

Robótica agrícola: proyecto Sureveg

CAR CSIC_UPM ,
LPF_Tagralia





STRIP-CROPPING SYSTEMS: wp4 → ROBOTIZATION: PROTOTYPE DESIGN GUIDELINES FOR TARGETED FERTILISATION

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- SUREVEG project
- **Organic farming in a strip-cropping layout**
- Aimed at fostering biodiversity (above and below ground), enhancing interactions between species (mycorrhiza, pollination, other agro-services) and improving nutrient usage (N recycling)
- <https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/sureveg/>

POLITÉCNICA



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CORE organic

Challenge: automatic fertilization of stripped crops



How to (re)introduce farm machinery in stripped crops? → “Smart machinery for strip-cropping systems”

Create a robotic platform for:

- Identifying individual plants
- Monitoring their evolution / health
- Calculating fertilization needs
- Applying organic fertiliser, on a single plant basis

Challenge: automatic fertilization of stripped crops



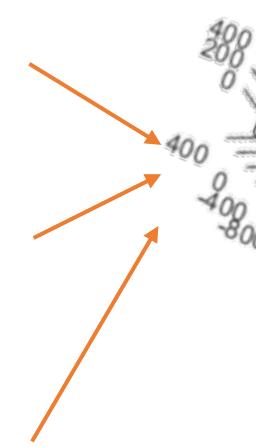
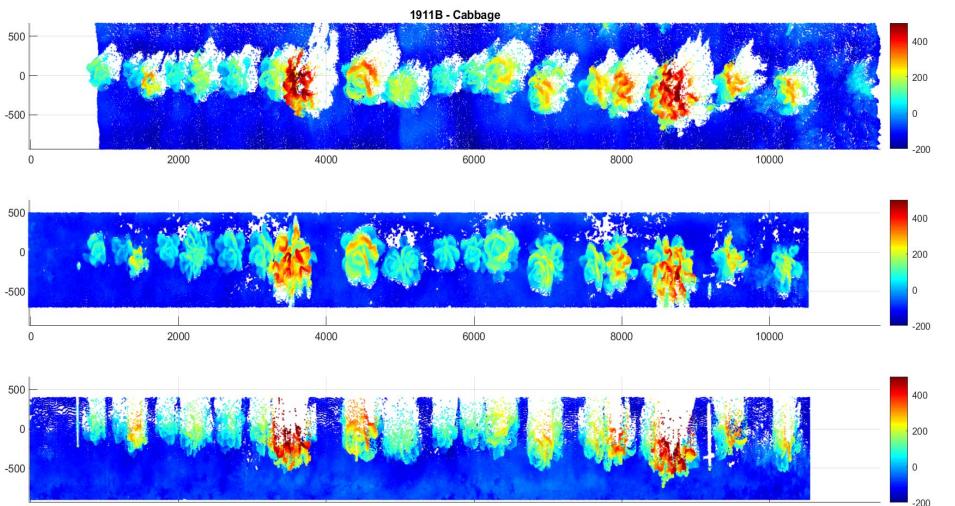
Prototype subsystems:

- **Mobile structure:** aluminium framework, wheels
- **Robotic manipulator:** Robolink Igus, 5DoF, 20kg, load 2.5kg, point-point trajectories
- **Sensory systems:** 3 LiDARs (Sick LMS-111), 1 multispectral camera (Parrot Sequoia), odometer
- **Actuation system:** fertiliser tank, pump, pipes+nozzle
- **Control:** portable computers, power supply

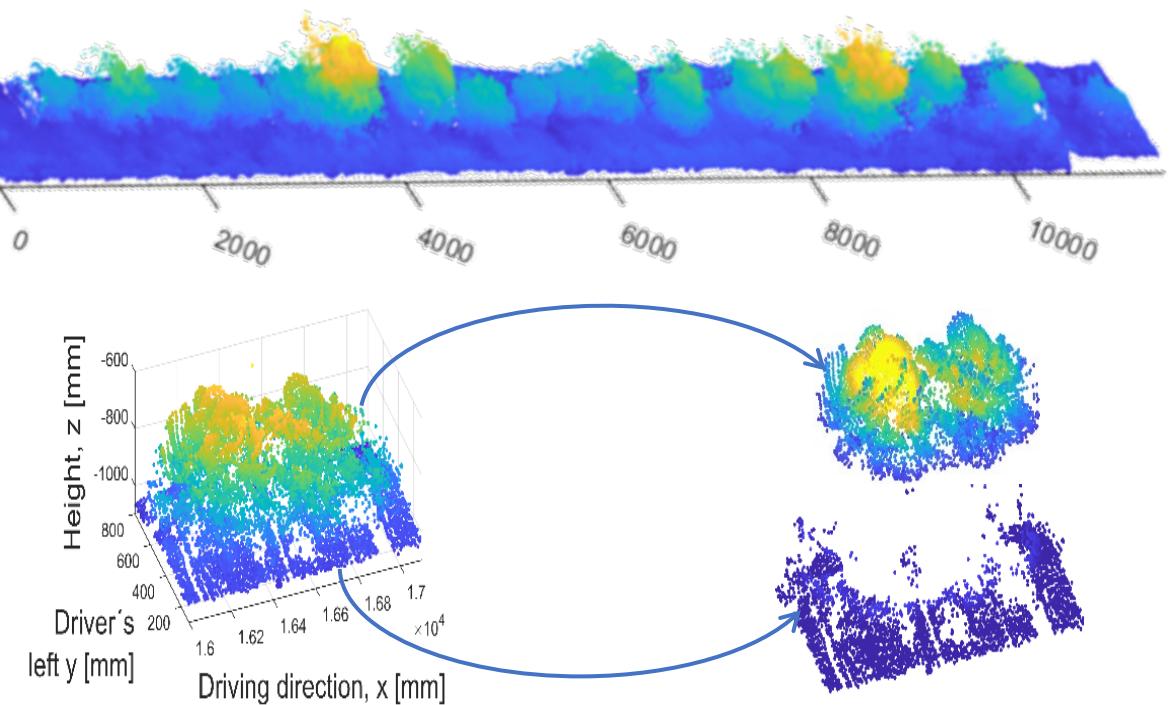
Robotic platform for single-plant fertilization

- **Sensing:**

1. Plant identification: 3D point cloud of 3 LiDARs



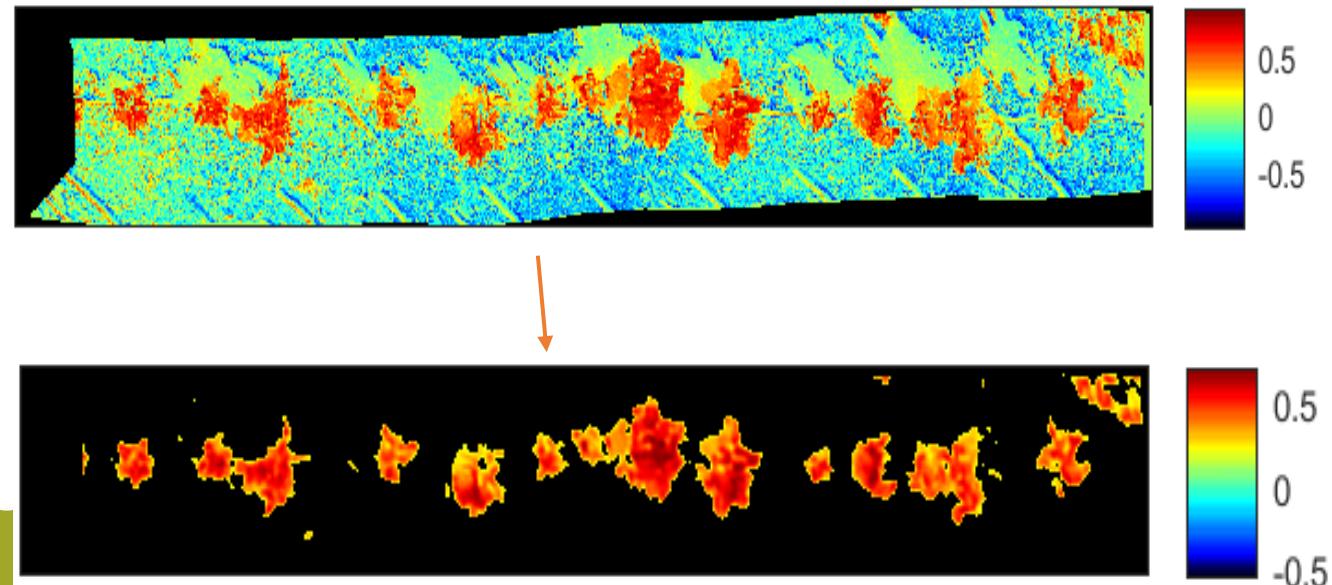
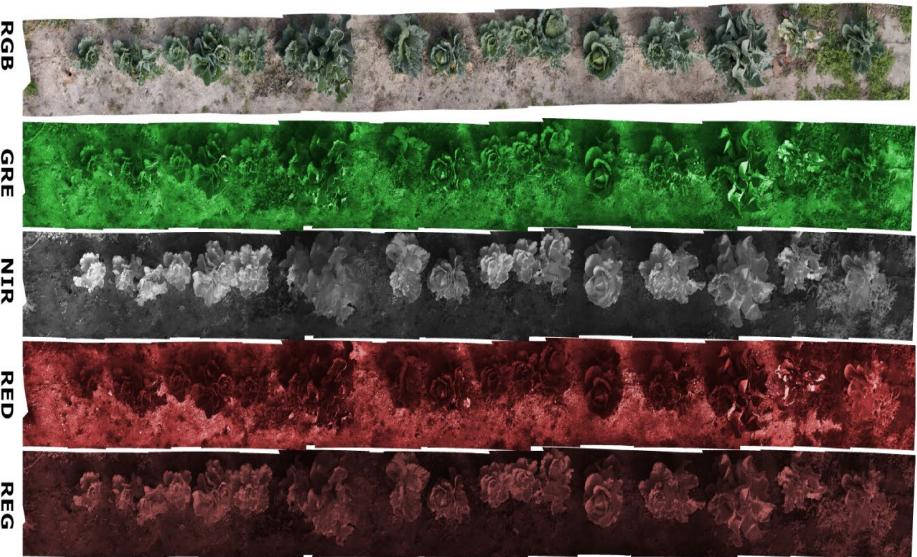
A. Krus; D. V. Apeldoorn; C. Valero; J. J. Ramirez. Acquiring Plant Features with Optical Sensing Devices in an Organic Strip-Cropping System. *Agronomy* **2020**, *10*, 197 .
<https://doi.org/10.3390/agronomy10020197>



Robotic platform for single-plant fertilization

- **Sensing:**

1. Plant identification: 3D point cloud of 3 LiDARs
2. Plant status: multispectral images and single plant NDVI

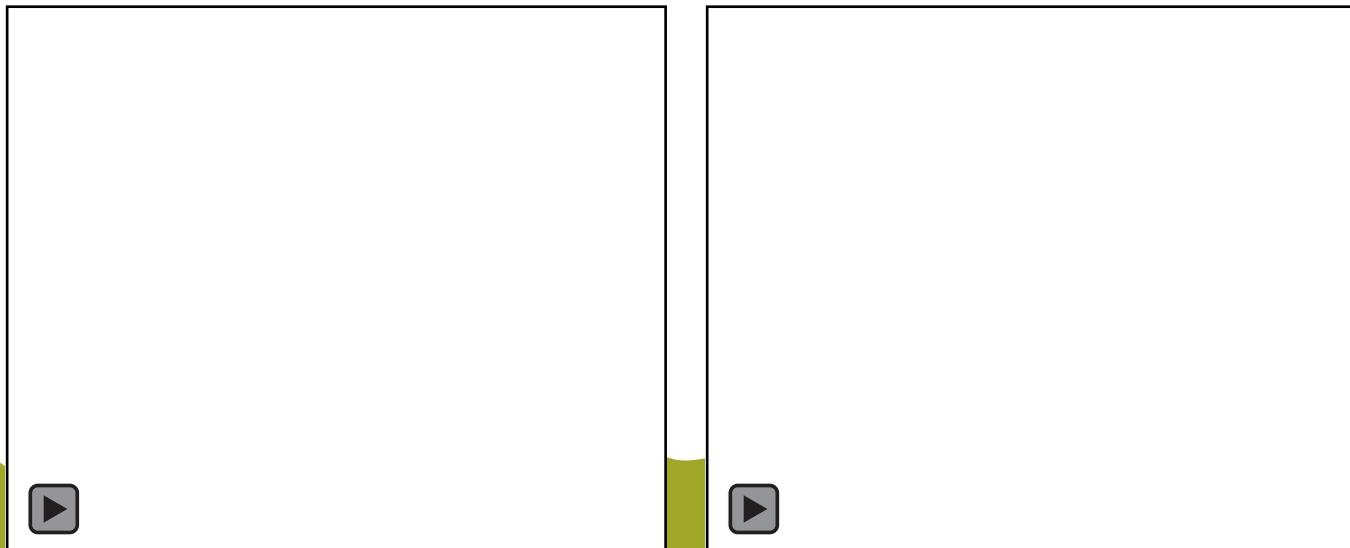
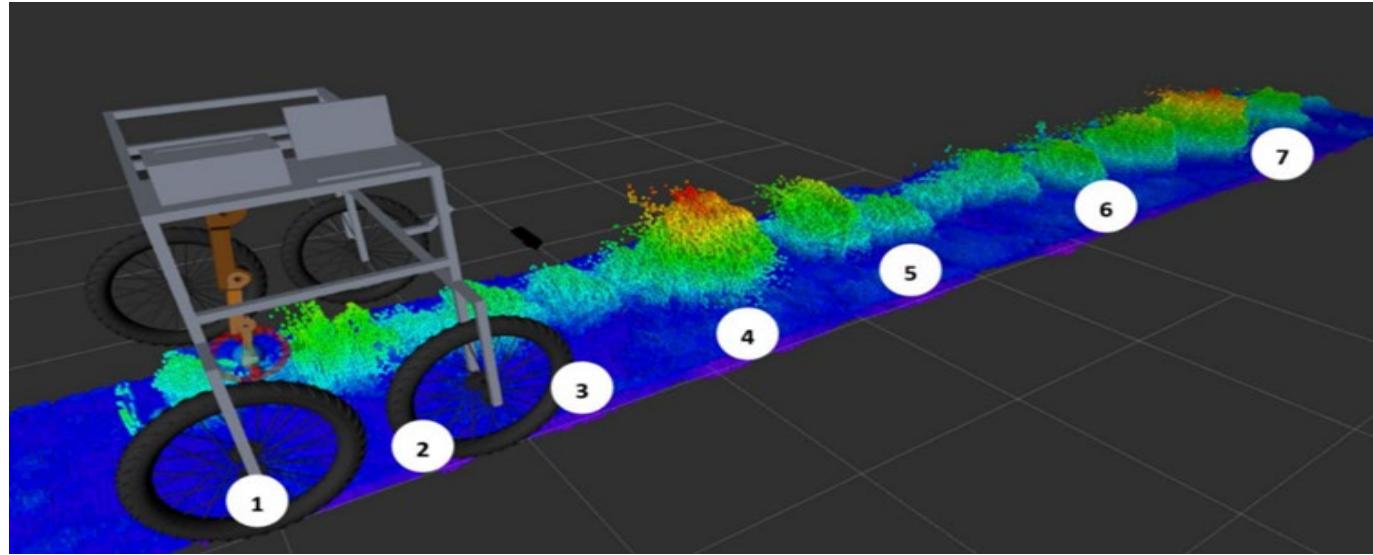


M. C. . Lima; A. Krus; C. Valero; A. Barrientos; J. d Cerro; J. J. Roldán-Gómez. Monitoring Plant Status and Fertilization Strategy through Multispectral Images. *Sensors* **2020**, *20*, 435 .
<https://doi.org/10.3390/s20020435>

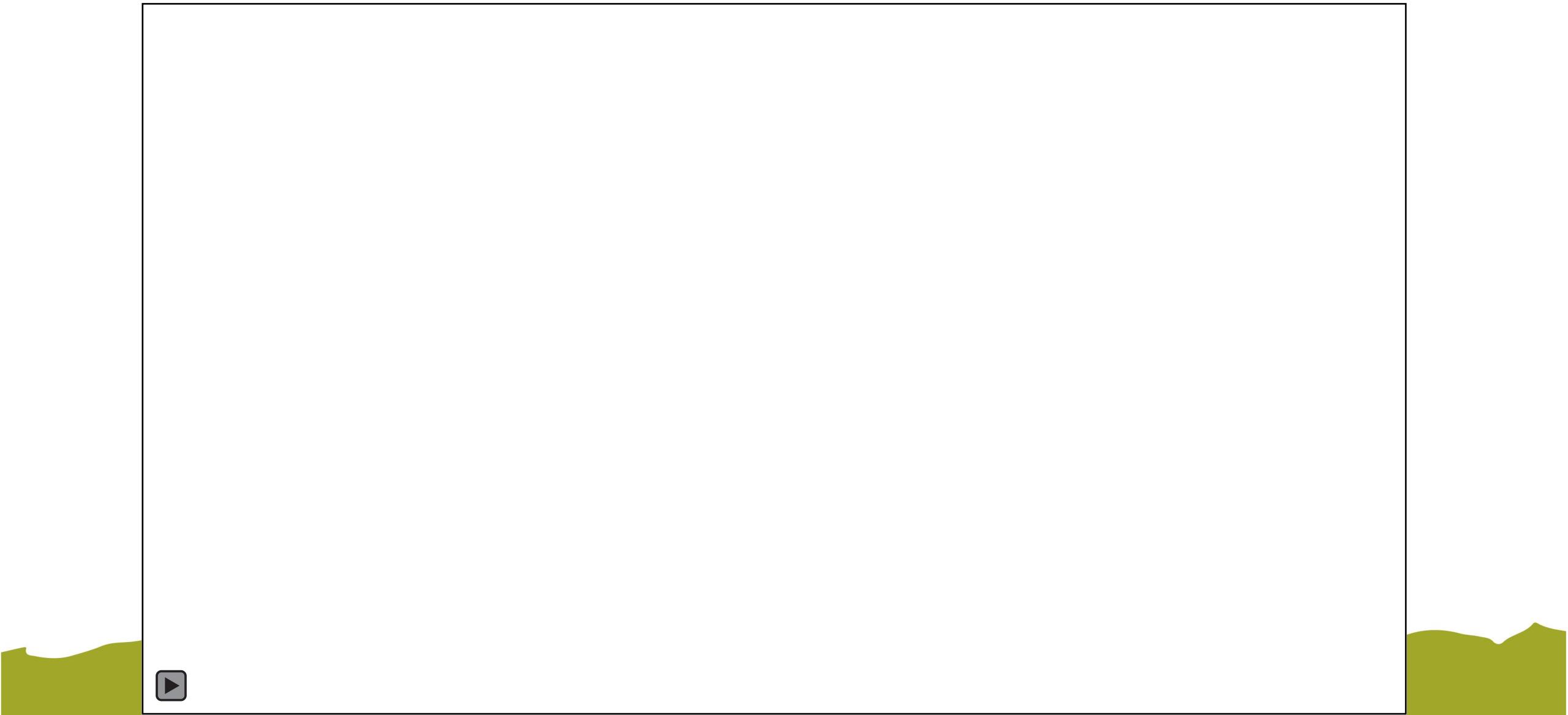
Robotic platform for single-plant fertilization

- **Actuation:**

- Localisation of robot:
 - No GPS
 - Previous LiDAR point cloud +
 - on-the-go LiDAR
- Simulation of movement (robotic arm)
- Decision on how/what to fertilise, based on:
 - NDVI
 - 3D volume reconstruction
- Spraying of liquid fertiliser around plant, on the ground



Robotic platform for single-plant fertilization



Gracias por su atención

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