than 100 partners) operating in the agri-food sector.

It was set up to **promote, defend and boost development of the agri-food system**, from agricultural production to processing and related industrial sectors, by driving innovation, spread research results, creating new skills and fostering collaboration between research, businesses, institutions and public administration.



3 YEARS ACTION PLAN



Position Paper on four strategic Technological trends:

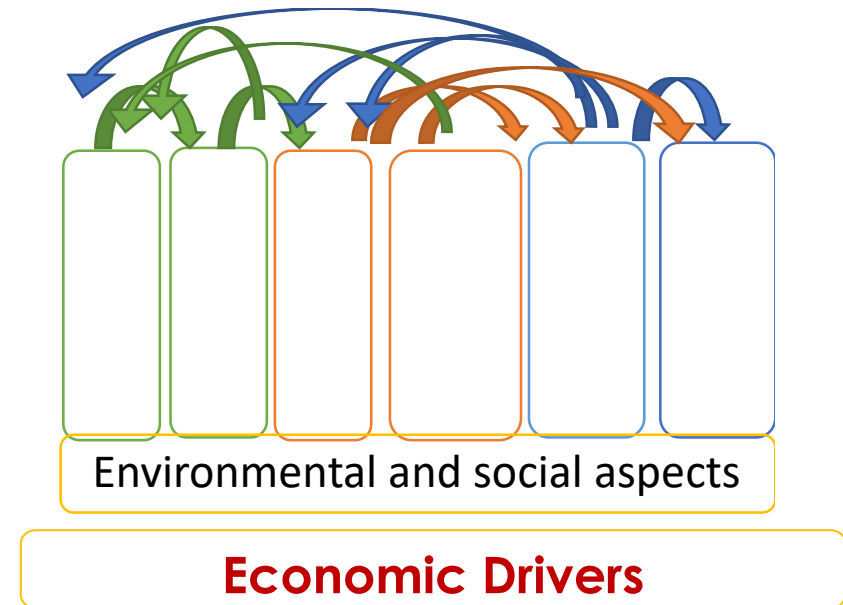
- **Decarbonization**
- **Foods by product and waste reduction**
- **Traceability of agri-food products**
- **Made in Italy and one health**

The contest

- Limited resources
- Global population increasing and polarization
- Growing Complexity and Uncertainty

Strategic documents:

- ✓ SDGs dell'ONU
- ✓ European Green Deal «Farm to Fork»
- ✓ Horizon Europe 2021-2027
- ✓ PAC
- ✓ PNR
- ✓ PNRR



BIOSOLUTIONS

A close-up photograph of a person's hands gently cupping a small, vibrant green seedling. The seedling has several serrated leaves. Two mosquitos are perched on the leaves: one on a lower leaf and another on a higher one. The background is a soft-focus mix of green and yellow, suggesting an outdoor, natural setting. The overall image conveys themes of nature, biology, and environmental stewardship.

Biosolutions represent a strong booming market although many technological and regulatory challenges remain. They cover products and solutions stemming from bio-tech – i.e., the use of living organisms to develop solutions and products.

DEFINITIONS

There are commonly accepted definitions but have not a legal status.

Biocide (European Biocidal Products Regulation EU 528/2012) is defined in the European legislation as a chemical substance or microorganism intended to destroy, deter, render harmless, or exert a controlling effect on any harmful organism

Biopesticide/Biorepellent (EPA, 2013): include naturally occurring substances that control pests (biochemical pesticides), microorganisms that control pests (microbial pesticides), and pesticidal substances produced by plants containing added genetic material (Plant-Incorporated Protectants)

Biostimulant (Du Jardin, 2012): are substances and materials, with the exception of nutrients and pesticides, which, when applied to plants, seeds or growing substrates in specific formulations, have the capacity to modify physiological processes of plants in a way that provides potential benefits to growth, development and/or stress response.

Organic fertilizer/biofertilizer (European Consortium of the Organic-Based Fertilizer Industry ECOFI): fertilizer whose main function is to provide nutrients under organic forms from organic materials of plant and/or animal origin.

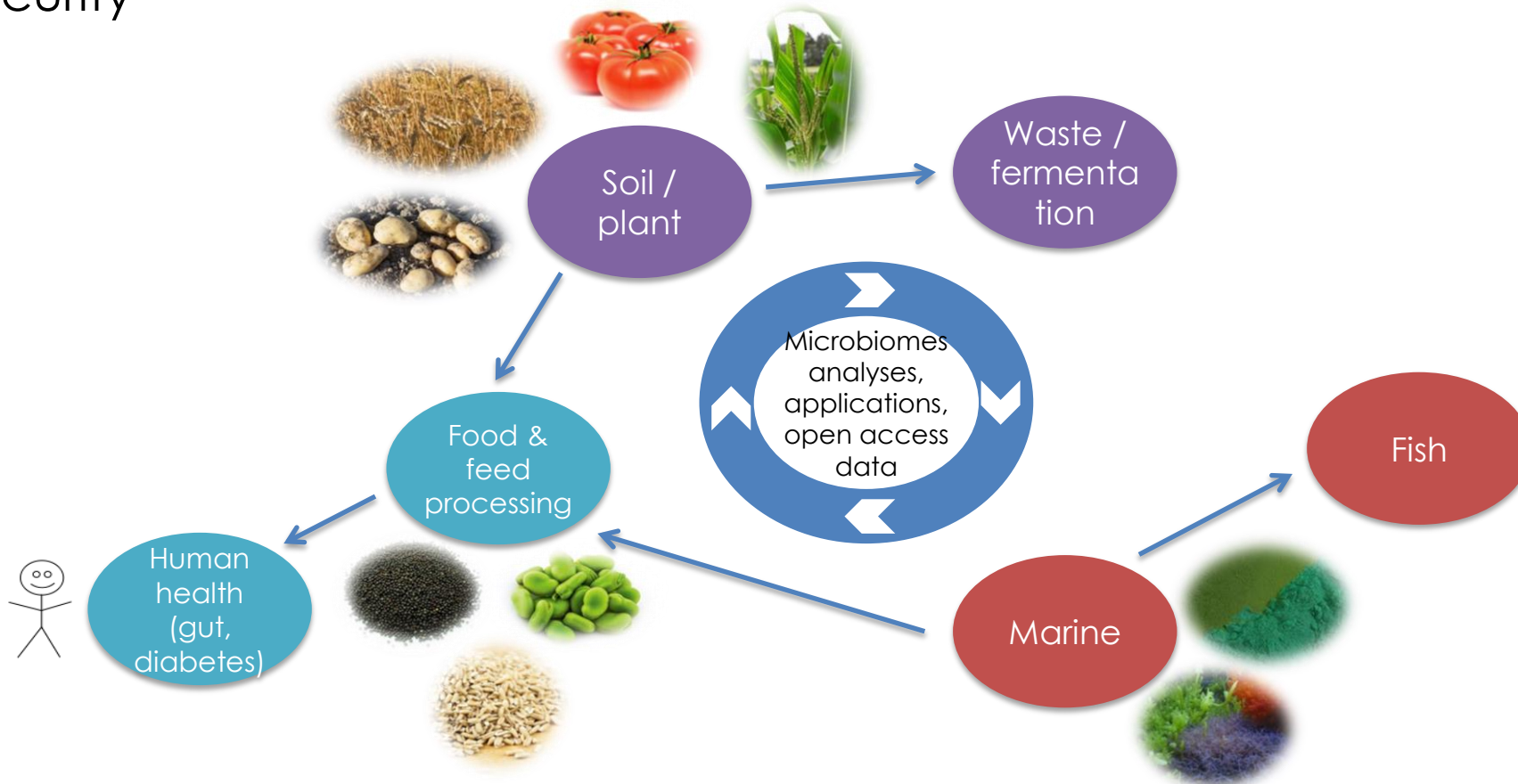
Organic soil improver (ECOFI): a soil improver containing carbonaceous materials of plant and/or animal origin, whose main function is to maintain or increase the soil organic matter content.

Some examples

- **Biosolutions for microbiome-based applications**
- **Applications of extracted/bioactive compounds from microalgae**
- **Biosolutions for Food Quality**

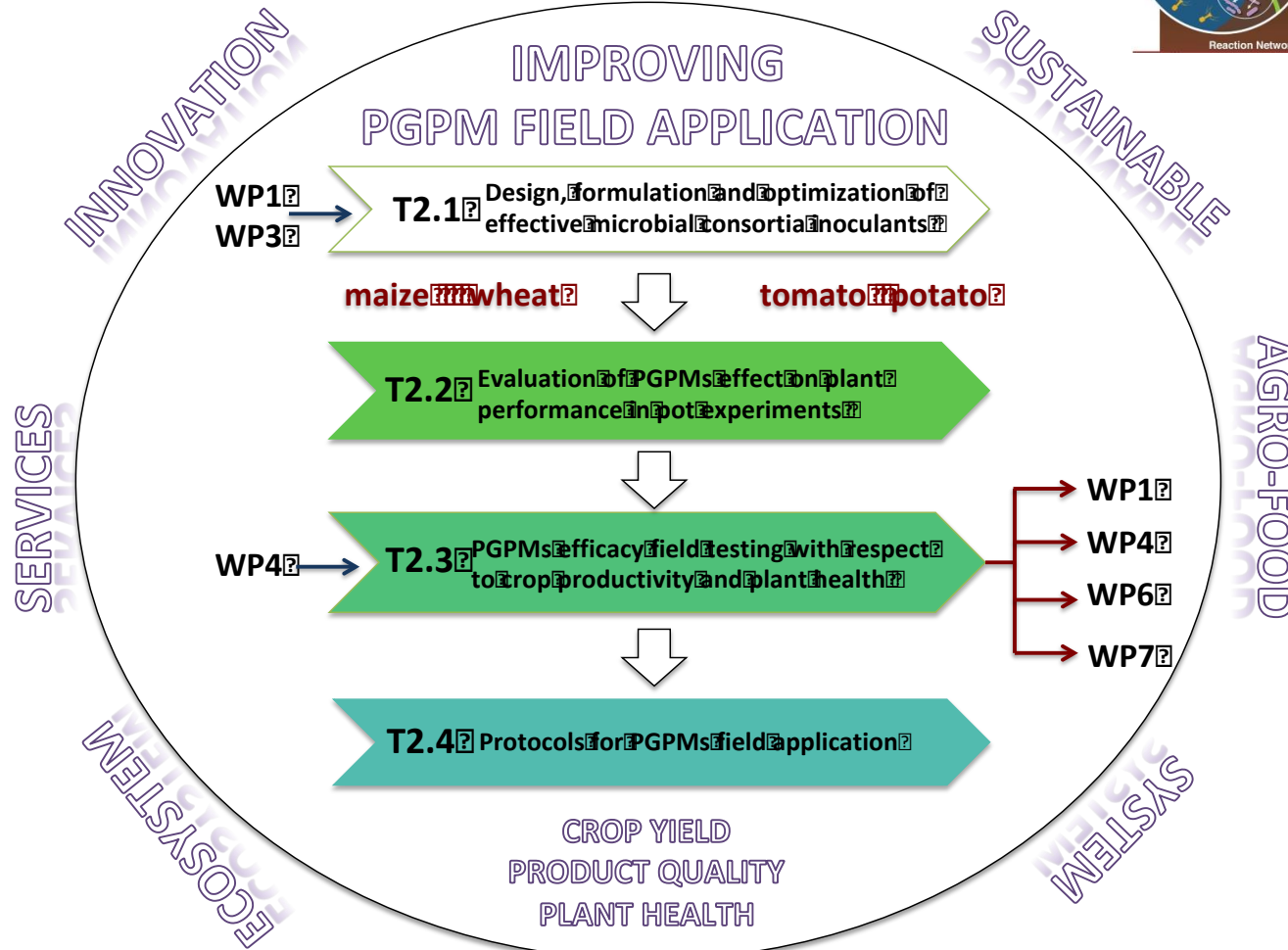
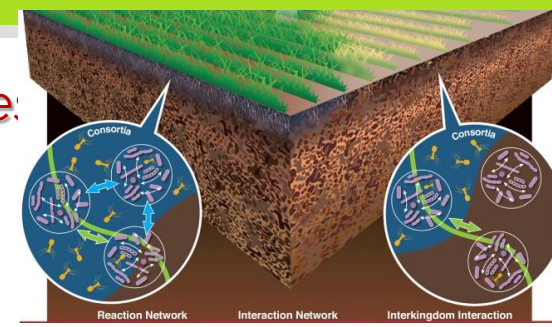
1. BIOSOLUTION for microbiome-based applications

SIMBA is a European innovation project, funded through Horizon 2020, which provides a holistic and innovative approach to the development of microbial solutions to increase food and nutrition security



A holistic approach taking advantage of the use of microbiomes in the agriculture and aquaculture food systems is required to increase sustainability in food production

Full potential of PGPMs (Plant Growth Promoting Microbe):



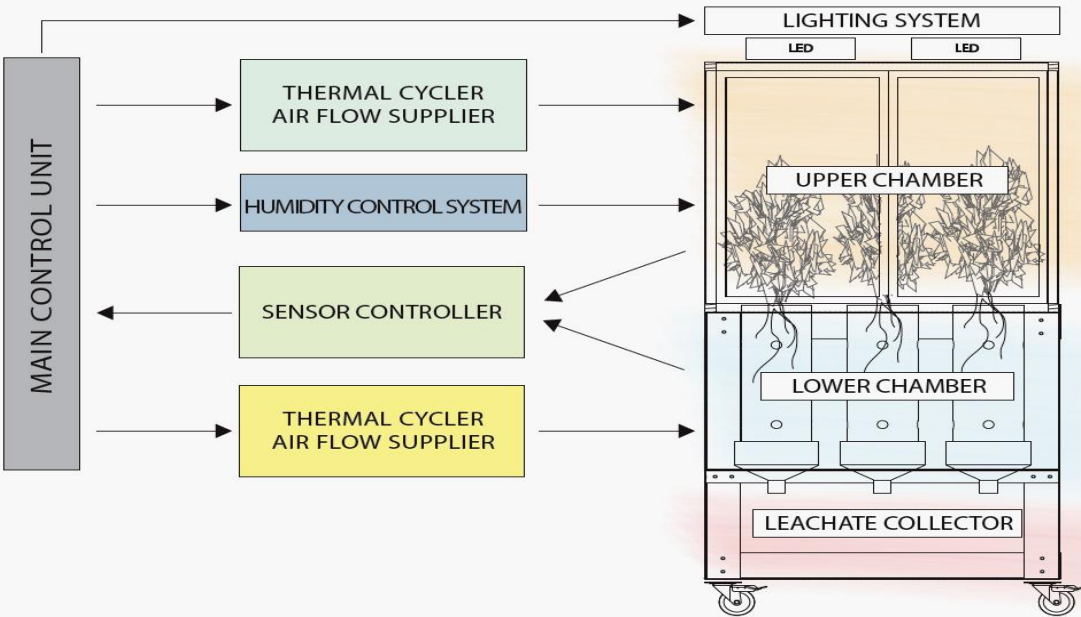
- ✓ To improve soil fertility and functionality
- ✓ To enhance plant resistance to abiotic and biotic stresses
- ✓ To improve plant productivity for the sustainable use of soil in different European farming system

Identify efficient microbial formulations to be applied as bioinoculants in arable crops in Italy and Germany, i.e. **WHEAT, MAIZE, POTATO and TOMATO**




Microcosmo ENEA: Smart Field Simulator



ENEA and FOS patent



2. Applications of extracted/bioactive compounds

<p><i>Extract of Dunaliella salina</i> Bioactive compound: β-carotene</p>	<p>FOOD</p>  <p>BETA-CAROTENE YES: allowed as Food Additive Identified with the E Number: E160a</p>	<p>FEED</p>  <p>BETA-CAROTENE YES: allowed as Food Additive Identified with the E Number: E160a</p>	<p>COSMETICS (Description reported in the Cos)</p>  <p>Dunaliella Salina Extract is an extract of the Alga, Dunaliella salina, Dunaliellaceae Usable as Skin conditioning</p>
	<p>FOOD</p> <p>ASTAXANTHIN RICH OLEORESIN YES: allowed as Novel Food (food supplement category) NOT allowed as food additive</p>	<p>FEED</p> <p>ASTAXANTHIN NOT as feed materials or feed additive; it is authorized only the synthetic form (Feed additive Identified with the E Number: E161j)</p>	<p>COSMETICS</p> <p>Haematococcus Pluvialis Extract is an extract of the Alga, Haematococcus pluvialis, Stephanosphaeraceae Usable as Antioxidant</p>
<p><i>Extract of Nannochloropsis Gaditana</i> Bioactive compound: EPA, OMEGA-3</p>	<p>FOOD</p> <p>EPA OMEGA-3 NOT since belonging the family of fatty acids, it is not considered an additive NOT allowed as food supplement. Until now only Algal oil from the microalgae Ulkenia sp. And Schizochytrium sp. oil rich in DHA and EPA have been authorized as EPA algal sources for food supplements</p>	<p>FEED</p> <p>EPA OMEGA-3 Potentially usable but not yet authorized</p>	<p>COSMETICS</p> <p>Nannochloropsis Gaditana Extract is the extract of the alga, Nannochloropsis gaditana. Usable as Antioxidant and Usable as Skin conditioning</p>

Optimization tests of CO₂-SF experimental test for microalgae



Haematococcus



Dunaliella salina



**Nannochloropsis
Gaditiana**

Optimization tests at Bench scale
for the Extraction of bio-products
from microalgae using
supercritical fluids extraction

Validation of bench scale
experiment result at pilot
scale SF-CO₂ extraction

Characterization of extracts
and exhausted biomass after
SF-CO₂



**Bench scale SFE-CO₂ plant
high view**



Pilot scale SFE-CO₂ plant high view

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation under grant agreement No. 745695

BBI: VALUEMAG project

Evaluation of the microalgal extract against pathogenic fungi

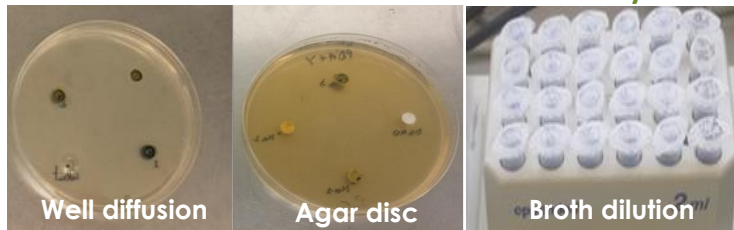
In vitro Screening on the effect of the extracts for selected fungal and bacterial phytopathogenic strain

In vivo Antimicrobial activity of *D. salina* extracts on Tomato plants against *Pseudomonas syringae*

In vivo Antimicrobial activity of *D. salina* extracts Tomato fruits against *Pectobacterium carotovorum*

In vivo Antimicrobial activity of *D. salina* extracts Zucchini fruits against *Pectobacterium carotovorum*

Different used methods for antimicrobial assay



Extraction

- Conventional and unconventional extraction tech.
- Different solvent will be used for extraction

Fungal plant pathogenic strains

Botrytis cinerea



gray grape mold

Monilinia laxa



destroys the plant organs: branches, leaves, flowers and fruits

Penicillium italicum



It is a common post harvest disease commonly associated with citrus fruits

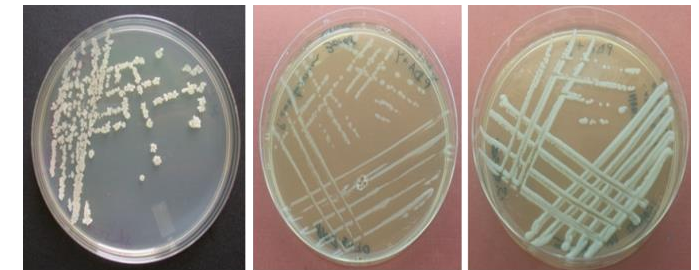
Penicillium digitatum



It is found in the soil of citrus-producing areas

Bacterial plant pathogenic strains

Bacterial strains cultured on nutrient agar plates. From left *B. subtilis*, *P. carotovorum* and *P. syringae*



Bacillus subtilis (Gram –)

found in soil and the gastrointestinal tract of ruminants and humans.

Pseudomonas syringae (Gram +ve)

is able to enter plants using its flagella via wounds of natural opening sites, as it is not able to breach the plant cell wall.

Pectobacterium carotovorum (Gram +ve)

it causes beet vascular necrosis and blackleg of potato and other vegetables.

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation under grant agreement No. 745695

BBI: VALUEMAG project

3. Biosolutions for Food Quality

Marketing standards & Food Quality

Marketing standard for tomatoes: Reg. (EC) 790/2000 (cons.2009)

DEFINITION OF PRODUCTS

Commercial types



round



ribbed



oblong



cherry

PROVISIONS CONCERNING QUALITY

Minimum requirements

Classification

Extra

Class I

Class II



*In relation
to defects*

*increase in value
and raise of
competitiveness*

Reference Materials

Reliable methods

PT schemes

Physical
properties

Microbiological
properties

Absence of
hazards

Lower content
of harmful or
un-desiderable
substances

Shelf life and
ease of use

Aspects
related to
packaging

Composition

Presence of
nutrient and
nutraceuticals

Organoleptic
properties

Origin of raw
materials

Environmental
sustainability

Ethic of
production

HIGH-LEVEL METROLOGY SERVICES IN FOOD AND NUTRITION FOR THE ENHANCEMENT OF FOOD QUALITY AND SAFETY

MISSION

To enhance
quality and
reliability of
measurement
results

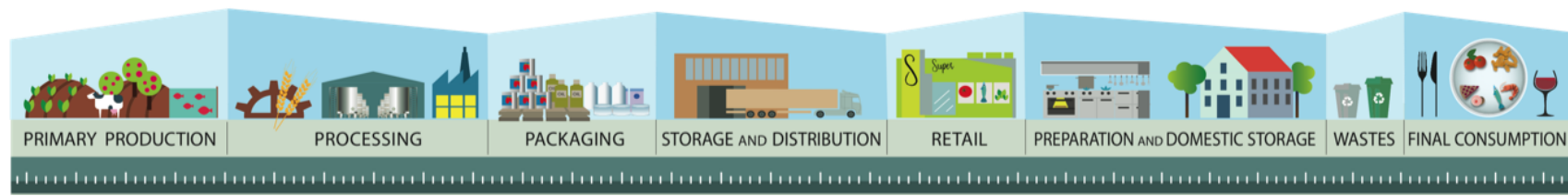
To make
available and
share data,
information
and
metrological
tools

To enhance
scientific
excellence in
the field of
food quality &
safety

To strengthen
scientific
knowledge,
promoting
scientific
cooperation
and integration



METROFOOD-PP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871083.

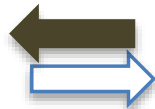


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- TR



Physical-RI

e-RI



Metro

Food

Plants and Labs for RM development

Analytical Labs.

Experimental fields/farms

Facilities for food processing and storage

Software development

Data collection

Data analysis

Management of Interlaboratory tests

Diffusion and Training

RM Preparation

Stability and homogeneity studies

- Sampling, pretreatment and storage
- Food composition and characterization
- Inorganic contaminants
- Organic contaminants
- Chemical and biological markers and profiles
- Microbiological analysis
- Development of sensors and devices
- Environmental Analysis
- Testing (rheological, leaching, etc.)
- Other

- Crop production
- Animal breedings
- Fish farms

- Industrial processing
- Packaging
- Supply chain and storage
- Food preparation



development of new databases

Integration of existing databases

graphical interfaces development

database maintenance and updating

- Reference Materials
- Official and Reference Methods
- Reference Laboratories
- Vocabularies, Guidelines and procedures
- PTs Providers
- Food composition
- Contaminants in food
- Food markers
- Characteristics of production areas and technologies
- Food consumption



Italian Recovery and Resilience Plan Mission 4: Education & Research

6
Missioni

- M1. DIGITALIZZAZIONE, INNOVAZIONE, COMPETITIVITÀ E CULTURA
- M2. RIVOLUZIONE VERDE E TRANSIZIONE ECOLOGICA
- M3. INFRASTRUTTURE PER UNA MOBILITÀ SOSTENIBILE
- M4. ISTRUZIONE E RICERCA
- M5. INCLUSIONE E COESIONE
- M6. SALUTE



Cluster Endorsement

- National Center **AGRITECH**


- Technological Infrastructure for Innovation **INFRAGRI**

- Research Infrastructures **METROFOOD** e **MIRRI**

- Innovation Ecosystems **iNEST** nord est- **UNIPD** e **NODES** nord ovest - **POLITO**

- Partnership on the **AgriFood Model for the Sustainability**

1 **Plant and animal genetic resources and adaptation to climatic changes**



Consiglio Nazionale delle Ricerche

Coordinatore dello Spoke: CNR

4 **Multifunctional and resilient agriculture and forestry systems for the mitigation of climate change risks**



UNIVERSITÀ DEGLI STUDI DI PADOVA

Coordinatore dello Spoke: Padova


7 **Integrated models for the development of marginal areas to promote multifunctional production systems enhancing agroecological and socio-economic sustainability**



UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO


Coordinatore dello Spoke: Bari

2 **Crop Health: a multidisciplinary system approach to reduce the use of agrochemicals**



UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

5 **Sustainable productivity and mitigation of environmental impact in livestock systems**



UNIVERSITÀ DEGLI STUDI DELLA TUSCIA

Coordinatore dello Spoke: Tuscia


8 **New models of circular economy in agriculture through waste valorization and recycling**



UNIVERSITÀ DEGLI STUDI DI MILANO

Coordinatore dello Spoke: Milano

3 **Enabling technologies and strategies for smart management of agricultural systems and their environmental impact**



ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

Coordinatore dello Spoke: Bologna

6 **Management models to promote sustainability and resilience of agricultural production systems**



UNIVERSITÀ DEGLI STUDI DI TORINO

Coordinatore dello Spoke: Torino

9 **New technologies and methodologies for traceability, quality, safety, measurements and certifications to enhance the value and protect the typical traits in agri-food chains**



UNIVERSITÀ DI SIENA 1240

Coordinatore dello Spoke: Siena

Crop Health: a multidisciplinary system approach to reduce the use of agrochemicals

1 Agroecology and landscape management to reinforce ecosystem services

Agroecological strategies promoting functional biodiversity, both at farm and landscape level, will be developed to enhance ecosystem services. Environmental monitoring technologies and modeling approaches will allow to assess their impact both on in-crop and off-crop levels of functional biodiversity and their contribution to ecological sustainability.

2 Alternative tools and strategies to reduce the use of synthetic pesticides and fertilizers

Plant defense and nutrition/growth will be reinforced through genetic improvement and enhanced with the use of microorganisms and signaling molecules. Biocontrol agents will be used both as organisms and as source of biopesticides and biostimulants, which will be also obtained from several biomasses; formulation nanotechnologies will allow their safe and efficient delivery. Non-chemical pest control strategies will be developed.

3 Smart technologies towards a sustainable “zero pollution” in agriculture

Accurate environmental monitoring, predictive models for crops, pests and fertilizers management, and precision agriculture will be developed for a timely and targeted environmental delivery of agrochemicals. Deterministic models and artificial intelligence (AI) will drive the definition of Integrated Pest Management plans and fertilization strategies which will be sustainable both from an environmental and socio-economic point of view. A geoSpatial CyberInfrastructure for a Decision Support System (DSS) to reduce the use of agrochemicals and environmental pollution will be developed.

Thanks for your attention

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web site <https://bioagro.sostenibilita.enea.it>

www.clusteragrifood.it

