



The Robots and the Intelligence Behind Them

The self-driving machines that inspect the panels and monitor the crops, and the smart tools that decide what needs doing and when.



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A photograph of a Husky A200 ground robot in a pear orchard. The robot is a black, two-wheeled mobile base with a white frame. Mounted on top is a drone with a camera. The robot is positioned between rows of pear trees, which have green leaves and some fruit. The ground is covered with dry leaves and grass. The text is overlaid on the left side of the image in a yellow, sans-serif font.

At the pear-tree orchard in Randwijk, in the Netherlands (a 50 kW AgriPV site at Wageningen University), TALOS puts two autonomous robots to work: a drone that inspects the solar panels from the air, and a ground robot that moves between the tree rows to monitor the crops.

Behind them, smart software handles two jobs at once, keeping the solar plant healthy and helping the grower manage the orchard. This brief describes those robots and the intelligence that drives them. The platform the team uses to supervise it all, and the site's central store of data, is described in the companion Technical Brief 5 / 6.

Usually, the solar plant and the farming are handled with unrelated tools.

TALOS combines them: a **live digital model** watches the panels, crop-monitoring software tracks the trees, and **two robots share the same field** safely so that panel maintenance and crop decisions can finally be looked at together. Across the project, this is expected to **improve resource efficiency in maintenance work** by around 70% and cut lost production by up to 10%.

In this brief, the smart tools that analyse the plant and the crops, and the two robotic solutions that do the work are outlined. The features of the digital platform the team uses, and the central data store, are covered in Technical Brief 5 / 6.

Two complementary sets of tools run side by side.



FOR THE SOLAR PLANT

A live digital model (a 'digital twin') mirrors how the panels should be performing, and software flags faults and underperformance with an estimate of what each is costing, feeding panel-maintenance suggestions ranked by the value they bring.



FOR THE CROPS

Crop-monitoring software turns the images gathered in the field into clear indicators of crop health and yield. It can detect and count fruit to support yield forecasts and produces maps and reports that help the grower decide where to act, feeding a separate stream of agricultural suggestions.

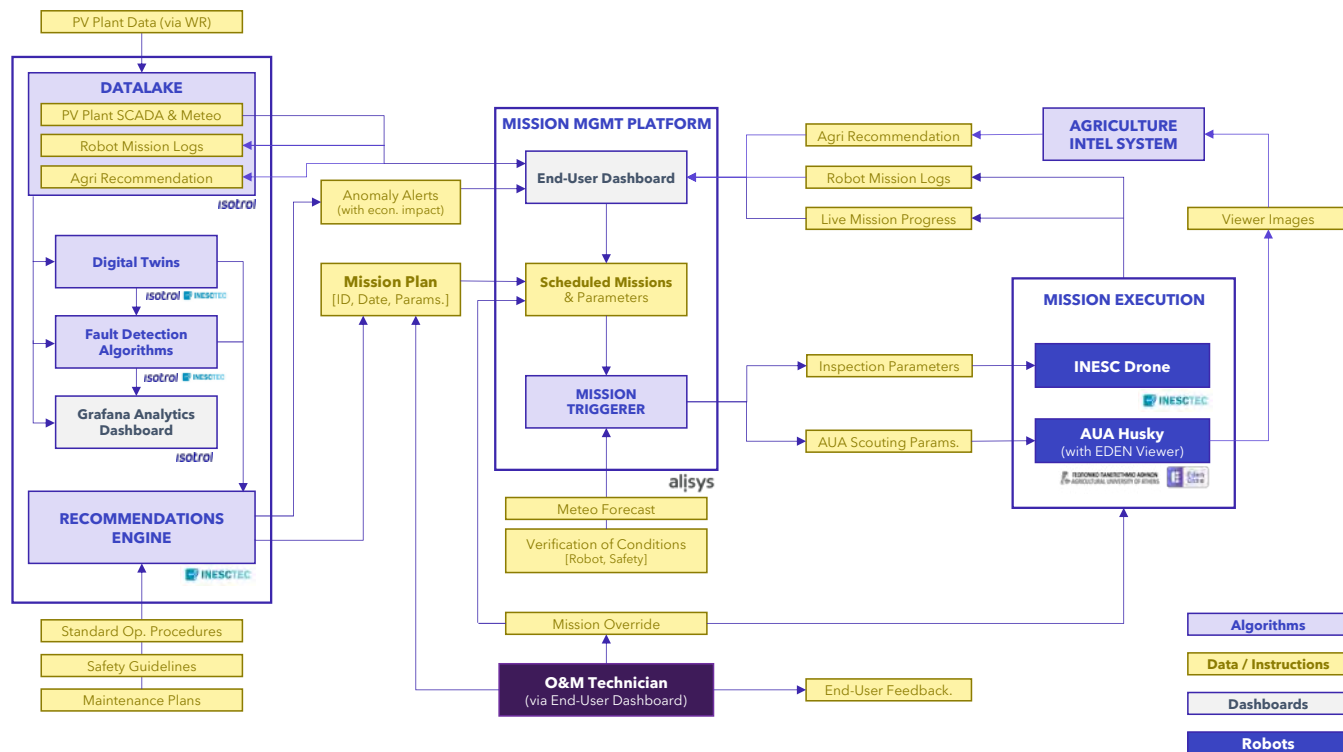


Figure 1. From plant and crop data to robot missions: how the smart tools and the robots work together in the AgriPV pilot.

Source: TALOS project.

The pilot uses two robotic solutions: an inspection drone and a crop-monitoring ground robot.



INSPECTION DRONE

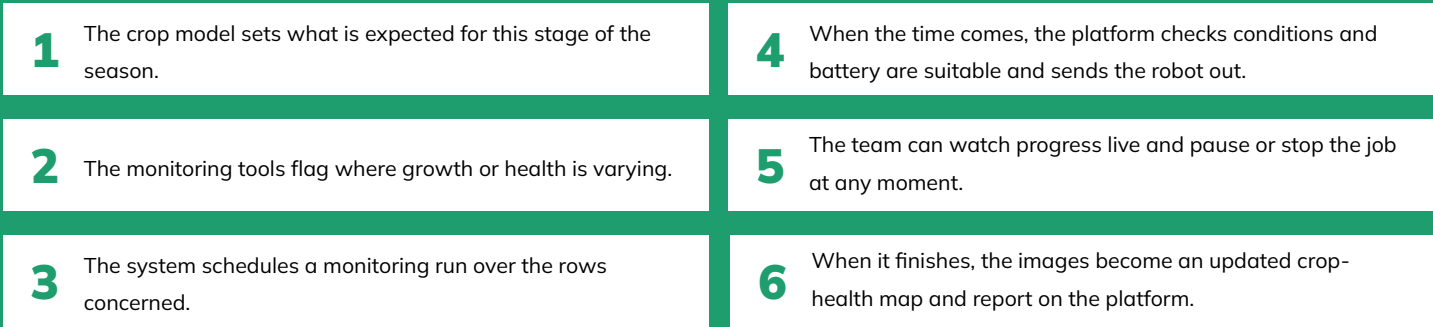
A drone inspects the panels from the air using ordinary and **heat-sensing (thermal) cameras**, which reveal problems the eye cannot see: hot spots, soiling and bird-droppings. It **flies pre-planned routes** on its own, can be based in a small automated 'garage' on site, and **delivers its images and a map of located faults** automatically.



CROP-MONITORING GROUND ROBOT

A **self-driving ground robot** moves between the orchard rows carrying a camera-and-sensor 'viewer' that **checks the health and condition of the trees**. It navigates on its own with minimal help, **detects obstacles and people in real time** and re-plans its route to stay safe, and counts fruit to support yield forecasts. It manages its own energy too, tracking its battery and returning to a charging station to dock and recharge when needed.

A typical monitoring job follows a simple chain:



When the drone is working at the same time, the platform keeps a safe distance between the two, the ground robot holds back or re-routes while the drone is overhead, then continues.

THE ROBOTS AT A GLANCE	
ROBOT	WHAT IT DOES
Inspection drone	Photographs the panels with normal and thermal cameras to find faults.
Crop-monitoring ground robot	Drives the orchard rows to check crop health and count fruit for yield estimates.

This part of TALOS is aimed at AgriPV operators, agricultural-robotics providers and technology partners who want to combine smart analysis with self-driving machines.

The benefits it targets are:

More frequent, objective crop monitoring, with fruit counting to support yield forecasts.

Fault detection on the panels with fuller coverage than occasional manual checks.

Safe shared operation of an aerial and a ground robot in the same field.

Long, low-effort missions thanks to self-managed charging.

Recommendations from the TALOS AgriPV experience

- **Supervise autonomy, especially during early roll-out:** keep operator validation of scheduling and execution to reduce risk and build confidence.
- **Plan the logistics that make autonomy work:** robots need upkeep and support such as water availability and charging to run reliably.
- **Adapt roles, procedures and training:** teams need updated safety rules and new skills to supervise the robots effectively.
- **Refine the intelligence over time:** new or improved algorithms can be added to automate further O&M tasks.

GLOSSARY

AgriPV	Growing crops and generating solar power on the same piece of land.
Digital twin	A live software model of the plant used to see how it should be performing.
Thermal camera	A camera that sees heat, revealing hot spots and hidden panel faults.
Drone (UAV)	A small uncrewed aircraft used to inspect the panels from the air.
Ground robot (UGV)	A self-driving ground vehicle that monitors the crops.

PROJECT PARTNERS BEHIND THE ROBOTS AND INTELLIGENCE



Digital model, fault detection, job suggestions and the inspection drone.



The crop-monitoring ground robot and its sensors.



Crop-health monitoring, fruit counting and yield estimation.



The platform and data store that connect and run the fleet (see Brief 5 / 6).



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