

WEEDING ROBOTIC PLATFORM

Targeted application of herbicide by the first ever completely autonomous robot for ecological and economical weeding of row crops, meadows, and intercropping cultures.



100% AUTONOMOUS

Solar powered with rechargeable batteries.
Can treat up to 10 ha/day.



HIGH PRECISION



90% LESS HERBICIDE

Less herbicide used.
Reduce your costs and your environmental impact.



AN INNOVATIVE, AUTONOMOUS AND ECONOMICAL MACHINE

Avo performs autonomous weeding operations in **plane fields and row crops**. Using cutting-edge machine learning, the robot detects and selectively sprays the weeds with a **micro-dose of herbicide**. The centimeter-precise detection and spraying **reduces the volume of herbicide** used by more than 90%, while ensuring crops are not sprayed for **yield preservation**.

Avo operates entirely autonomously and is powered by **solar power** and **rechargeable batteries**. The user can introduce **field boundary and crop line information** in the user interface software. The system then generates a **navigation path** considering field constraints and user predefined inputs. Combining **GPS RTK positioning and visual navigation**, Avo navigates with a high degree of precision, **ensuring minimal crop roll over**.

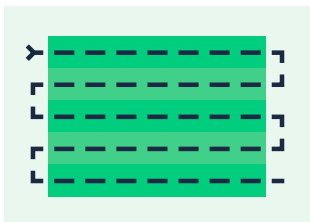
The **four-wheel drive** system enables the robot to clear obstacles and operate on slopes commonly encountered in cultivated crops. All four wheels can be steered independently, resulting in **high maneuverability** of robot and **short turning radius**, and thereby minimizing non-treatable field areas.

Due to Avo's speed, a standard throughput of **0.6 ha per hour** can be achieved. The robot can also **operate during the night**, further extending its daily throughput. Depending on solar illumination conditions, battery recharge, and terrain conditions, the robot can treat up to **10 ha per day** (including night-time operation).

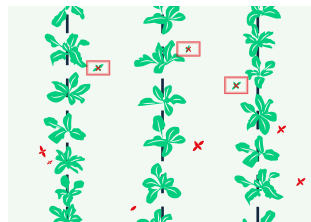
TYPICAL PATTERN OF USE THROUGH THE YEAR

MARCH - APRIL	MAY - JUNE	JULY - AUGUST	SEPT. - OCT.
Eradication of perennial weeds in meadows and intercropping fields (i.e. rumex)	Weeding sugar beets and green beans*	Eradication of weeds in meadows and intercropping fields and beans (i.e. rumex)	Weeding rapeseed* and eliminating perennial growths in meadows and intercropping cultures

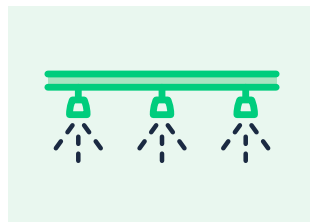
HOW IT WORKS



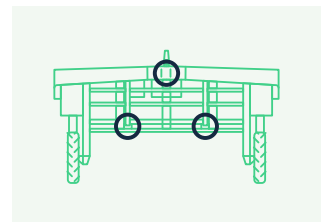
Systematic sweep of the entire field – no corners are left out.



Weeds are detected with a success rate in excess of 85%** both in and between rows.



The nozzle row places a microdose just at the right spot, without any wastage.

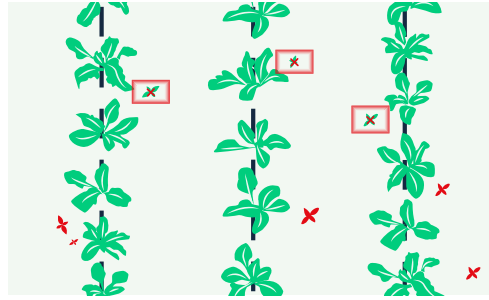


The robot can easily be transported by tractor, using three-point hitch system.

* Other cultures are in the pipeline and will be added with new software updates. For example spinaches, onions, salads.

PRECISION WEEDING

By means of its multi-camera vision system, Avo detects weeds and sprays them once they pass under its spraying tool. The spraying tool consists of 52 equidistant nozzles on a height adjustable spraying ramp. Each nozzle provides a small spray footprint and desired spray droplet size to efficiently treat the weeds. The system can be used for full surface spraying (e.g. for pre-treatments) as well as spot spraying.



Spray Ramp and nozzles	52 equidistant nozzles on height adjustable ramp (15 – 30 cm above ground) flat spray nozzle geometry (~16 cm ² spray resolution on ground)
Herbicide Mixture Autonomy	10 ha under 'standard' weeding densities
Detection and Spraying Accuracy	> 90% of weeds detected** < 5% of crops wrongly detected as weeds** > 95% of detected weed surface area sprayed**
Growth Stage Weeding	Weeding can be performed before crop emergence stage and up to crop height of 30 cm
Herbicide Types	Contact herbicides Systemic herbicides Non-synthetic herbicides

USER COMMAND & DATA INTERFACES

The user can control & monitor the Avo robot through the ecoRobotix™ mobile app and define its missions via the desktop web app.

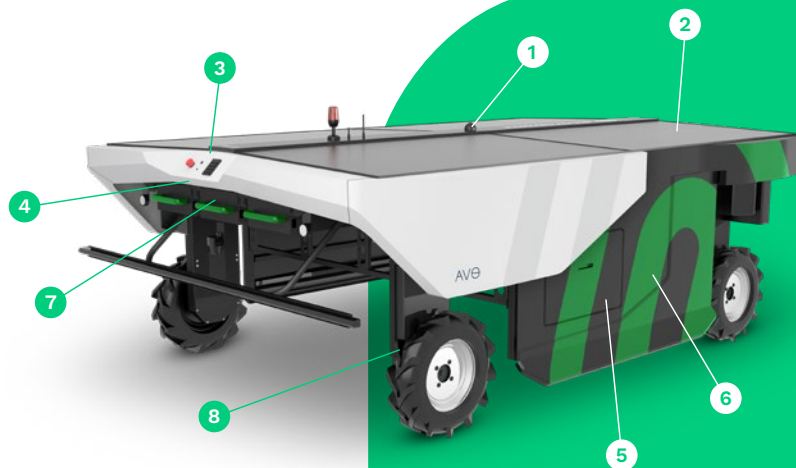
Field and crop data generated with other GPS-enabled farm systems (e.g. GPS rtk tractor data) can be input using the web app and service points defined. The software then generates a mission navigation path. This mission is loaded onto the robot and launched by means of the mobile app, which also serves for manual robot control and status monitoring.

During the mission, robot data is uploaded to an ecoRobotix™ server for viewing, analysis and download. Information includes mission status and progress (e.g. live location, battery charge, herbicide mixture level, etc.) as well as weed density data.

** under ideal conditions

AVΘ TECHNICAL SPECIFICATIONS

- 1 GPS Antena
- 2 Photovoltaic Panels
- 3 Front Control Panel
- 4 Row-tracking Camera
- 5 Access hatch for herbicide mixture reservoir refill
- 6 Tool System with nozzle spray bar
- 7 Exchangeable Batteries
- 8 4WD System



Specifications for information purposes only, subject to change without notice.

Robot Dimensions	3.75 m x 2.45 m x 1.3 m (L x W x H)
Weight	~750 kg (fully loaded), with 60 kg batteries and 120 l herbicide mixture
Working Width	2.04 m
Wheel Spacing	1.7 & 2 m (software adjustable)
Crops Spacing	35 – 70 cm (adjustable)
Speed	1.0 m/s (max)
Daily Throughput and Autonomy	5 ha* with 8 hours of autonomy Up to 10 ha* (including night-time operation and battery swap)
Spraying	52x nozzle spot-spraying ramp
Herbicides	Compatible with standard contact herbicides
Drive & Terrain	High maneuverability: 4x Wheel Drive, Steering & Suspension Max Drive Power: 3 kW Suitable for slightly sloped terrain (10%)
Energy	Solar Power (1150 W) – 3x 48 V removable batteries (75 Ah per battery) at robot front
Navigation	Fully autonomous navigation based on vision and GPS RTK 100% of the field can be surveyed, except safety border Minimal turning radius for short end-of-row turns
Control and Configuration	By Smartphone or Tablet (Android/iOS) Apps – Desktop Web App for Mission Definition
Communication	Short (WiFi) or long distance (3G, 4G)
Safety Features of Autonomous Operation	LIDAR & ultra-sound sensors for obstacle and human detection Safety bumper bringing robot to immediate stop when triggered

* depending on terrain and solar illumination conditions



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