PATAFEST

Biobased solutions for potato plants and tubers

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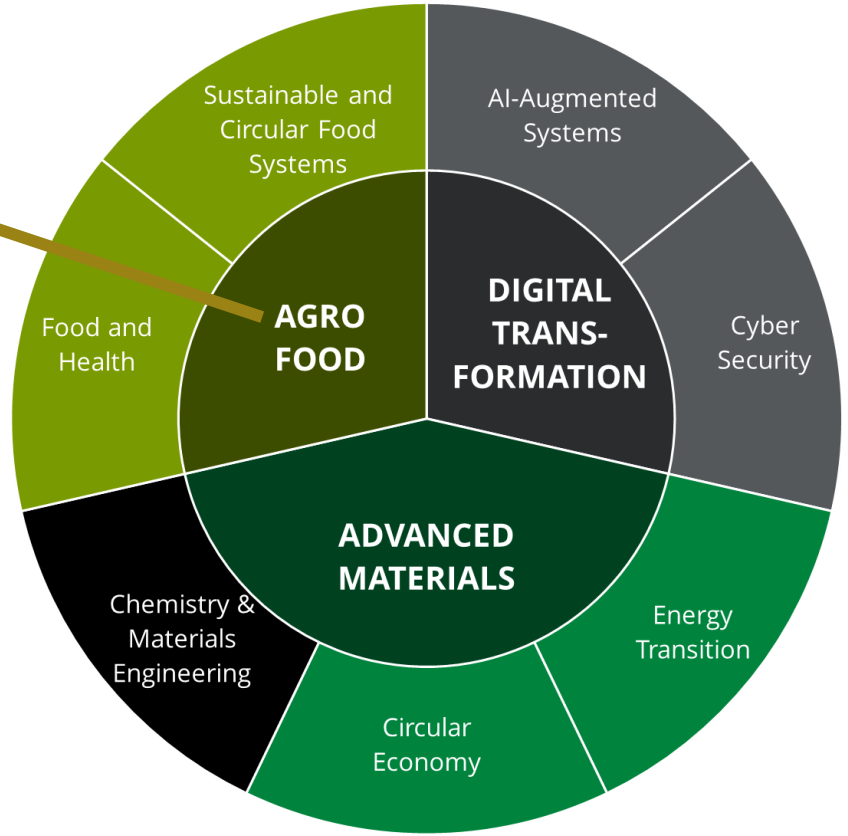

TOPIC DESCRIPTION

HORIZON-CL6-2022-FARM2FORK-02-02: Emerging and future risks to plant health

Expected outcomes:

- Find **adequate responses** to new and/or emerging plant pests;
- Improve the **understanding of drivers of plant pest emergence** including the influence of climate change, ecosystem degradation and globalisation;
- **Develop** economic and environmentally sound **solutions for effective pest management** in farming and forestry in line with the principles of integrated pest management; Support to relevant plant health policies in the EU and Associated Countries.

THE BACKGROUND

Global Significance

- In Europe (2020), potato production reached **55.3 million tonnes**, valued at 12.3 billion euros.
- Top EU producers include **Germany** (21.2%), **Poland** (16.4%), **France** (15.7%), and the **Netherlands** (12.7%).
- In South America, particularly the Andean region, there are over **4,500 potato varieties** and 100+ wild species.

Challenges in Potato Cultivation

- Potatoes face susceptibility to pests and soil-borne pathogens
- This vulnerability contributes to **food and economic losses** within the potato industry.

European Regulatory Framework

- The European and Mediterranean Protection Organization (EPPO), sets **phytosanitary measures for seed and ware potatoes** in international trade to **prevent the introduction and spread** of quarantine pests.
- The EU Green Deal aims to **reduce fossil-based pesticide by 50%**

Challenges in Potato Cultivation

PREHARVEST → Bacteria *Candidatus* Liberibacter solanacearum (CLso) and which disease is known as **zebra chip (ZC)**.
Vector psyllid *Bactericera cockerelli* (BC).

POSTHARVEST: Fusarium sambucinum, Colletothricum coccodes, Helminthosporium solani

PROJECT OBJECTIVES

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1. Characterize at molecular level the **ecological pest spread pathway**

2. Identify potato disease resistance varieties against CLso and postharvest pathogens.

1. **Cutting-edge digital technologies**

2. Effective **preharvest plant and soil treatments** against CLso vector and soil-borne pathogens combined.

Develop **postharvest technologies** to control the incidence of soil pathogens and maintain the quality of potato tubers stored
i) biocontrol coating solution; ii) controlled atmosphere storage; iii) volatile organic compounds (VOCs) sensors.

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POTATO CROP EFFECTIVE MANAGEMENT STRATEGIES TO TACKLE FUTURE PEST THREATS

PROJECT INFORMATION

48 MONTHS

6 MILLIONS €

9 COUNTRIES

18 PARTNERS

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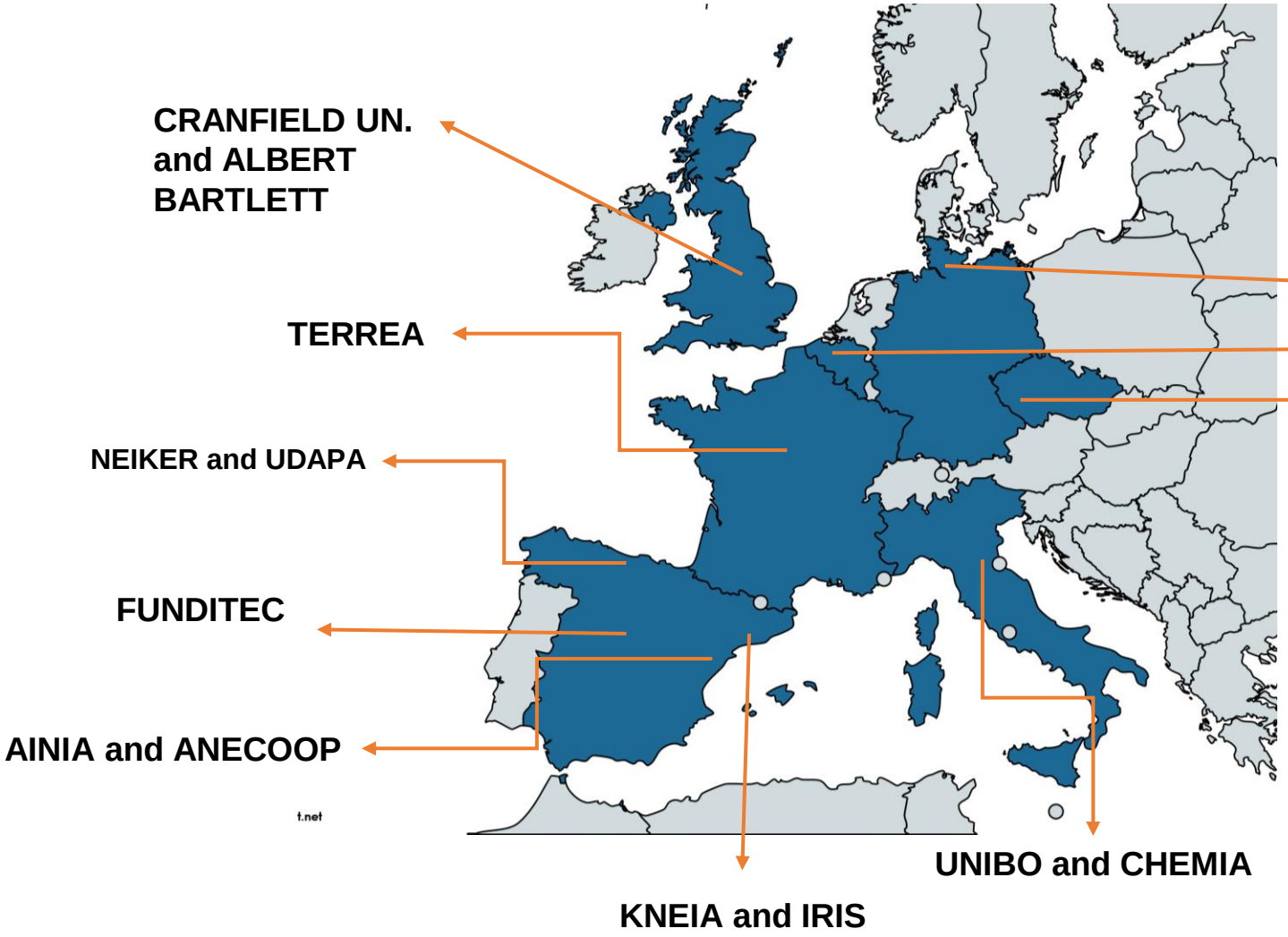
Consortium



6 SMEs
2 Large companies
4 RTOs
4 Universities
2 associations

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PEST AND POTATO MOLECULAR CHARACTERISATION

Modelling surveillance, detection, and control of CLso pest protocol

NGS technologies
Bioinformatics approaches

Selection of resistant potato varieties against plant pest and soil-borne pathogens

Molecular bioassays
Bioinformatics approaches

PREHARVEST DISEASE

Monitoring and surveillance

Image Analysis digital tool

AI predictive algorithms

Prevention

Insect repellent and anti-adhesive solution

Plant soil management

Agricultural waste based solution
Soil quality affected by different climate scenarios

POSTHARVEST DISEASE

Monitoring and surveillance

VOCS Sensors

Prevention

Postharvest biocontrol solution
Innovative storage technology

BIOBASED SOLUTIONS

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PEST AND POTATO MOLECULAR CHARACTERISATION

- **Modelling surveillance, detection, and control of CLso pest protocol**
  - NGS technologies
  - Bioinformatics approaches
- **Selection of resistant potato varieties against plant pest and soil-borne pathogens**
  - Molecular bioassays
  - Bioinformatics approaches

PREHARVEST DISEASE

- **Monitoring and surveillance**
  - Image Analysis digital tool
  - AI predictive algorithms
- **Prevention**
  - Insect repellent and anti-adhesive solution
- **Plant soil management**
  - Agricultural waste based solution
  - Soil quality affected by different climate scenarios

POSTHARVEST DISEASE

- **Monitoring and surveillance**
  - VOCS Sensors
- **Prevention**
  - Postharvest biocontrol solution
  - Innovative storage technology

Citizen science

ecsa European Citizen Science Association

Kneia

Diss. Comm & Exploit.

Europatat

udapa

Kneia

INTEGRATED PEST MANAGEMENT (IPM) STRATEGY

FARMERS/AGRICULTURAL & POTATO ASSOCIATIONS & COOPERATIVES

VALIDATION IN FIELD TRIALS UNDER REAL CONDITIONS

Ecuador, France, Germany, Spain

INIAP, Terrêa, BÖHMER, udapa

VALIDATION IN WAREHOUSES UNDER REAL CONDITIONS

France, UK, Germany

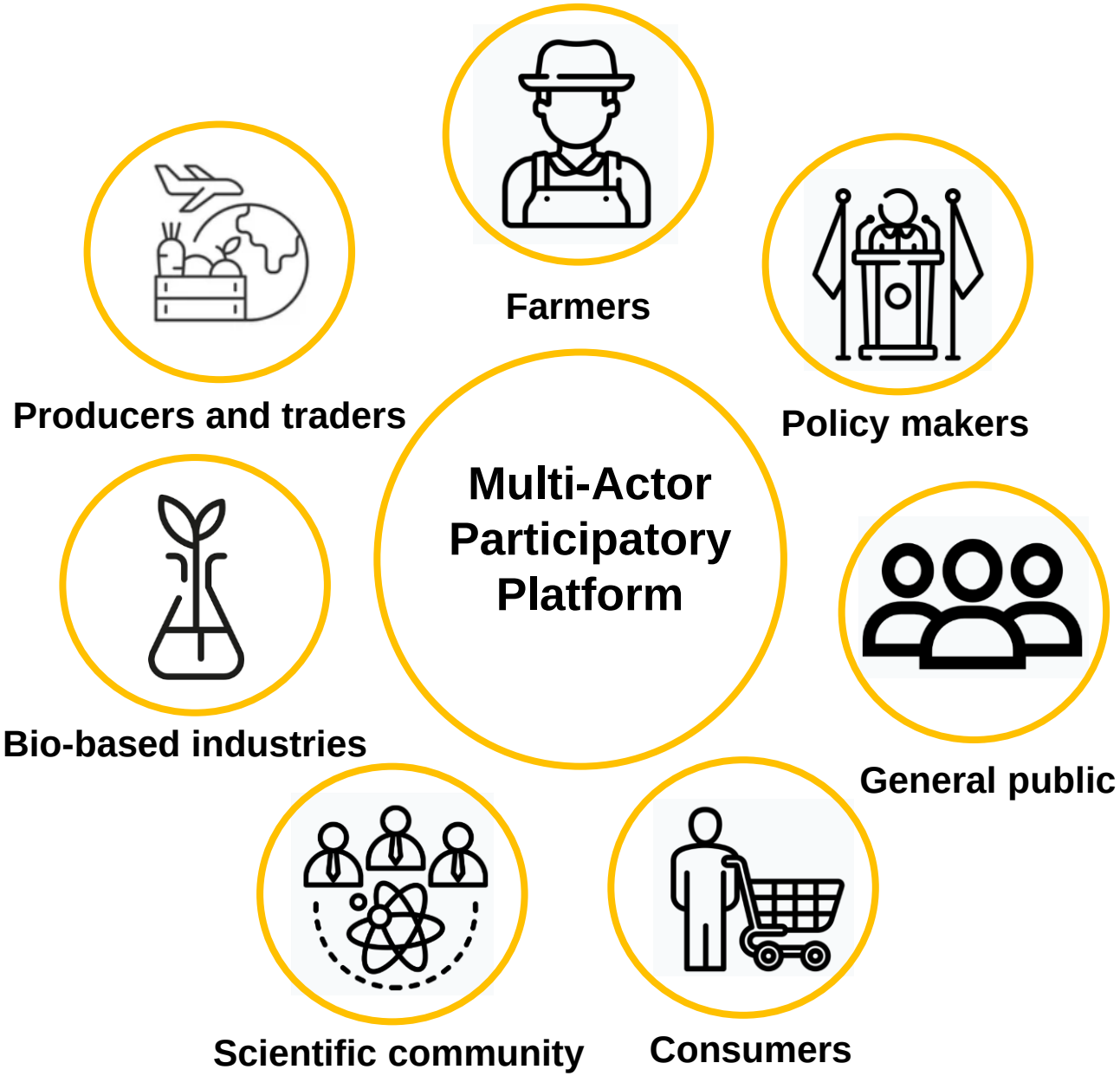
Terrêa, BÖHMER

DISTRIBUTION & COMMERCIALISATION

BÖHMER, Anecoop, Terrêa, Europatat, udapa

Potato pre and post- harvest season:

- ✓ 2025
- ✓ 2026



- ✓ **Share knowledge, experience and ensure economic sustainability of EU potato production**
- ✓ **Creation of at least 25 “practice abstracts” to the EIP-Agri repository**

Citizen Science

Monitor emerging potato threats and collect scientific data by the general public.

- **2 events**
  - **Long Night of Science** (Germany)
  - **Experimental Field Station** (Spain)
    →Collecting scientific data of potato resistance gens.

- **3 practical workshops** (Germany, Spain and Ecuador)
  →Test the bio-based sustainable solutions applied to potato soil.

- **8 webinars**
  → Scientific discussion
  → **Disseminate** the main technological solutions

- …press releases, communication campaigns and publication of articles in newspapers and popular magazines.

Expected outcomes of the project

Plant natural and sustainable solution with CLso repellent action

Reduce the presence of psyllid (BC) by at least 50% and the incidence of ZC by 25%.

2 ha of potato plants will be treated using **pesticide free natural solutions** against CLso vector;

Biocontrol solution and controlled atmosphere strategies for the postharvest pathogen reduction

Decrease at least 40% the incidence of soil-borne pathogen.

Soil management strategy

Reduce incidence of CLso and post-harvest pathogens in potato crop by 30%.

Work in progress

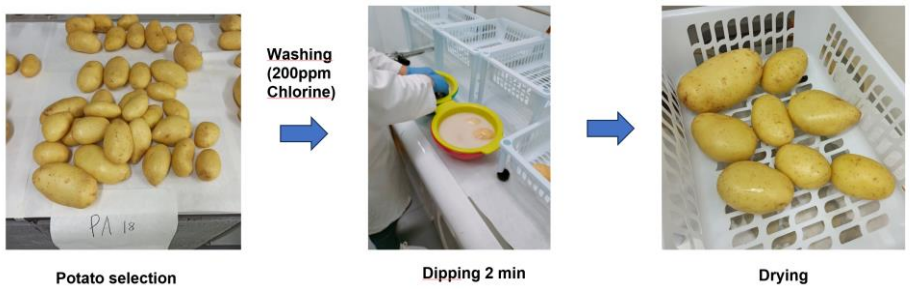
PLANT INSECT REPELLENT BIOBASED SOLUTION

- Experimental trials using **cotton aphids** as model
- **EOs-Wax** based superhydrophobic **coating** treatment on plant leaf
  - ✓ 30-40% mortality, no adhesion of aphids after 24h
- Studying the aphid behaviour: aphids stylet mode of action on the plant and how increase the physical barriers on the plant surface (use of biogenic organic salts and/or clays)
  - ✓ High disrupted effect of **clay-wax solution** on aphid adhesion and feeding behaviours (after 3h)

Work in progress

POSTHARVEST BIOCONTROL COATING

- **Fermentation process** optimisation to achieve higher biomass and metabolite production of **antagonistic yeast** (biocontrol agent)
  - ✓ *F. sambucinum*: 70-75% inhibition.
  - ✓ *C. coccodes*: 60-65% inhibition.
- Optimisation of **the enzyme substrate system** to improve the antifungal effectiveness
  - ✓ *F. sambucinum*: 80-85% inhibition.
- Mix of **polysaccharides and lipids-based coating prototypes** tested in new harvested potato tubers
  - ✓ Reduction on weight loss
  - ✓ Improvements on barrier to gases (O_2 and CO_2)
  - ✓ Maintain the colour



Work in progress

SOIL MANAGEMENT STRATEGY (Biobased fertilizer development)

- **Seashell** Slow-release multi- nutrient **fertilizer** (SMF)

  - ✓ Physicochemical characterisation
  - ✓ Combination with micro and macro elements
  - ✓ Studying the methodology to prepare the biobased solution fertilizers

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