

1. Content of the 'Topic Description' document

1.1. Topic area

A: Diagnostics, field detection, surveillance

1.2. Links to the Euphresco Strategic Research Agenda

The topic addresses the following objective(s) of the 2017-2022 Euphresco Strategic Research Agenda:

- Objective 2017-R-2.1: to improve knowledge on emerging pathways of entry and means of spread for pests
- Objective 2017-R-5.4: to test and validate the use NGS (e.g. whole genome sequencing, metagenomics, deep sequencing, typing by sequencing) for routine diagnostics
- Objective 2017-R-6.1: to test and validate methods for *in situ* detection and identification of pests
- Objective 2017-R-7.2: to validate cost-effective and socially acceptable phytosanitary measures at the place of production (inland) for plants, plant products, water and soil
- Objective 2017-C-2.1: to address plant health challenges through whole-chain, multi-actor approaches

1.3. Topic title

Early detection of *Phytophthora* in EU nurseries and traded plants.

1.4. Description of the problem the research should solve

Invasive *Phytophthora* pathogens are causing significant economic damage to agricultural, horticultural and forestry crops worldwide, as well as ecological damage to native plant species in wider environments. *Phytophthoras* are well adapted to thriving in plant nurseries, particularly in water, soil and on plant roots. Since much of the *Phytophthora* life cycle takes place in these substrates, the diseases they cause are difficult to diagnose and control. Traded plants for planting are a well-documented pathway for *Phytophthora* pathogens, facilitating their spread both nationally and internationally. New invasions of *Phytophthora* from global sources are likely because of their ability to survive in soil unseen, the difficulties of effective disease surveillance given the high annual volumes of imported plants and associated soil, and the limitations of current molecular and biological detection techniques, particularly when a previously undescribed species is present. These factors together mean that current phytosanitary protocols only have limited effect.

A recent project in the UK has developed and tested a metabarcoding method for the analysis of *Phytophthora* diversity in water and root samples from UK nurseries operating different management practices. Data revealed a high diversity of *Phytophthora* pathogens including findings on plants directly imported from other EU member states. These data on *Phytophthora* findings are being linked to host species and nursery management practice and are providing the evidence to inform best practice guidance being established as part of a proposed new UK-wide plant health assurance scheme.

The aim of this research project is to develop a co-ordinated strategy for the early detection of *Phytophthora* pathogens in plant nurseries and traded plants for planting across EU and third countries in order to inform best practice, complement phytosanitary regulation and to enhance engagement on Plant Health with traders operating in different countries. The sampling and metabarcoding detection methods already developed and applied successfully in the UK will be validated across participating countries. The existing methodology, including the bioinformatics pipeline, *Phytophthora* database and automated sample reporting pipeline linking results to associated sample metadata will be passed on to project participants for a ring-testing of sampling and metabarcoding protocols involving key nursery stakeholders in

each respective country (year 1). Further nursery testing will be conducted (year 2) involving a wider range of nurseries and traders in each country operating different practices. Data on *Phytophthora* findings in each country will be linked to management practice and host species, and 'high risk' pathways of spread will be identified. Social science investigations will identify key factors underlying risky behaviours. Information on these 'high risk' trading and management practices as well as feasible alternative approaches to good biosecurity will be co-designed and shared with industry and policy stakeholders and a set of 'best practice' guidance developed and disseminated to stakeholders in each country using appropriate forums. The project will enable trade partner countries to identify the potential introduction and spread of *Phytophthora* species through the plant trade and take action to mitigate this risk through more effective Plant Health surveillance and management practice for growers and traders.

The project will be divided into four work packages:

WP1: Ring-testing and refinement of sampling and metabarcoding protocols

WP2: Sampling and analysis of *Phytophthora* diversity and associated hosts in European and third country nurseries

WP3: Influence of management practice and host species on *Phytophthora* incidence and diversity

WP4: Stakeholder awareness of *Phytophthora* risks in trade and mitigation through co-design of best practice guidance across partner countries

1.5. Description of the expected results

- A validated sampling and metabarcoding protocol for early detection of *Phytophthora* spp. in import/export nurseries and in traded plants for planting across participating countries.
- Identification of management/trading practices that raise *Phytophthora* risk and which can be targeted in an international 'best practice' awareness scheme.
- Establishment of a co-ordinated, international network of scientists and policymakers dedicated to limiting the impact and spread of *Phytophthora* in trade.
- Co-design and promotion of risk awareness, knowledge exchange and best practice guidance for those involved in the international plant trade.

1.6. Beneficiaries of this research product

This project will benefit:

- National Plant Protection Organisations (NPPOs)
- EPPO and International Plant Protection Organisations.
- Nurseries, farmers and others directly involved in the plant trade.
- Plant Health diagnostic labs
- Ecosystem services provided by the wider environment as a result of reduced *Phytophthora* outbreaks

1.7. Research funders and research contribution/ distribution

Funding organisation	Research activity and researchers involved
1. Department for Environment Food and Rural Affairs, United Kingdom Elspeth Steel Elspeth.steel@defra.gov.uk	-Co-ordination; -Method tech-transfer and protocol development; -Sampling and analysis of plants traded through UK import/export nurseries;



	<p>-Stakeholder engagement and dissemination of best practice across partner countries;</p> <p>Contact person: Sarah Green E-mail address: sarah.green@ForestResearch.gov.uk</p> <p>Contact person: Mariella Marzano E-mail address: mariella.marzano@ForestResearch.gov.uk</p> <p>Contact person: Debbie Frederickson-Matika E-mail address: Debbie.frederickson@ForestResearch.gov.uk</p> <p>-Method development and application of metabarcoding testing for genus <i>Phytophthora</i> in plant nurseries; -Optimisation of existing bioinformatic pipelines and data visualisation tools; -Communication of findings to relevant stakeholders and conversion to improved best practice advice;</p> <p>Contact person: David Cooke E-mail address: david.cooke@hutton.ac.uk</p> <p>Contact person: Peter Cock E-mail address: peter.cock@hutton.ac.uk</p> <p>-Contribution to be detailed</p> <p>Contact person: David Kenyon E-mail address: David.Kenyon@sasa.gov.scot</p>
<p>2. Austrian Agency for Health and Food Safety, Austria</p> <p>Sylvia Bluemel sbluemel@ages.at</p>	<p>-Detection of <i>Phytophthora</i> spp. at species level; -Early detection of <i>Phytophthora</i> with NGS directly from plant materials; -Testing and validation of a developed protocol for the detection of <i>Phytophthora</i> spp.; -Data analysis and interpretation;</p> <p>Contact person: Thomas Leichtfried E-mail: thomas.leichtfried@ages.at</p>



<p>3. French Agency for Food, Environmental and Occupational Health & Safety, France</p> <p>Geraldine Anthoine geraldine.anthoine@anses.fr</p>	<p>-Validation of the sampling methodology; - Sample preparation (DNA extraction); - Bioinformatics;</p> <p>Contact person: Jaime Aguayo E mail address: jaime.aguayo@anses.fr</p>
<p>4. Benaki Phytopathological Institute, Greece</p> <p>Irene Vloutoglou i.vloutoglou@bpi.gr</p>	<p>-Validation of the sampling and metabarcoding detection protocol; -Implementation of the validated protocol on plants for planting traded/moved within Greece; -Data analysis and interpretation;</p> <p>Contact person: Emilia Markellou E-mail: e.markellou@bpi.gr</p> <p>Contact person: Dimosthenis Kizis E-mail: d.kizis@bpi.gr</p>
<p>5. Department of Agriculture, Food and Marine, Ireland</p> <p>Maria Laura Destefanis Maria.Destefanis@agriculture.gov.ie</p>	<p>-Contribution to be detailed</p> <p>Contact person: Maria Laura Destefanis E-mail: Maria.Destefanis@agriculture.gov.ie</p>
<p>6. All-Russian Plant Quarantine Center, Russia</p> <p>Natalia Sherokolova natalia_sh@mail.ru</p>	<p>-Sampling and analysing plant nurseries in Russia; -Detection and identification <i>Phytophthora</i> spp. by baiting method and PCR in soil and planting material; -Identification of <i>Phytophthora</i> spp. by sequencing;</p> <p>Contact person: Maria Kopina E-mail: kopinamaria645@gmail.com</p> <p>Contact person: Tatiana Surina E-mail: t.a.surina@yandex.ru</p> <p>Contact person: Golovin Sergey E-mail: block2410@yandex.ru</p>
<p>7. Ministry of Agriculture and Rural Development of the Slovak Republic, Slovakia</p> <p>Katarina Benovska katarina.benovska@land.gov.sk</p>	<p>-Sampling in plant nurseries in Slovakia; -Analysing the collected samples; -Testing the method in laboratories nationally;</p> <p>Contact person: Katarína Adamčíková e-mail: katarina.adamcikova@ife.sk</p>
<p>8. Forestry Commission</p> <p>Joan Webber</p>	<p>-Refer to partner 1 for details</p> <p>Contact person: Sarah Green</p>

<p>joan.webber@forestry.gsi.gov.uk</p> <p>Ana Perez Sierra ana.perez-sierra@forestry.gsi.gov.uk</p>	<p>E-mail address: sarah.green@ForestResearch.gov.uk</p> <p>Contact person: Mariella Marzano E-mail address: mariella.marzano@ForestResearch.gov.uk</p> <p>Contact person: Debbie Frederickson-Matika E-mail address: Debbie.frederickson@ForestResearch.gov.uk</p>
<p>9. Science and Advice for Scottish Agriculture, United Kingdom</p> <p>David Kenyon David.Kenyon@sasa.gov.scot</p>	<p>-Refer to partner 1 for details</p> <p>Contact person: David Kenyon E-mail address: David.Kenyon@sasa.gov.scot</p>
<p>10. Naktuinbouw, the Netherlands</p> <p>Marcel Toonen m.toonen@naktuinbouw.nl</p>	<p>-Identification of <i>Phytophthora</i> spp. based on nanopore sequencing for detection of pathogenic <i>Phytophthoras</i> in planting material and soil;</p> <p>Contact person: Daniel Bakker E-mail: d.bakker@naktuinbouw.nl</p>
<p>11. US Forest Service, United States</p> <p>Susan Frankel susan.frankel@usda.gov</p>	<p>-Contribution to be detailed</p> <p>Contact person: Susan Frankel E-mail: susan.frankel@usda.gov</p>

1.8. Research project partnership outside Euphresco

Euphresco funding ensures a certain level of transnational collaboration among Euphresco member countries. It is possible, if the funding consortium is interested, to contact funding organisations or research groups outside the geographical area covered by Euphresco members. The Euphresco coordinator could advertise the research topic in order to have an enlarged collaboration. If funders are interested in this possibility, please check the case below:

The funding consortium of the topic mentioned in section 1.2 requires that the topic is advertised outside the Euphresco network

1.9. Any other relevant information on content

None.

2. Euphresco management aspects of the project

2.1. Indication of the topic budget

Funding organisation ^a	Mechanism ^b	Total Budget ^c
1. Defra (GB) ¹	NC	€
2. AGES (AT)	NC	€
3. ANSES (FR)	NC	€
4. BPI (GR)	NC	€
5. DAFM (IE)	NC	€
6. VNIKR (RU)	NC	€
7. LAND (SK)	NC	€
8. FC (GB)	NC	€
9. SASA (GB)	NC	€
10. Naktuinbouw (NL)	NC	€
11. USFS (US)	NC	€
total		€

2.2. Expected duration of the project (only for non-competitive topics)

24 months.

2.3. Identification of project coordinator

Has the research project coordinator been identified?

Yes

No

2.4. Any other relevant information on topic organisation and management

None.

^a First member is project coordinator. A minimum of two partners are necessary for each proposal. Add lines as needed.

^b Please indicate the preferred mechanism (e.g. real pot RP; virtual pot VP; non-competitive NC), or several mechanisms if there is flexibility.

^c Optional, as this amount can still change in the next phase. In-kind contribution should also be indicated in this column.

¹ Defra will fund partners Forestry Commission, James Hutton Institute and Science and Advice for Scottish Agriculture. Co-funding is expected from Forestry Commission and Advice for Scottish Agriculture