

Fostering the use of satellite Remote Sensing to support Plant Health surveillance activities

PLANT HEALTH AT A GLANCE

Human activities have opened new opportunities for the rapid and global movement of plant pests. Pests that move into areas where they were not previously present have the potential to cause serious damage to agriculture, the environment and trade.

As an example, the bacterium *Xylella fastidiosa* has recently been diagnosed in Europe, where it has established in a few regions in France, Italy and Spain; the bacterium can infect hundreds of plant species and potential annual production losses have been estimated up to EUR 5.5 billion. Emerald Ash Borer (*Agrilus planipennis*) can cause serious damages by killing ash trees, resulting in serious threat to ecosystems, loss of forest products and wood sales. In the USA, the pest has killed tens of millions of ash trees and damage was estimated at USD 10.7 billion. *A. planipennis* was detected in the European continent in Russia (Moscow's region) in 2005 and has spread to Ukraine, where its presence was officially confirmed in 2019; the pest is currently under eradication in Ukraine.

Preventive measures to support early detection are much more effective than measures aimed at containing or eradicating pests once they are established.

Surveillance in countries (e.g. at seaports, airports, fields, forests, nurseries, in urban green areas), is an activity under the responsibility of the National Plant Protection Organisations. However, these official activities are not backed by sufficient human and financial resources to effectively ensure the systematic survey of the national territory.

WHAT CAN SATELLITES DO FOR PLANT HEALTH?

Remote Sensing technologies have the potential to guide and instruct on ground surveillance activities and other phytosanitary measures of the National Plant Protection Organisations as they allow:

- development of precise (in time and space) maps of the Earth's surface
- regular and rapid monitoring of large area or areas that are difficult to reach
- means to identify and map plants and trees
- detection of stress in plants before they are visible to the naked eye

Satellites (but also aircraft and drones) are already used in a number of countries worldwide (e.g. Australia and the United States of America), but practical application for European Plant Health needs is still very limited, despite the implementation of the Copernicus Earth Observation system of satellites and its free open data policy. Copernicus is the European Union Programme aimed at developing EU information services based on satellite Earth Observation and in situ (non-space) data. Near-real-time

data from the Copernicus satellites can be accessed and used through six thematic portals focused on Atmosphere, Environment, Land Monitoring, Climate Change, Emergency Management, and Security.

WHAT ARE THE REASONS FOR REMOTE SENSING TECHNOLOGIES NOT BEING ADOPTED IN PLANT HEALTH SURVEILLANCE PROGRAMMES?

Data limitations: There are many platforms and sensors designed for the acquisition of satellite data. These sensors have various spatial, spectral and temporal resolutions. But the resolution of freely available satellite imagery is too low to monitor plant pests in specific areas, while high resolution imagery comes with a high cost. Moreover, no pest-specific sensors are available, precluding the use of Remote Sensing technology for targeted monitoring of pests' status of specific areas.

Resources: The amount, diversity, complexity and heterogeneity of the satellite-based data make data processing extremely demanding and require specialised expertise. The bodies in charge of monitoring Plant Health in the EU lack the expertise and economic resources needed to integrate satellite-based data into their monitoring and decision-making processes.

Communication and collaboration: A gap exists among the activities of research funders and policy makers, which hinders the application of satellite Remote Sensing in pest surveillance programmes.

WHAT CAN BE DONE TO FOSTER THE OPERATIONAL USE OF SATELLITES TO SUPPORT PLANT HEALTH SURVEILLANCE ACTIVITIES?

To favour the transfer of space technologies to the Plant Health community, Remote Sensing data must be easily available and adapted to the needs of National Plant Protection Organisations.

Mechanisms should be established for National Plant Protection Organisations to access high resolution data for free or at a lower cost. In this respect, the implementation of a platform to centralise the acquisition of Remote Sensing data relevant for the monitoring of Plant Health at EU level, could provide an easy access to Copernicus data (and other available satellite data) for National Plant Protection Organisations that these could transfer to stakeholders at national, regional and local levels.

Current technological and operational limitations should be overcome and future research should aim to: identify areas of the electromagnetic spectrum (packages of wavelengths) to detect specific biotic stresses; to develop most performing spectral vegetation indices (sVIs) for pest detection/identification; to progress research on sensor technology; to develop pest-specific sensors that are user' friendly and inexpensive.

Public funding should support applied research projects for the development of tools that could be operationally used by National Plant Protection Organisations to access, use and share satellite-based data. Communication and collaboration between Remote Sensing and Plant Health experts should be enhanced to ensure transfer of knowledge and expertise.

This policy brief was prepared on the basis of analyses and recommendations made in the framework of the Euphresco project [2016-I-226](#) 'The Applications of Remote Sensing in Plant Health'.

Euphresco is a network of research programme owners, programme managers, National Plant Protection Organisations and research institutes aiming at enhancing coordination and facilitating collaboration in phytosanitary research activities.

As of 2020-02, 70 organisations from more than 50 countries in five continents (Africa, America, Asia, Europe and Oceania) are members of the network. The Euphresco topics fall into the category of explorative and applied science needed to support policy.

In 2018, Eurisy moderated the EPP0-Euphresco Scientific Colloquium 'The Applications of Remote Sensing in Plant Health', focusing on the benefits and limitations of Remote Sensing applications in Plant Health.

EURISY is a Non Profit Organisation aiming to promoting the benefits of space for European society. Its members include governmental space offices/agencies, international organisations, research institutions and private business involved in space-related activities.

Eurisy's mission consists in providing a framework to structure the dialogue between the space community and society, raising awareness among decision-makers, civil society and users, of the strategic importance of space for sustainable economic, environmental and social development policies. Eurisy therefore acts as a facilitator by offering an active dialogue with users and decision makers, a forum for open, free debates and a thrust for collaboration.

Eurisy undertakes activities aiming at fostering the exchange of know-how and experiences among European regions, cities, national administrations, SMEs, satellite-based service providers, space agencies and decision makers. The Association pursues such objective through conferences, workshops, online articles, reports, and projects seeking to assess new services based on space applications, share practices, challenges and issues, and propose evolution for the future services, based on the requirements of the user communities themselves.