



**Harnessing the Power of Digital Technologies to
Protect Plants & the Environment**

D3.2: STELLA PSS platform operational

Grant Agreement No.	101134750
Project Acronym	STELLA
Project Title	Harnessing the Power of Digital Technologies to Protect Plants & the Environment
Type of action	HORIZON Research and Innovation Actions
Horizon Europe Call Topic	HORIZON-CL6-2023-GOVERNANCE-01-16
Start – ending date	1 st of January 2024 – 31 st of December, 2027
Project Website	stella-pss.eu
Work Package	WP3: STELLA Platform
WP Lead Beneficiary	Agricultural University of Athens (AUA)
Relevant Task(s)	T3.2: Platform specifications and design
Deliverable type Dissemination level	OTHER; PU: Public;
Due Date of Deliverable	15 05 2025
Actual Submission Date	17 07 2025
Responsible Author	Fotis Deligiannis (AUA)
Contributors	Sofia Mouseti (AUA), Alexandra Danglidi (AUA)
Reviewer(s)	Christina Markou (AUA), Dimitrios Tsitsigiannis (AUA)

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

Copyright message

This document contains unpublished original work unless clearly stated otherwise. Previously published material and the work of others has been acknowledged by appropriate citation or quotation, or both. Reproduction is authorised provided the source is acknowledged.

Consortium			
No.	Participants organisation name	Short name	Country
1	GEOPONIKO PANEPISTIMION ATHINON	AUA	EL
2	UNIVERSITA CATTOLICA DEL SACRO CUORE	UCSC	IT
3	EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW- EN VISSERIJONDERZOEK	EV ILVO	BE
4	UNIVERSITAET FUER BODENKULTUR WIEN	BOKU	AT
5	GREEN & DIGITAL IDIOTIKI KEFALAIOUCHIKI ETAIREIA	GREEN & DIGITAL	EL
6	REFRAME FOOD ASTIKI MI KerdoskopiKI ETAIREIA	RFF	EL
7	ACTA ASSOCIATION DE COORDINATION TECHNIQUE AGRICOLE - LES INSTITUTS TECHNIQUES AGRICOLES	ACTA	FR
8	HORTA SRL	HORTA SRL	IT
9	PESSL INSTRUMENTS GMBH	PESSL	AT
10	GREEN SUPPLY CHAIN DIGITAL INNOVATION HUB ASTIKI MI KerdoskopiKI ETAIREIA	GSC	EL
11	AgriFood Lithuania DIH	AFL	LT
12	EDENCORE TECHNOLOGIES IKE	EDENCORE	EL
13	INSTITUT FRANCAIS DE LA VIGNE ET DU VIN	IFV	FR
14	LINCOLN AGRITECH LIMITED	LincolnAgritech	NZ

Executive Summary

The present document serves as the report for the first version of the STELLA Pest Surveillance System (PSS) digital platform going online. It has been created to complement Deliverable 3.2 “STELLA PSS platform operational” and summarizes the work conducted during the development of the first version of the STELLA PSS (T3.3). The purpose of this document is to provide additional documentation of the platform’s Graphic User Interface (GUI) with hyperlinks as designed and developed in the first reporting period (RP). It outlines the web interface of the platform as envisioned so far, based on partner’s and stakeholder’s input on user needs, as well as based on the description of the STELLA PSS functional and non-functional requirements described in D3.1. The prototype version of the platform has been developed in June 2025 (M18) and is managed by the Agricultural University of Athens.

Table of Contents

1	Introduction	7
2	Aim and objectives of the STELLA PSS	8
3.	STELLA PSS Interface	10
3.1	STELLA PSS platform features & functionalities	10
3.2	Mockups presentation	10
4.	Conclusions	24

List of Figures

Figure 1.	STELLA project website landing page.	10
Figure 2.	STELLA PSS landing page.	11
Figure 3.	STELLA PSS - System selection interface.	12
Figure 4.	STELLA PSS - Early Warning System Interface.	12
Figure 5.	STELLA PSS - EWS Field details view (1).	13
Figure 6.	STELLA PSS - EWS Field details view (2).	14
Figure 7.	Notification System and Prognosis List in STELLA PSS – Early Warning Subsystem.	15
Figure 8.	Pest Detection System (Satellite Based) Interface in STELLA PSS (1).	16
Figure 9.	Pest Detection System (Satellite Based) Interface in STELLA PSS (2).	17
Figure 10.	Pest Detection System (Satellite Based) Interface in STELLA PSS - UCP Area Visualization.	18
Figure 11.	Pest Detection System (Satellite Based) Interface in STELLA PSS - Pathogen Detection and Response Interface.	19
Figure 12.	Pest Detection System (Satellite Based) Interface in STELLA PSS - Notification System for Pest Detection Events.	20
Figure 13.	EDEN Viewer Pest Detection System Interface in the STELLA PSS.	21
Figure 14.	EDEN Viewer PDS Interface in the STELLA PSS - Anomaly Marker Interaction Interface.	22
Figure 15.	Example of Pest Response System Output for RNQP Detections in STELLA PSS.	23

List of Tables

Table 1.	Objectives that the STELLA PSS digital platform will serve for its stakeholders	9
----------	---	---

Glossary of terms and abbreviations used

List of Abbreviations and Acronyms	
AI	Artificial Intelligence
API	Application Programming Interface
EWS	Early Warning System
GUI	Graphical User Interface
IoT	Internet of Things
PA	Phytosanitary Authority
PDS	Pest Detection System
PRS	Pest Response System
PSS	Pest Surveillance System
QP	Quarantine Pest
REST	Representational State Transfer
RNQP	Regulated Non-Quarantine Pests
SRS	System Requirement Specifications
UAV	Unmanned Aerial Vehicle
UCP	Use Case Pilot
UI	User Interface
UN	User Need
WP	Work Package

1 Introduction

The present report outlines the progress achieved in Task 3.3, focusing on the development and maintenance of the STELLA PSS. This platform serves as an advanced, centralized solution for real-time monitoring, detection, and management of Quarantine and Regulated Non-Quarantine pests (RNQPs) and diseases, designed to support sustainable and efficient plant protection strategies in agriculture and forestry. The STELLA PSS platform integrates cutting-edge technologies, including IoT sensors, satellite platforms, drones and proximal sensing devices (EDEN viewer).

The STELLA PSS is a direct outcome of the STELLA EU-funded project and is a digital platform that aims to deliver actionable insights to users for managing the eight (8) Quarantine (QP) and Regulated Non-Quarantine (RNQP) pests and diseases studied within the project. This will be achieved through data processing models exploited by the platform's three main subsystems, namely the Early Warning System using bioclimatic indices to predict infestations, the Pest Detection System using data processing AI models to detect physiological anomalies in vegetation based on satellite or proximal (EDEN Viewer) platforms, and the Pest Response System providing alerts and guidelines on how to manage the pests and diseases studied in the STELLA project based on its type (QP or RNQP). The platform also includes robust data standardization protocols and APIs to ensure seamless integration with external systems and compatibility with a variety of data sources. A key feature will be the user-friendly Graphical User Interface (GUI), designed for non-expert users to interact with the platform effectively.

Additionally, the platform includes a data sharing framework that leverages state-of-the-art standards for interoperability and data security. This framework draws inspiration from the existing successful platform DjustConnect (<https://djustconnect.be/en>), which provides a robust infrastructure for data exchange and governance in the agricultural sector. The incorporation of principles from DjustConnect ensures that the STELLA PSS platform supports secure, transparent, and efficient sharing of data among stakeholders. Through APIs and semantic data models, it ensures open access to curated datasets and enables integration with third-party systems, fostering collaboration across agricultural networks and enhancing the platform's utility in pest surveillance.

The STELLA PSS platform consists of three subsystems:

Subsystem 1: Early Warning System

Subsystem 2: Pest Detection System

Subsystem 3: Pest Response System

The STELLA PSS platform is accessible through the <https://stella-pss.eu/pss-platform/> hyperlink, available through the stella website (<https://stella-pss.eu/>).

2 Aim and objectives of the STELLA PSS

The STELLA Pest Surveillance System (PSS) platform aims to serve as a centralized digital hub designed to revolutionize pest and disease monitoring and management in agriculture and forestry. Its overarching goal is to provide stakeholders with actionable insights, tools, and recommendations for monitoring, detecting, and responding to Quarantine and RNQPs, all while fostering sustainable agricultural practices and data driven decision making. The platform exploits cutting-edge technologies, including IoT sensor devices, remote sensing (satellite) and proximal sensing (EDEN Viewer) platforms, Artificial Intelligence (AI) models, and citizen science (PESSL mobile app), to deliver a robust and user-friendly digital ecosystem. By offering these features through a unified and interactive system, the STELLA PSS platform ensures accessibility and usability for a diverse range of stakeholder groups, from farmers and agronomists to policymakers and researchers.

The STELLA PSS platform encompasses three subsystems, made available through the <https://stella-pss.eu/pss-platform/> hyperlink. Overall, the three main subsystems in the platform address all aspects of pest and disease management. The **Early Warning System** aims to provide predictive insights into pest outbreaks through IoT-enabled monitoring and advanced pest forecasting models based on bioclimatic indices, allowing stakeholders to take preventive action before significant damage occurs.

The **Pest Detection System** is divided into two (2) different systems, one based on satellite platform detections (remote sensing technology) and one based on detections derived from proximal sensing devices (EDEN Viewer). Overall, the Pest Detection system, aims to provide high accuracy pest presence and pressure detection based on the combination of AI-powered analysis and geospatial data from UAVs and satellites or proximal sensing devices (EDEN Viewer).

The **Pest Response System** works in combination with detections derived from the Pest Detection system (satellite based or EDEN Viewer based). It filters and lists the detections as QP or RNQP type and offers dashboard alerts and real-time, data-driven recommendations and spatially targeted actions for pest containment and mitigation, supporting decision-making for sustainable management of QPs and RNQPs in the EU.

Table 1 outlines the identified target stakeholder groups along with the corresponding objectives that the STELLA PSS digital platform is intended to address for each stakeholder group independently. Even though there might be different or divergent motivations in the objectives of the diverse members and stakeholders, the overarching objective is to cultivate a dynamic point of reference for digital tools, data, and technologies that accommodate the interests of all stakeholders.

Table 1. Objectives that the STELLA PSS digital platform will serve for its stakeholders

Stakeholder	Objective
Researchers	Provide open access to AI models, and analytical tools to enable groundbreaking research and foster innovation in plant health and pest management.
Policymakers	Deliver actionable insights and multi-criteria assessment outputs derived from pest surveillance and control data to support evidence-based policy development for sustainable pest management strategies.
Agricultural Advisors	Facilitate access to accurate, geolocated pest and disease monitoring and detection outputs, to enable them to provide more effective, data-driven guidance to farming communities and support the adoption of advanced pest control methods.
Farmers and Foresters	Facilitate access to accurate, geolocated pest and disease monitoring outputs, as well as tailored recommendations for pest response. This will enable stakeholders to optimize their practices, reduce reliance on pesticides, and improve crop health.
Technology Developers	Offer a framework for integrating existing and emerging digital technologies into pest management systems, enabling developers to align their innovations with agricultural needs and market trends.

The STELLA PSS platform represents a significant milestone in advancing digitally supported pest management, providing a cohesive digital system that integrates monitoring, detection, and response. By catering to the unique needs of its diverse stakeholders, the platform aims to promote collaboration, innovation, and sustainability in agriculture and forestry. Continuous feedback from stakeholders will drive future enhancements, ensuring the platform remains at the forefront of pest and disease management solutions.

3. STELLA PSS Interface

3.1 STELLA PSS platform features & functionalities

3.2 Mockups presentation

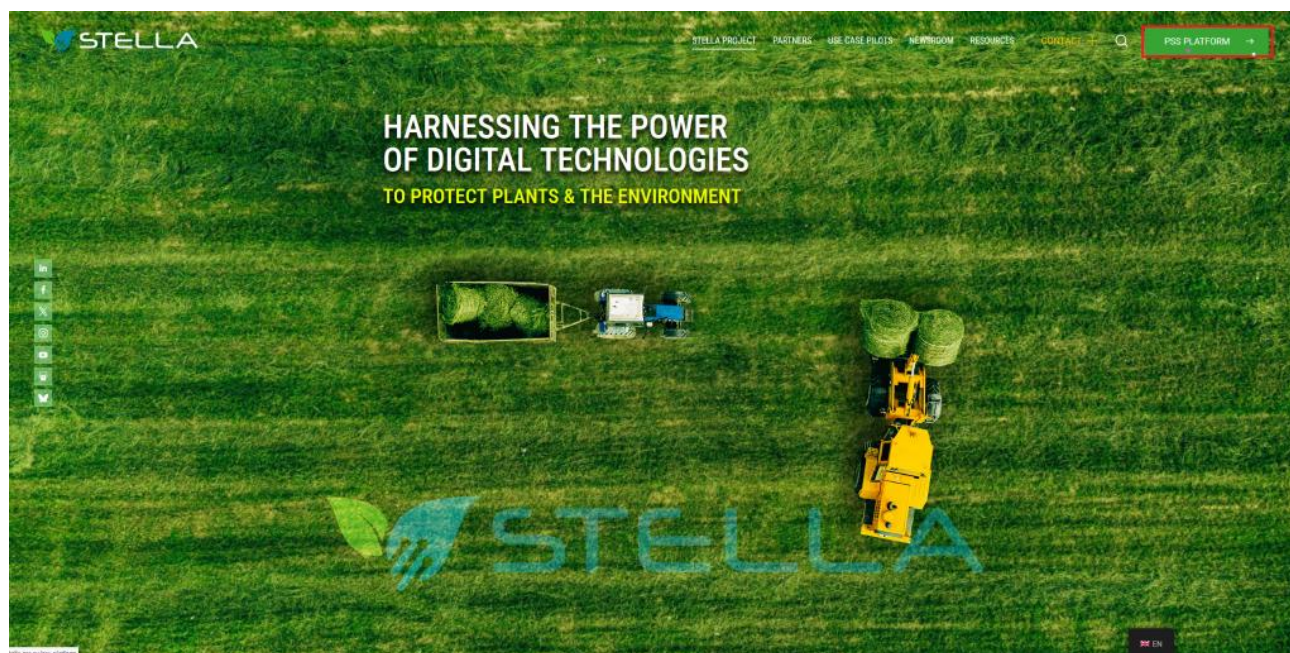


Figure 1. STELLA project website landing page

Screenshot of the STELLA project’s official website landing page. The red boundary box highlights the access button for the STELLA PSS, providing direct entry to the platform for registered users. As shown in **Figure 1.**, The STELLA PSS platform is accessible through the “PSS PLATFORM” button found on the top right of the STELLA website.

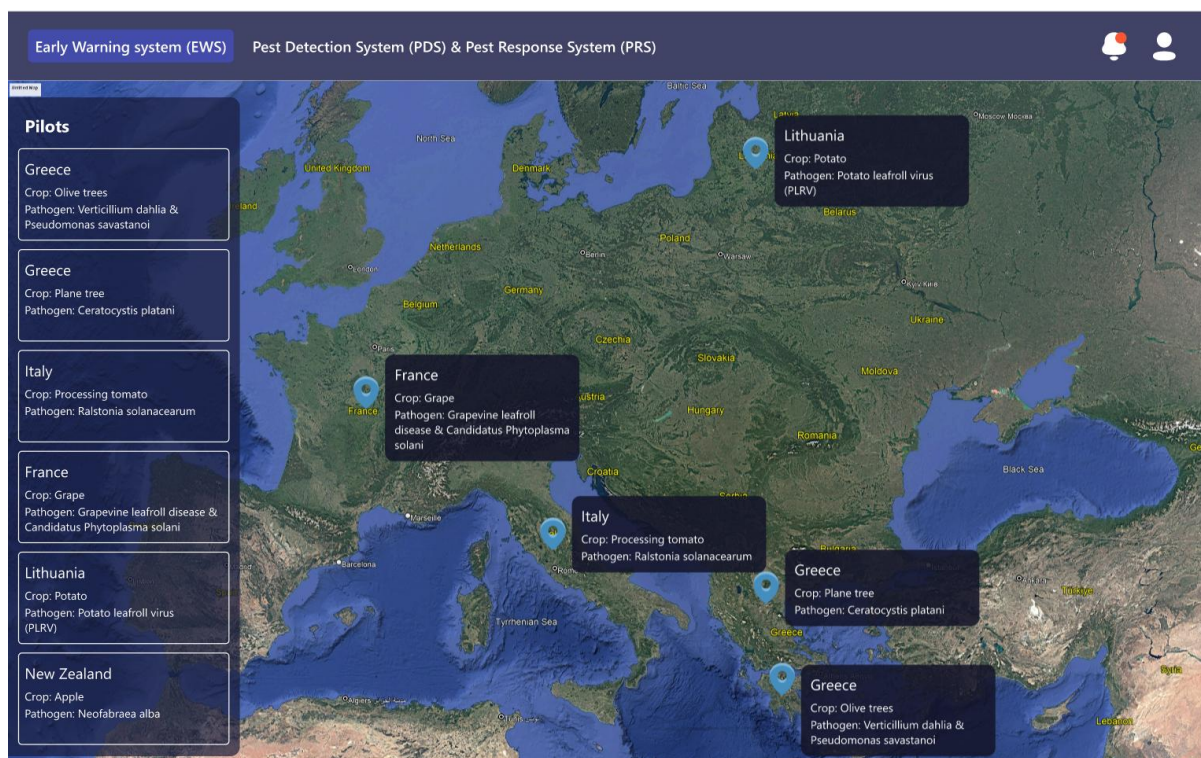


Figure 2. STELLA PSS landing page

Upon entering the PSS platform, the user is redirected to the STELLA PSS landing page, as shown in **Figure 2**. Upon accessing the platform, the user is presented with a high-resolution satellite image depicting Europe and New Zealand. Markers indicate the geographical locations of the STELLA Use Case Pilots (UCPs) and are accompanied by a box containing a short description of the UCP (crop and pathogen of interest).

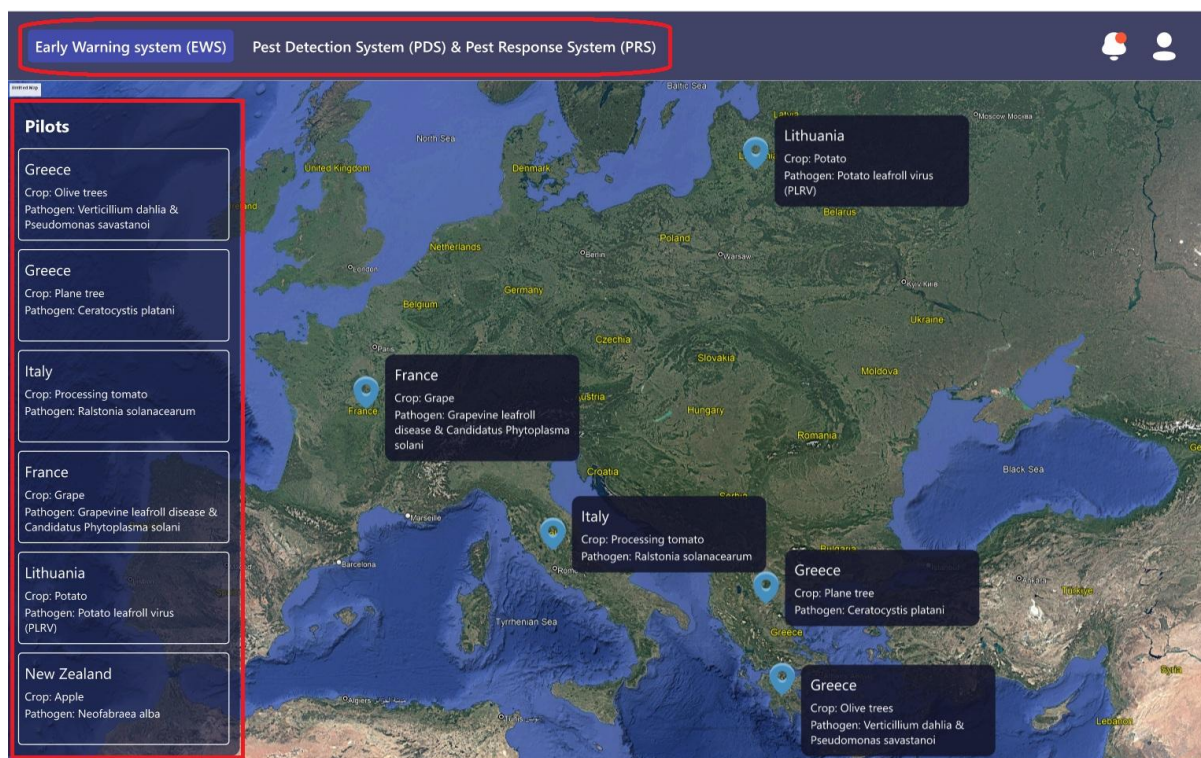


Figure 3. STELLA PSS - System selection interface

From the top left (red bounding box), the user can select the subsystem to use. In the **Figure 3** above, the Early Warning System (EWS) is selected. To the left, the user can select and click on the UCP of interest.

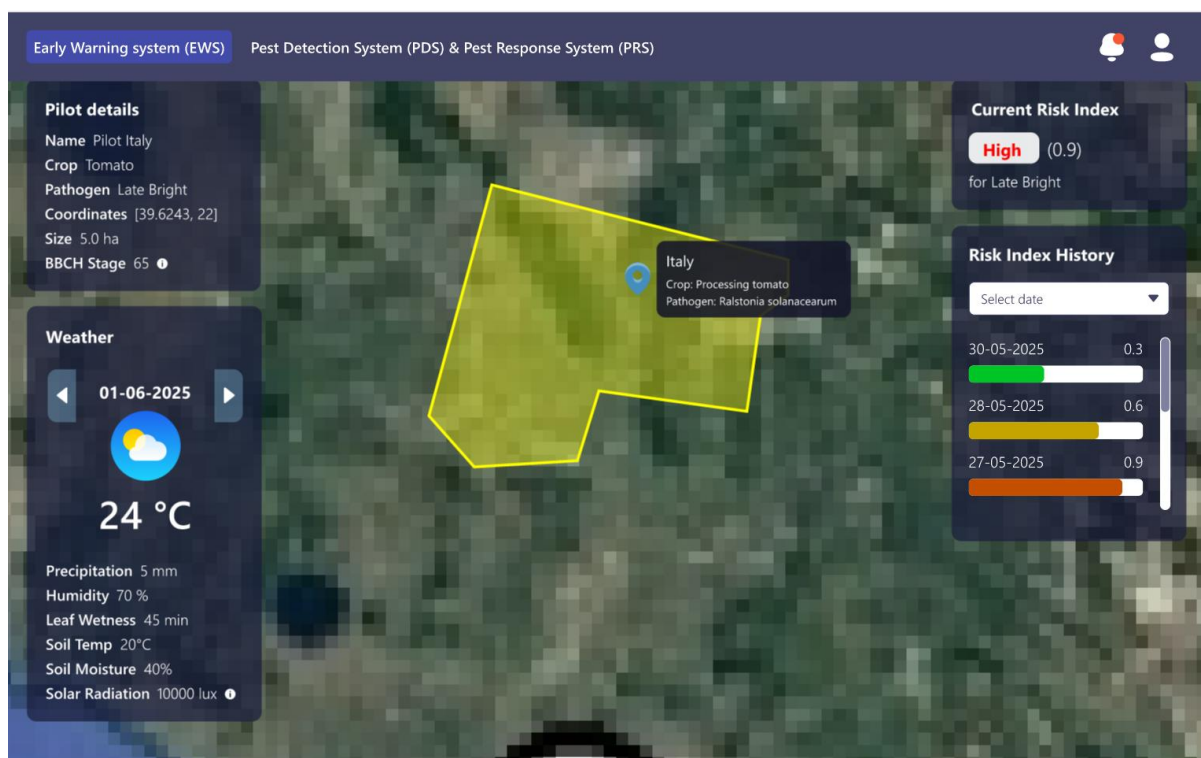


Figure 4. STELLA PSS - Early Warning System Interface

Upon clicking on the UCP (both in the Early Warning System and the Pest Detection System), the map zooms in to the specific location of the UCP field polygon, marked up in colour (**Figure 4**).

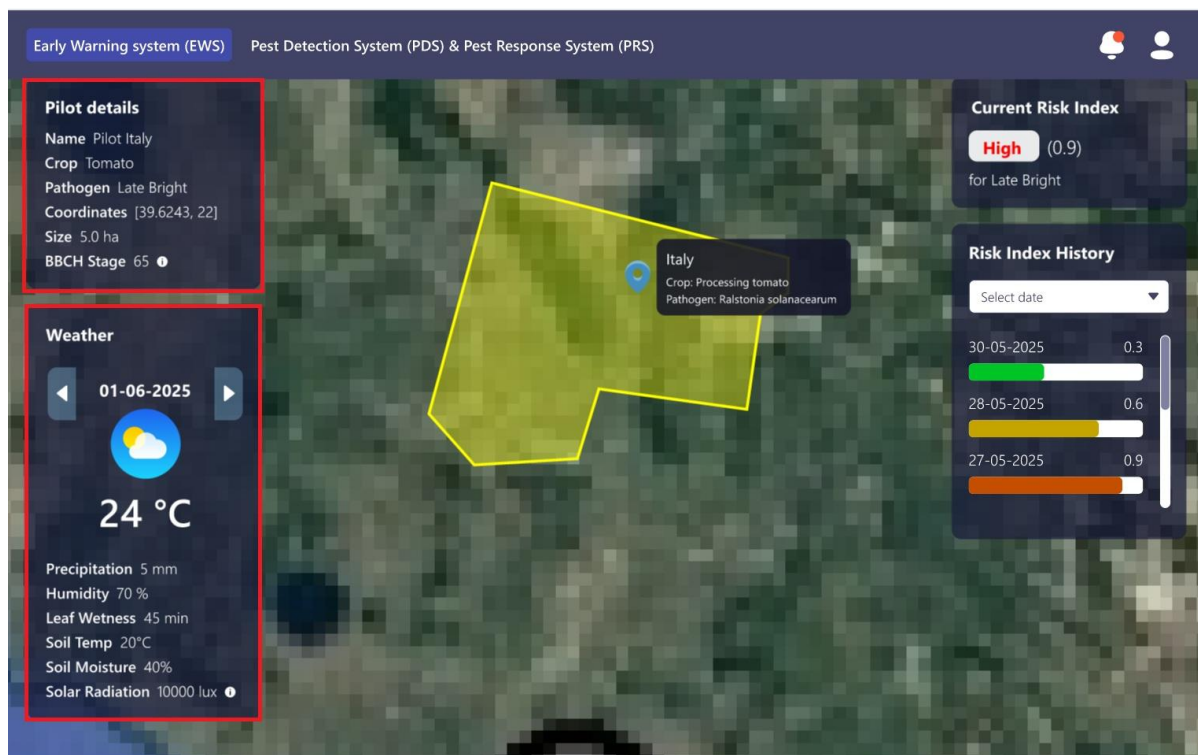


Figure 5. STELLA PSS - EWS Field details view (1)

To the top left (**Figure 5**), the user may find general field details (location, name, crop etc.), while to the bottom left, the meteorological conditions in the field are presented, as taken from the connected IoT weather station.

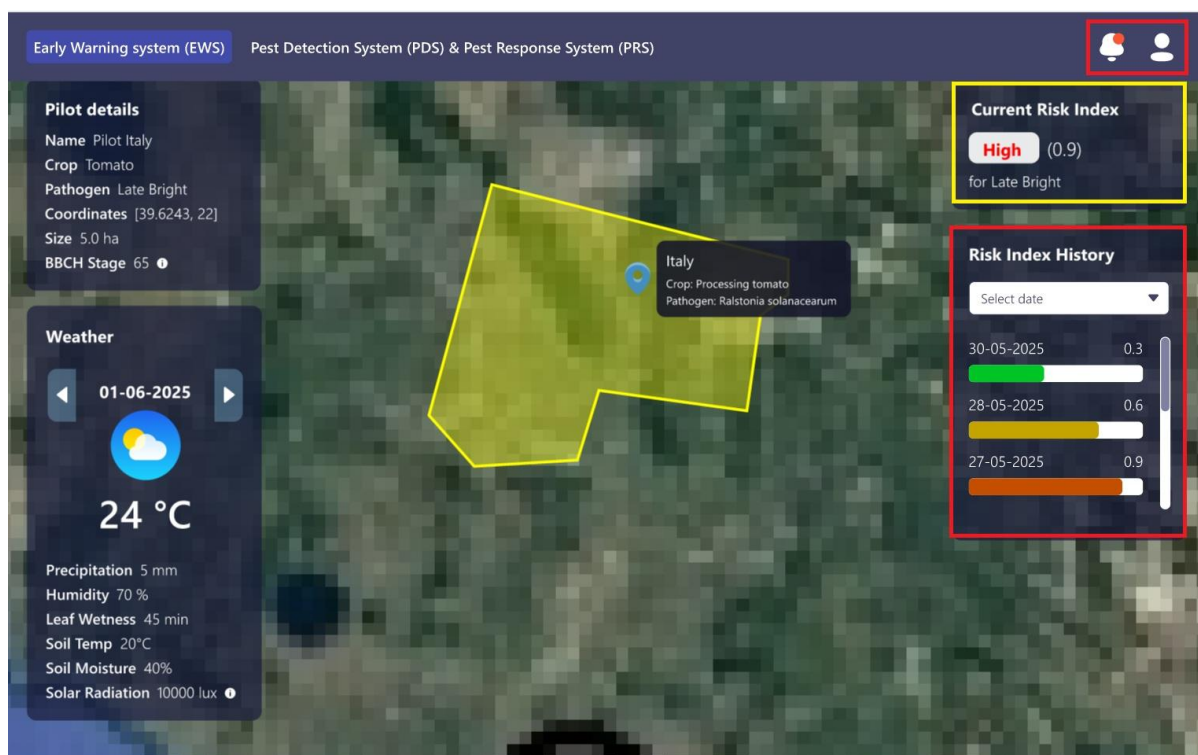


Figure 6. STELLA PSS - EWS Field details view (2)

In the top-right section of the interface (highlighted in red), users can access the alert notification system and profile management options. Directly below (highlighted in yellow), the platform displays the current risk index, which reflects the probability of disease occurrence in the field. This index is dynamically calculated using bioclimatic indicators and real-time environmental data. Additionally, the interface includes a chronological list of all previous prognoses, enabling users to review and track historical forecasts for the monitored field (Figure 6).

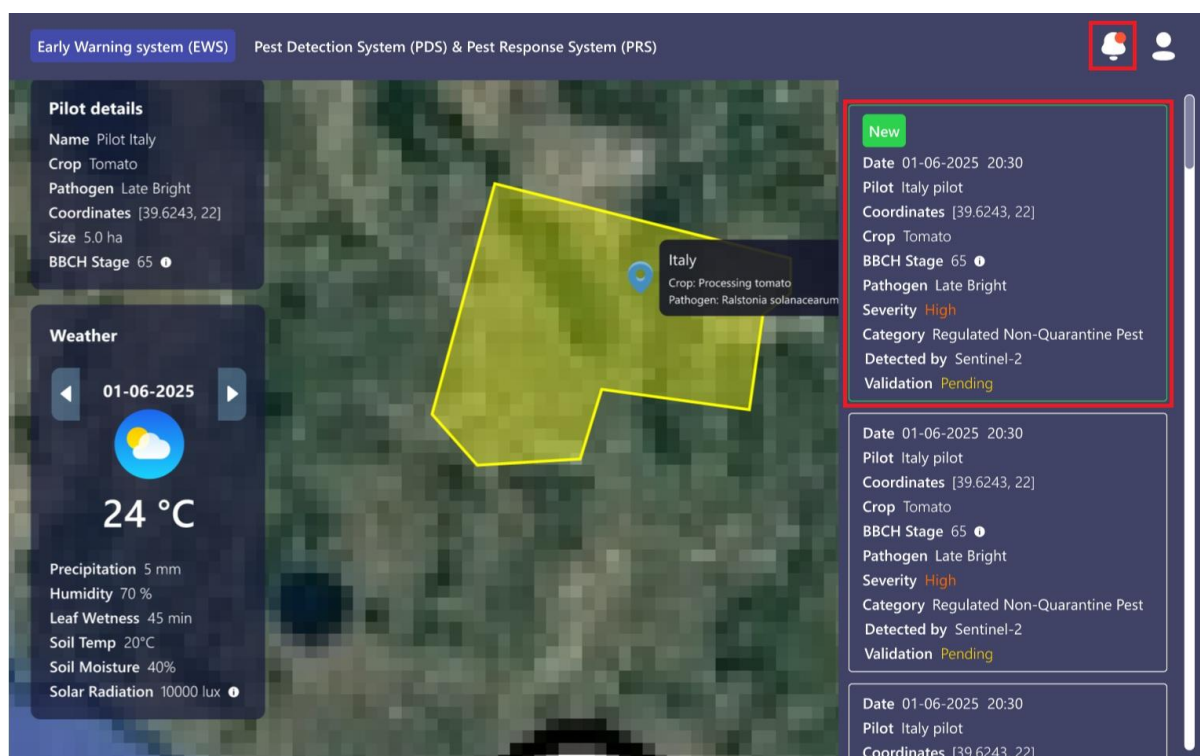


Figure 7. Notification System and Prognosis List in STELLA PSS – Early Warning Subsystem

Notification system and prognosis list in the STELLA PSS platform - Early Warning Subsystem. When a new prognosis is generated, the notification button is visually highlighted with a red dot (top red box), indicating the presence of an unread alert. Upon clicking the notification button, a scroll-down tabular list of prognoses is displayed, containing key metadata such as the date of issuance, associated pilot, and geographical coordinates. Newly generated notifications are distinctly marked with a green label reading "New", allowing users to quickly identify recent updates (bottom red box). This feature enhances user awareness and ensures timely access to critical field-level disease forecasts (**Figure 7**).

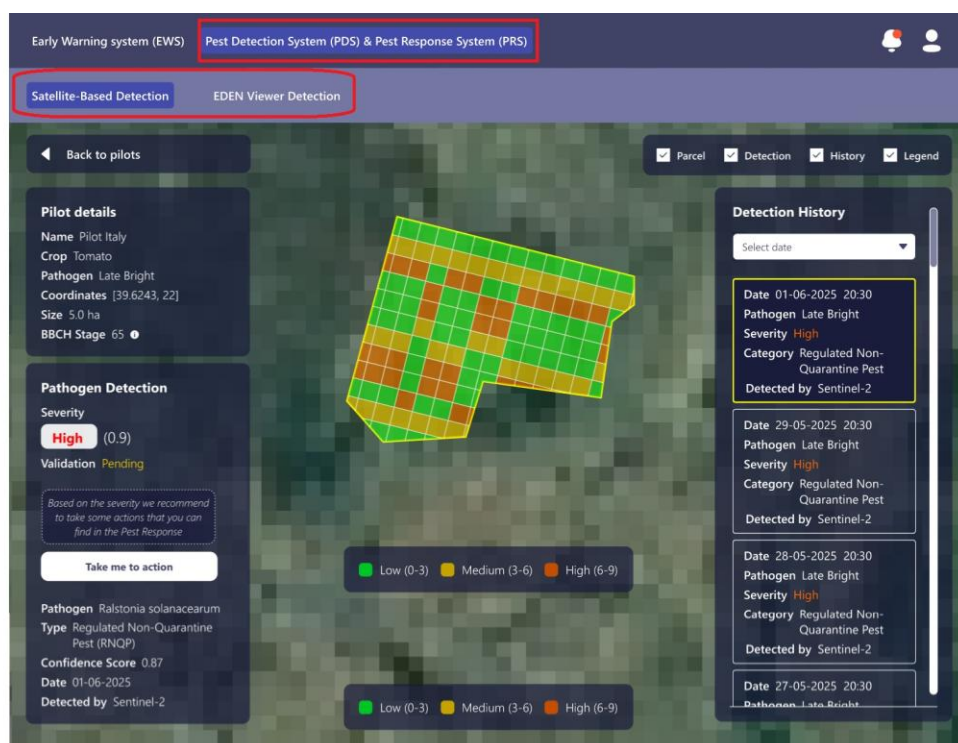


Figure 8. Pest Detection System (Satellite Based) Interface in STELLA PSS (1).

Pest Detection System interface within the STELLA PSS platform. The Pest Detection System is structured into two distinct subsystems: the Satellite-based Pest Detection System and the EDEN Viewer-based Pest Detection System. Users can navigate between the broader Early Warning System (EWS) and the Pest Detection and Pest Response System (PDS & PRS) using the selection buttons located at the top-left of the interface. When the user selects the PDS & PRS option, two additional buttons become visible, allowing the user to choose between the satellite-based or the EDEN Viewer-based pest detection subsystem. This modular design enables targeted access to the most relevant detection tool based on the user's needs and data availability (**Figure 8**).

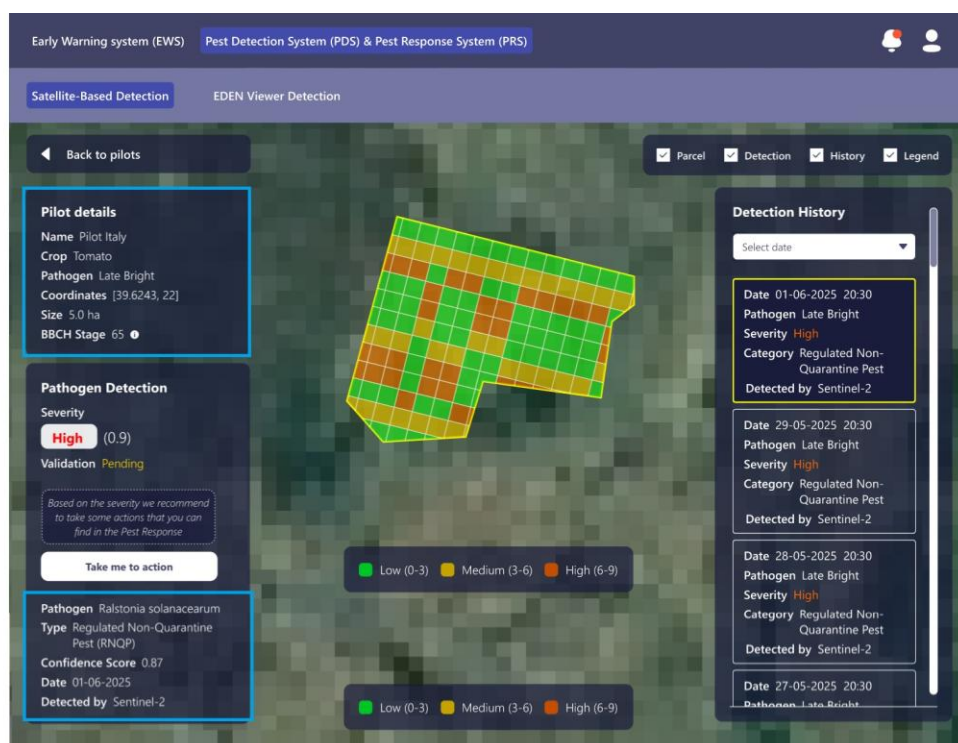


Figure 9. Pest Detection System (Satellite Based) Interface in STELLA PSS (2)

Satellite-based Pest Detection and Pest Response System interface of the STELLA PSS platform. Upon selecting the satellite-based pest detection system (top left red box), the user is presented with pilot site-specific details, including the site name, target pathogen, detection system used, and geographic coordinates, as displayed within blue-highlighted boxes. Notification and profile buttons remain consistent with those found in the Early Warning System (EWS) (**Figure 9**).

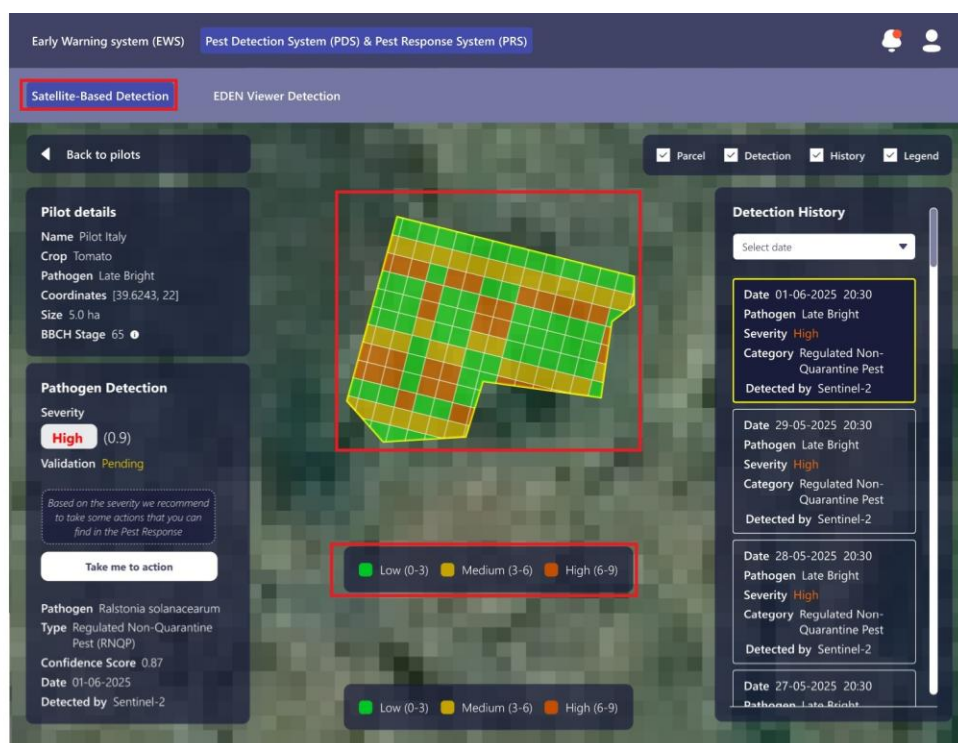


Figure 10. Pest Detection System (Satellite Based) Interface in STELLA PSS - UCP Area Visualization.

The Use Case Pilot (UCP) area is visualized through a grid-based map, where detection severity is categorized using a colour-coded classification scheme, indicating the spatial distribution and progression of the pathogen within the field (**Figure 10**).

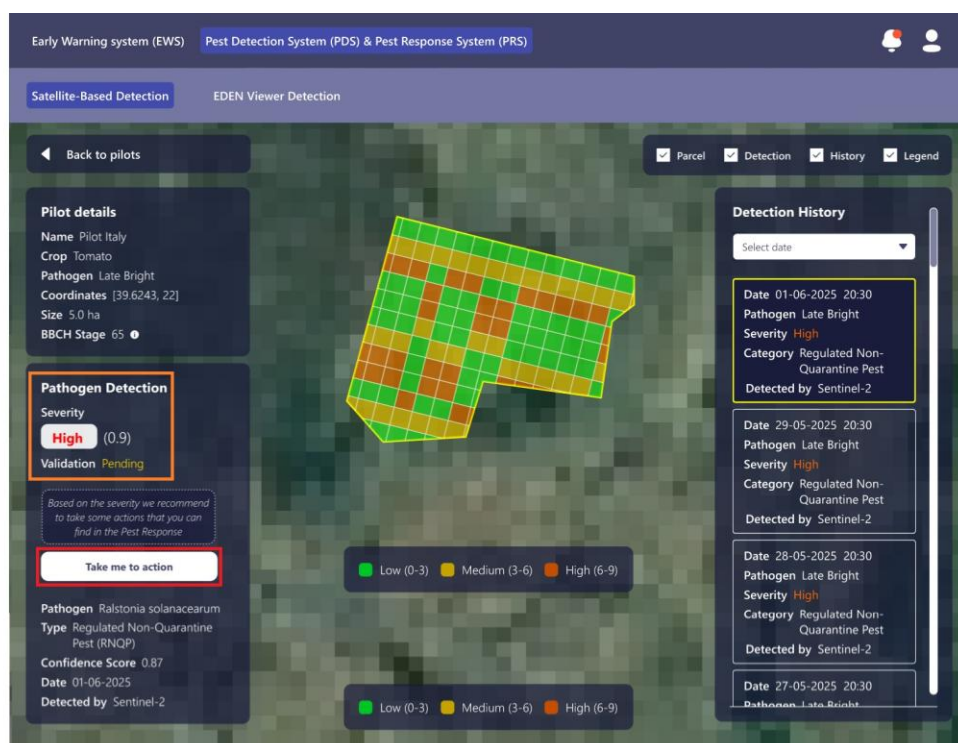


Figure 11. Pest Detection System (Satellite Based) Interface in STELLA PSS - Pathogen Detection and Response Interface

Pathogen detection, severity class and validation status can be seen on the left of the screen (orange box) (**Figure 11**). By selecting the "Take me to action" button—available in both the satellite- and EDEN Viewer-based Pest Detection systems—the user is redirected to the Pest Response System. This subsystem provides actionable guidance for managing the detected pathogen depending on its group (QP or RNQP). If the pathogen is classified as a Quarantine Pest (QP), an alert is triggered on the dashboard and automatically forwarded to the relevant regional phytosanitary authorities. The phytosanitary authorities are responsible for initiating immediate control actions, including field sampling, laboratory analysis, and validation of pest presence. Following validation, the designated phytosanitary manager must input the outcome into the system, selecting one of the following statuses: *Positive detection*, *Negative detection*, or *Detection pending validation*. Validation progress is visually supported through a colour-coded palette to enhance user understanding. In cases where the pathogen is categorized as a Regulated Non-Quarantine Pest (RNQP), the system provides the user with a downloadable PDF document containing tailored management guidelines and best practices for field-level mitigation.

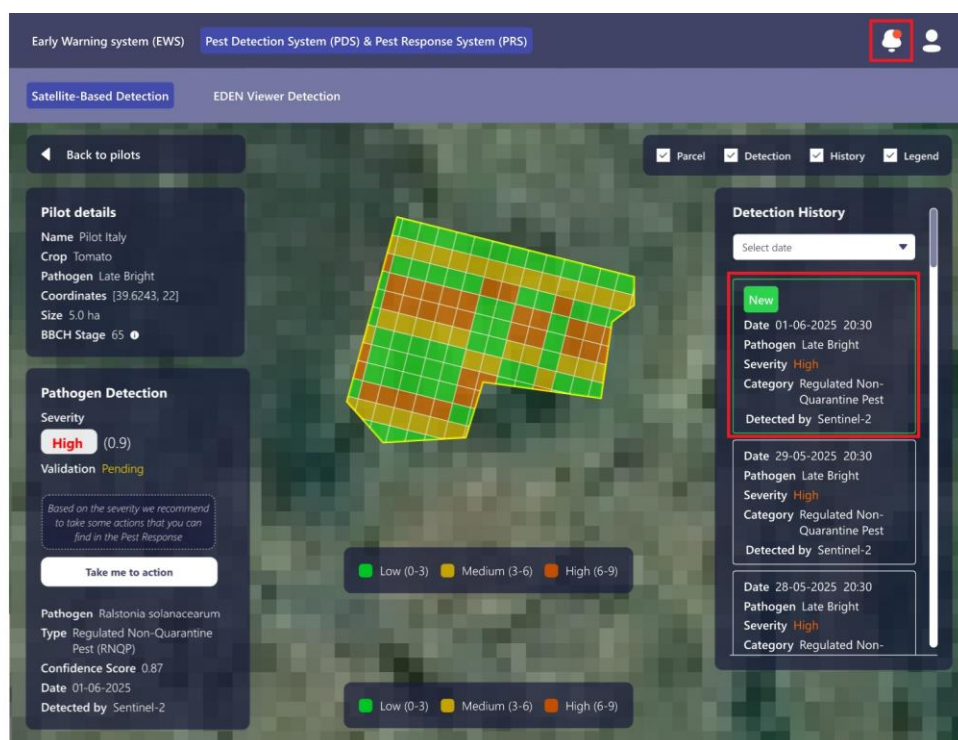


Figure 12. Pest Detection System (Satellite Based) Interface in STELLA PSS - Notification System for Pest Detection Events.

Notifications and new detection events follow the same design logic as implemented in the Early Warning System (EWS). When a new detection is registered, a red dot appears on the notification icon located at the top right of the screen interface, visually alerting the user. Upon clicking the notification icon, a scroll-down tabular list is displayed, presenting all recorded detection events along with associated metadata. Newly registered detections are distinctly highlighted with a green label bearing the text "New", allowing users to easily identify recent alerts. This consistent notification mechanism ensures user familiarity and promotes efficient monitoring of pest-related developments across pilot sites (**Figure 12**).

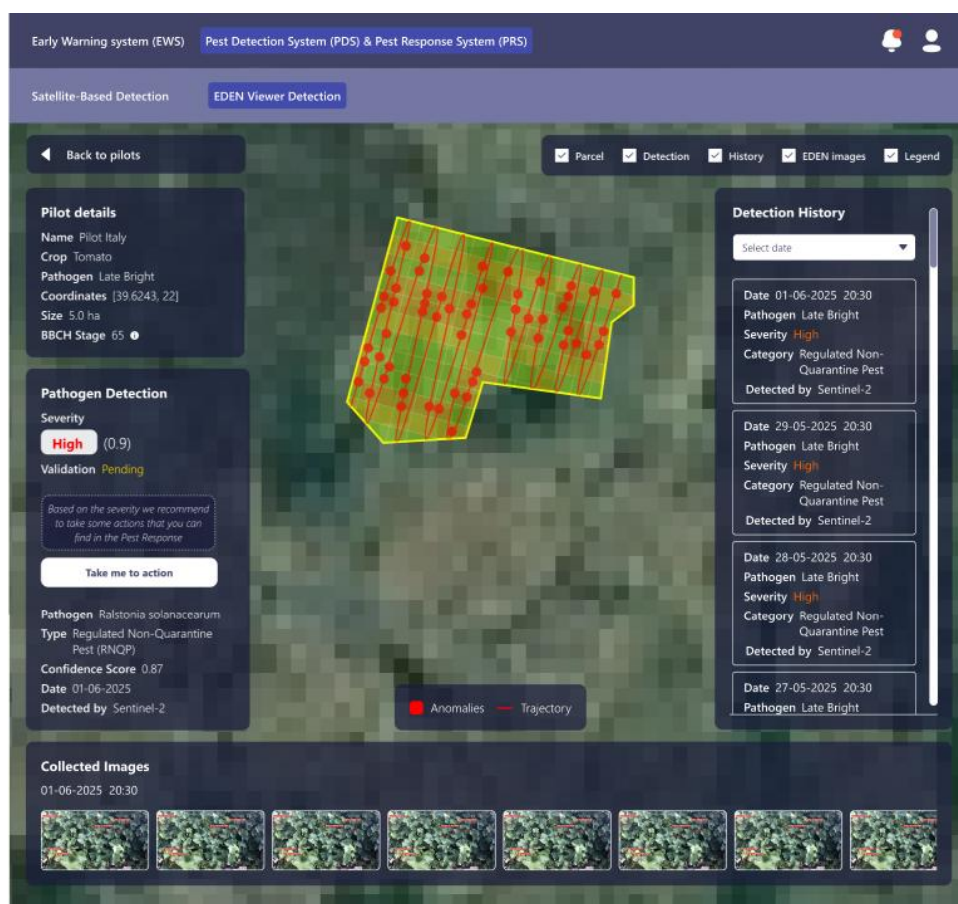


Figure 13. EDEN Viewer Pest Detection System Interface in the STELLA PSS

EDEN Viewer Pest Detection System interface within the STELLA PSS platform. This subsystem is based on data collected and analysed through the EDEN Viewer proximal sensing platform. In addition to displaying general detection information, such as severity level and integration with the Pest Response System, the interface also presents the trajectory of the EDEN Viewer device in the field, visualized as a red line. Detected anomalies, which may indicate the presence of a pathogen, are marked on the map as red squares (**Figure 13**).

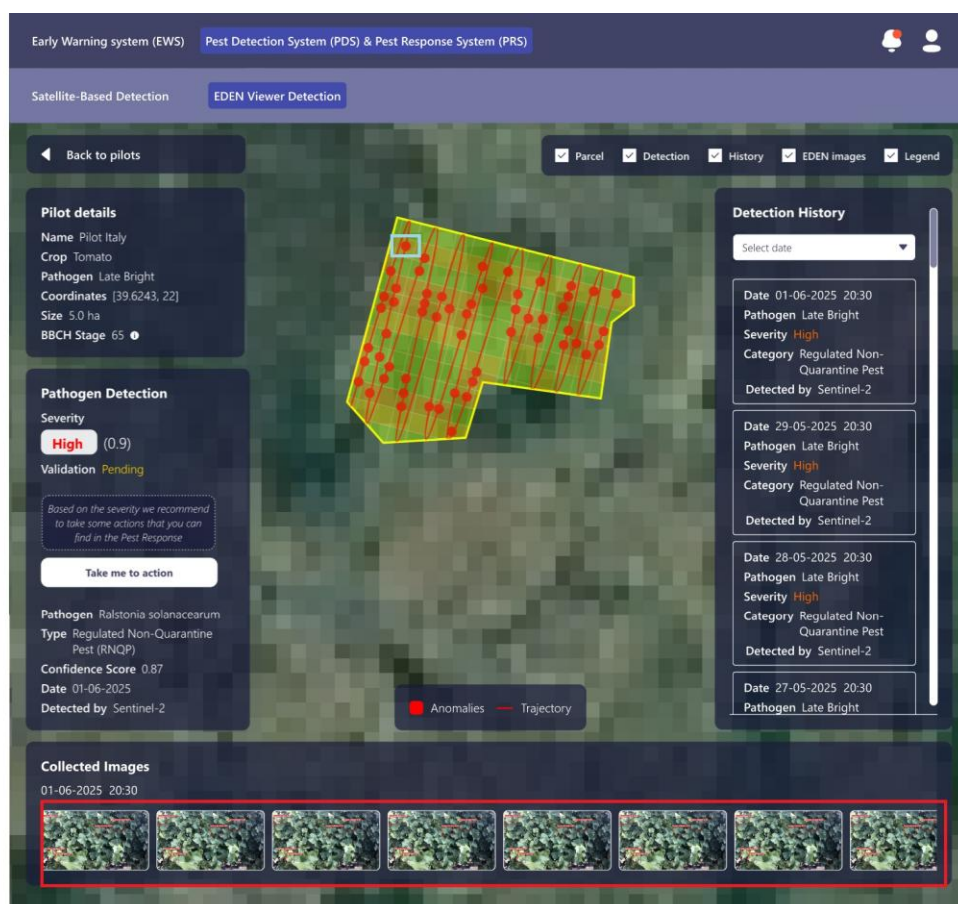


Figure 14. EDEN Viewer PDS Interface in the STELLA PSS - Anomaly Marker Interaction Interface.

By clicking on any anomaly marker (blue box, inside field grid), a pop-up window is triggered (red box, bottom), displaying the corresponding georeferenced images captured by the EDEN Viewer system. This functionality allows users to visually assess the affected area and verify the situation on the ground. The integration of real-time imagery and spatial tracking enhances the reliability and interpretability of the pest detection process (**Figure 14**).



Figure 15. Example of Pest Response System Output for RNQP Detections in STELLA PSS

Pest Response System output for RNQP pathogen detections within the STELLA PSS platform. In addition to alerting the relevant phytosanitary authorities in the event of a Quarantine Pest (QP) detection, the system also provides comprehensive support in the case of Regulated Non-Quarantine Pest (RNQP) infestations. Specifically, when an RNQP pathogen is detected, the user is presented with an integrated set of pathogen management guidelines in a downloadable document format. This document includes the STELLA project logo, general information about the identified pathogen (e.g., name, description, and potential impact), and a structured list of best-practice management guidelines. Furthermore, it contains legal and compliance text covering GDPR, Non-Disclosure, and Liability disclaimers. To support continuous learning, the document also provides a direct link to the STELLA e-learning platform, where users can access additional training materials and detailed information on pest management practices (Figure 15).

4. Conclusions

This document outlines the GUI and main functionalities of the first version of the STELLA PSS, based on the work conducted under Tasks 3.3, as well as D3.1. It defines the core system architecture, building on stakeholder requirements, functional and non-functional specifications, and data interoperability mechanisms that will guide the development of the STELLA PSS digital platform throughout the project, as outlined in D3.1. The platform aims to support the detection and management of Quarantine and Regulated Non-Quarantine Pests (RNQPs) across diverse agricultural contexts in the STELLA UCPs. To this end, it integrates remote sensing, proximal sensing (EDEN Viewer), IoT systems, and crowdsourced inputs into three main subsystems—Early Warning, Pest Detection, and Pest Response. This deliverable presents in detail how these subsystems will operate and interface with each other when the subsystems are made available by relevant partners in WP2, later in the project (M38). D3.2 builds upon the SRS document (D3.1), which also provides a detailed specification of data standardization and metadata requirements to support interoperability and that datasets generated or used by the STELLA PSS modules are compatible with broader European data infrastructures.