

# Evento finale progetto Rovitis 4.0 – Webinar 4 dicembre 2020

M.Eng. Matteo Pantano  
R&D project engineer

[matteo.pantano@rovitis.com](mailto:matteo.pantano@rovitis.com)

**Rovitis 4.0: Robot autonomo connesso a DSS per la gestione sostenibile ed efficiente del vigneto**

**Rovitis 4.0: Autonomous robot connected to a DSS for a sustainable and efficient management of the vineyard**

Conclusione di progetto

**Azienda Agricola Giorgio Pantano**  
Via Stradelle, 40 – Candiana  
35020 – Italy

<https://www.aziendapantano.it/>

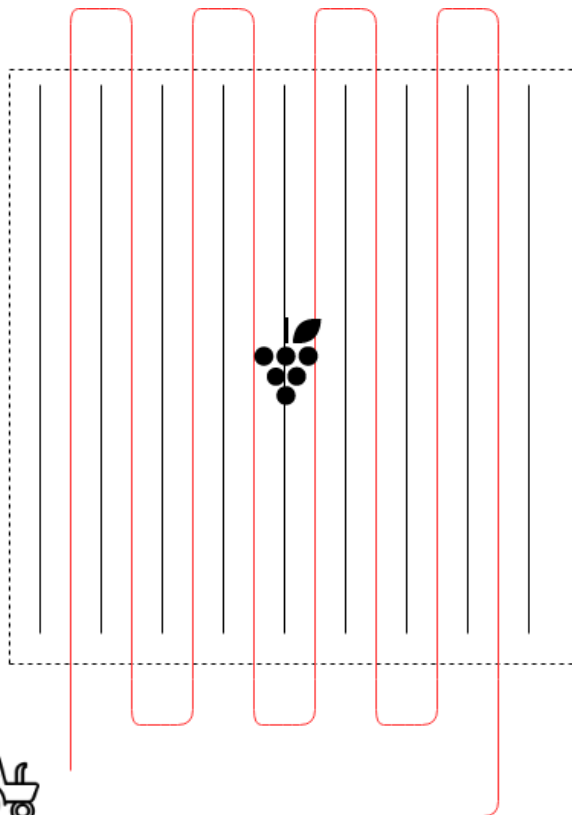
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# Need for autonomous robots

## The processes



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- x 17 times: spraying
- x 2 times: weedkilling with chemicals
- x 3 times: grass mowing
- x 3 times: branches trimming
- x 2 times: chemical/organic fertilizer
- x 1 times: old canes cutting

=

**TOTAL:** 28 (for each season)



# The idea becomes a prototype

## History



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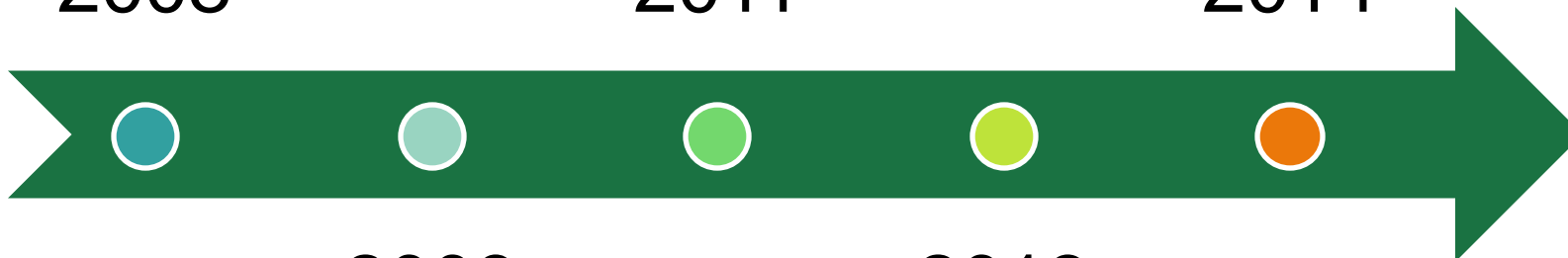
2008



2011



2014



2009



2013



# The idea becomes a prototype

*Video (2014)*



2020-4.0



eip-agri  
AGRICOLTURA E INNOVAZIONE



FEASR

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REGIONE DEL VENETO



PSR  
VENETO  
2014-2020

PANTANO

Rovitis  
robotics in viticulture

<https://www.youtube.com/watch?v=eEGS7UUa5-w&t=39s>

# Early prototype

## *The components*



2020-2024



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## A prototype with worthy views

- Skid steer
- High-Low level control
- Laser scanner and encoders

**How to industrialize the concept?**



# Rovitis 4.0 project Partners



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Leader Partner



## PSR Veneto Region 16.1 – 16.2 - 2017



# The Rovitis4.0 project

## *A decision making for robot agents*



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### Teaching

Operator decides where to go

### Home station

Parking and automatic filling of liquids

### In-field sensors

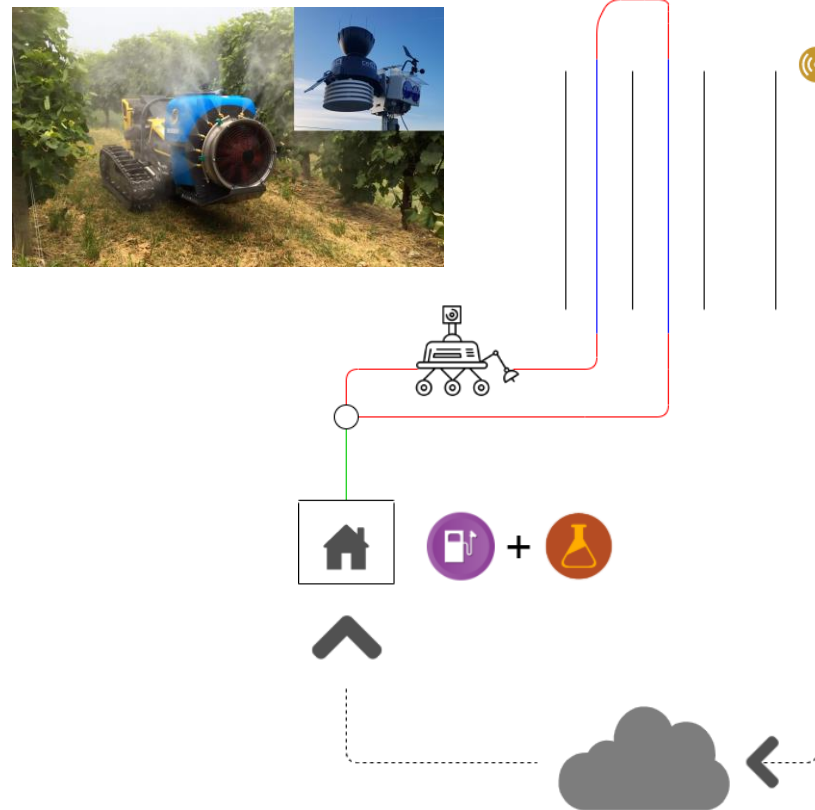
Information is coming from the real field, better knowledge of crop status

### On-board sensors

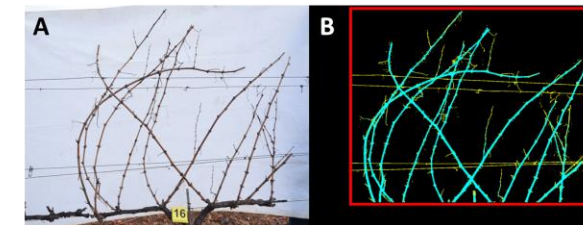
Information directly from the robot, no need of UAVs

### DSS

Choose best spraying timing



Source: [1]



Source: [2]

#### Sources:

1: (2018) DLR, Dionysos, available online (<https://www.dlr.de/content/en/images/2019/4/dionysos-en.html>)

2: (2019) Milan, Vineyard pruning w eight assessment by machine vision: tow ards an on-the-go measurement system, 21th GIESCO International Meeting, Thessaloniki, Greece

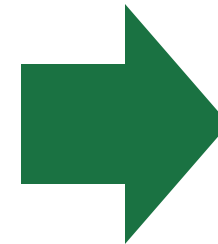
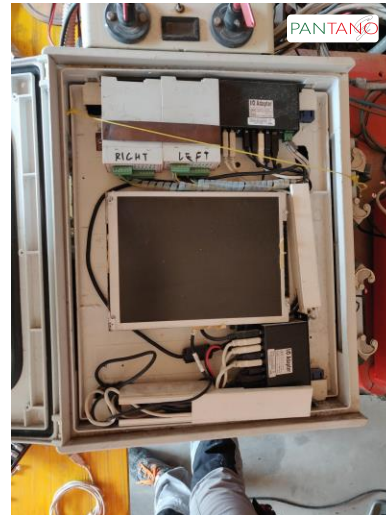
# Rovitis 4.0 background

## High/low level controllers



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## An "industrialized" version on the views



HYDRAULICS ↔  
ENGINE STATUS ↔  
ENGINE CONTROL ↔  
AUX CONTROL ↔  
SAFETY ↔



ECU  
(low-level  
control)

←BUS→



PC  
(high-level  
control)

NAVIGATION  
SENSORS





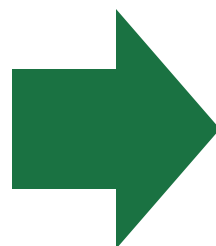
# Rovitis4.0 background

## Skid-steer and platforms



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### An "industrialized" version on the views



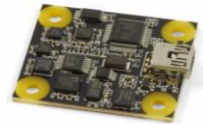
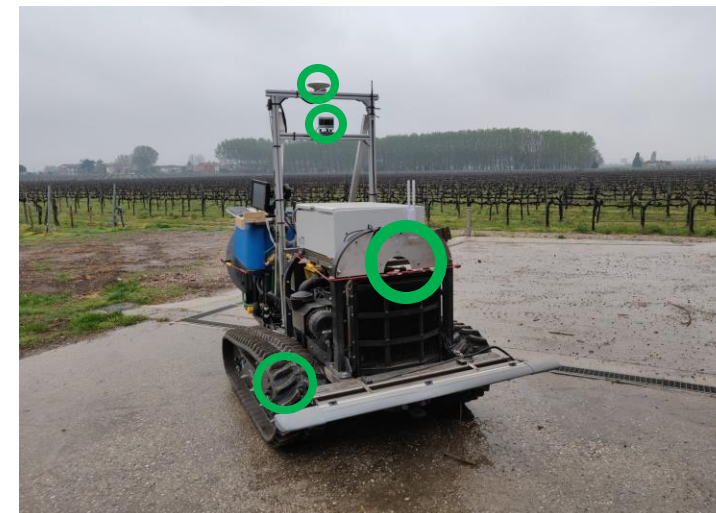
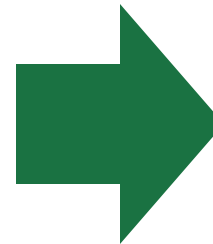
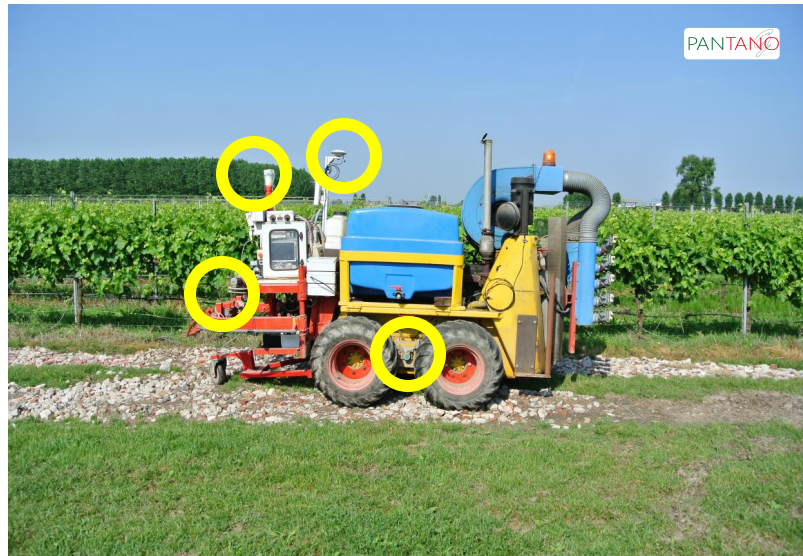
# Rovitis4.0 background

## Sensor technologies



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### An "industrialized" version on the views



# Operation

## *A challenging environment*



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The Rovitis robot must drive in highly vegetation areas and the software system must cope with them.



[https://youtu.be/\\_2R5TlfcC4I](https://youtu.be/_2R5TlfcC4I)



<https://youtu.be/Ka7NG7kK-RU>

# Operation

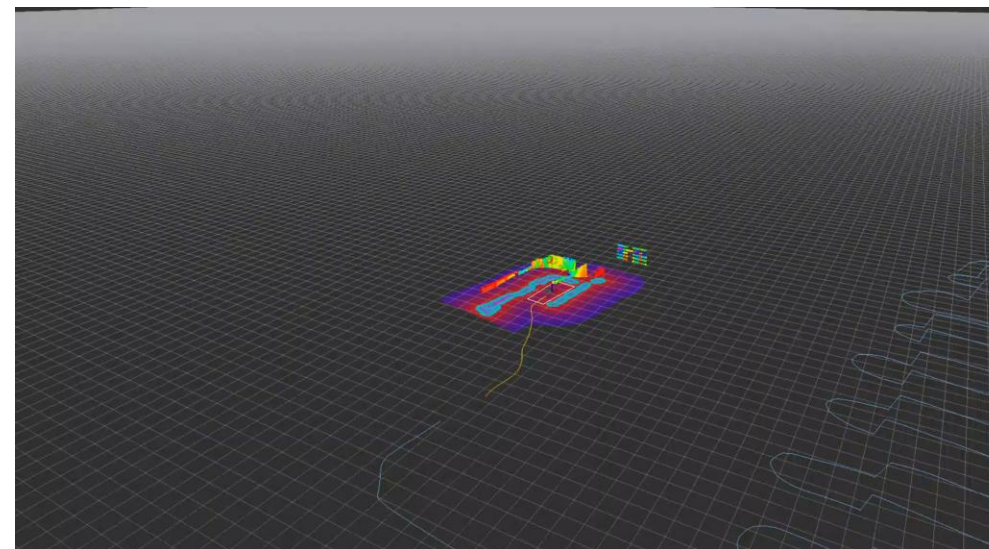
## *An intelligent system (2)*



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The Rovitis robot is not a “dummy” system which just uses GPS but it is a **highly intelligent machine which uses the sensors and the software systems to detect its environment and act in on it**. Example of those are: planning algorithms in highly vegetation areas, detection of rows and obstacle avoidance.



[https://youtu.be/D4LC81\\_bTGM](https://youtu.be/D4LC81_bTGM)

# Automatic refilling

## For human-less operations



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Camera recognition and Gantry



Kinematics with image processing



Coffee machine for accurate dosing



# Robot teaching

*The best user experience for operators*



2020-2021

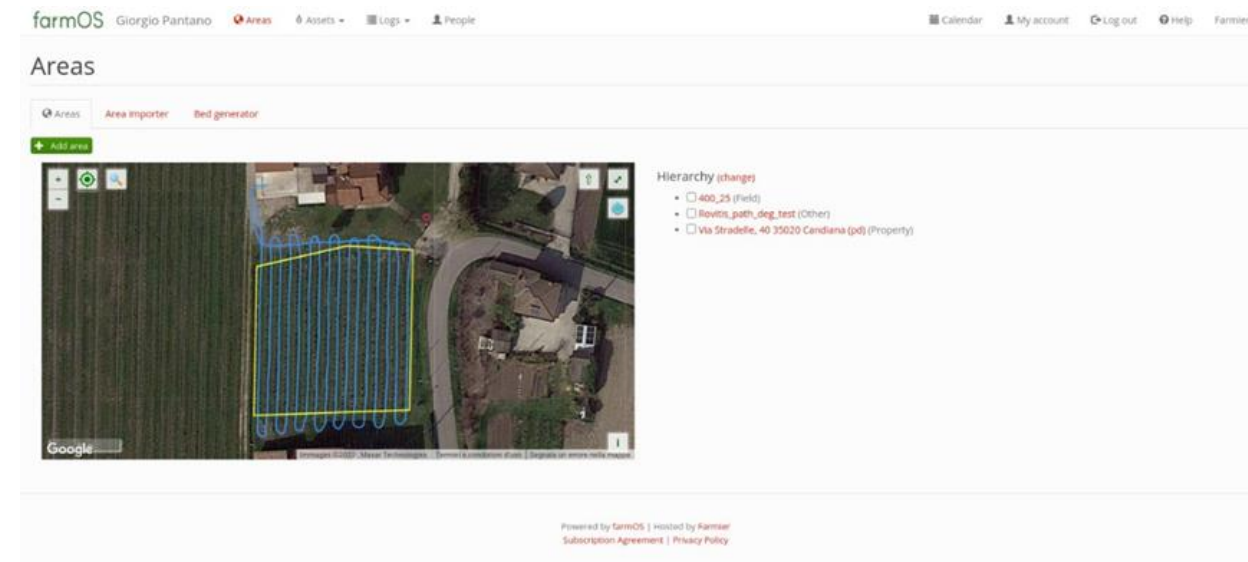
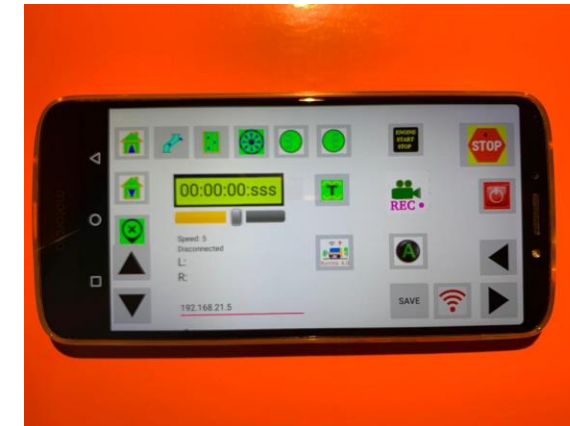


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## APPS are easy to understand and handle

The Rovitis robot gets the information on where to drive through the teach&repeat methodology. This is achieved through a **highly customizable app** and an **open-source** platform for farming robotic applications.



# Grape producer gets off the tractor

## *A concrete achievement*



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## Finally, the grape producer gets off from tractor

In 2020 Pantano's “**robots-grapes**” were delivered to *Cantina di Cona*. The grapes were the product of the “robot” vineyard where all 13 treatments were done using Rovitis and not a traditional tractor.

# Operation

## Field one and two



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<https://www.youtube.com/watch?v=2hK7Tz2j-co&feature=youtu.be>

<https://www.youtube.com/watch?v=yIs-odmj2Y&feature=youtu.be>





# Outlook

## Rovitis in next years?



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### Decreto MIT 70/2018 (Smart Road)

Ing. Mario Nobile – DG Sistemi Informativi

The screenshot shows the official website of the Ministero delle Infrastrutture e dei Trasporti. The page is titled 'Smart road' and contains the following text:

Il Decreto MIT 70/2018 (**Decreto Smart Road**), definisce da una parte gli standard funzionali minimi delle strade di interesse nazionale, non entrando nel merito delle tecnologie specifiche, dall'altra regolamenta la **sperimentazione** di veicoli automatici e connessi su strada pubblica, posizionando l'Italia tra i primi Paesi al mondo ad aver normato tale ambito.

La **sicurezza** stradale sarà il comune denominatore di tutte le sperimentazioni. I molteplici sensori di cui le Smart Road saranno dotate, forniranno informazioni in tempo reale sul traffico, sul meteo, sui pericoli lungo il percorso e molto altro ancora, nonché sullo stato di salute delle infrastrutture, garantendone un **monitoraggio** costante ed azioni manutentive preventive e all'occorrenza straordinarie.



[12 Sep 2019 ministro@politicheagricole.gov.it](mailto:ministro@politicheagricole.gov.it)

[09 Jan 2020 urp@pec.politicheagricole.gov.it](mailto:urp@pec.politicheagricole.gov.it)

NO ANSWERS

Art. 842 c.c.

# Outlook

## Rovitis in an IT environment

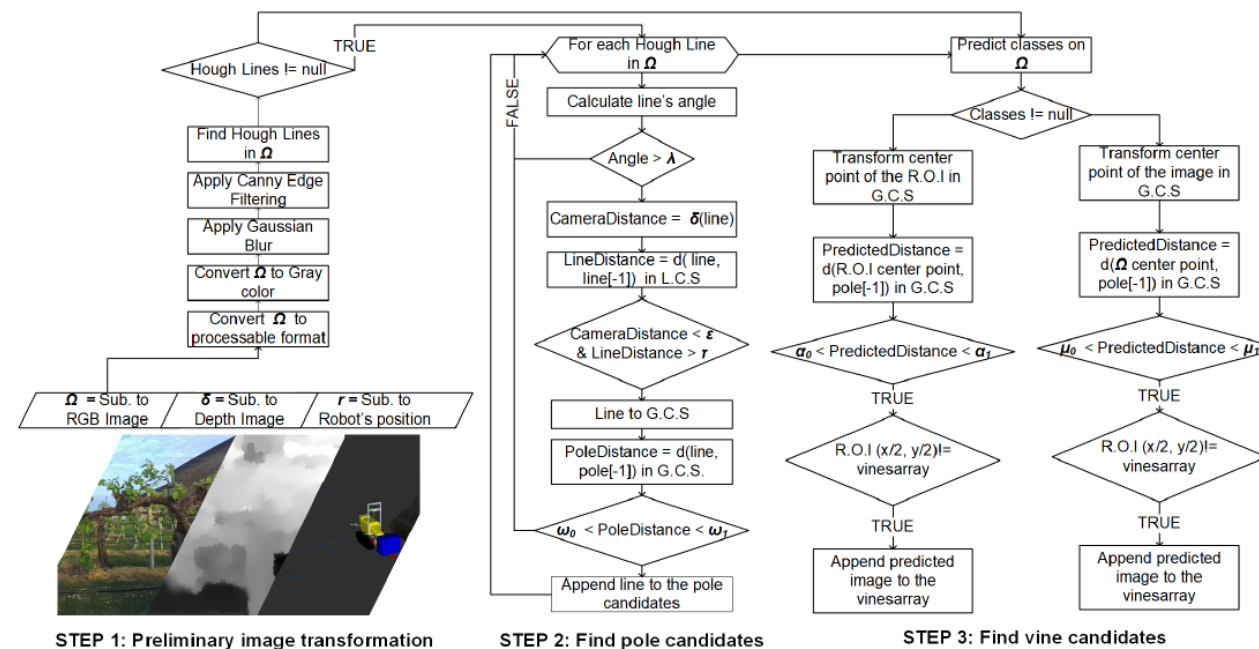


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## Methodology for Plant Specific Cultivation through a Plant Identification pipeline

2020 IEEE International Workshop on Metrology for Agriculture and Forestry

Matteo Pantano et al.





## We need a clear answer from Italy!

### FIRA 2020 8-10 December GLOBALIZATION STRATEGY



#### National Ambassadors to promote FIRA in their own countries:

- **USA:** Jim Sulecki, freelance agent
- **JAPAN:** EU-Japan Centre for Industrial Cooperation
- **AUSTALIA:** SPAA Society of Precision Agriculture Australia
- **TURKEY:** Tarmakbir
- **SLOVENIA:** Agrifood - ITC
- **IRELAND:** The Yield Lab
- **BRAZIL:** ABIMAQ
- **ISRAEL:** Volcani Institute
- **ROMANIA:** IND-AGRO-POL
- **SPAIN:** FEMAC
- **FRANCE:** Agronov, Université de Montpellier...

## Italy?

AMBITION:

create a global ecosystem for agricultural robotics

## Robot kit for getting off the tractor

Software Stack



ECU



Embedded computer



Lidar



Low-cost GPS

# “Old” Dodich, version 2020



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<https://youtu.be/IQaKmxqgfRw>

**Thank you,  
questions?**