



4TH ACRE WORKSHOP

The ACRE Campaigns and Where to Find Them ...

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ACRE CAMPAIGNS (METRICS PROJECT)



Agri-Food Campaigns for Robot Evaluation focus on **autonomous weeding robots** as an **alternative to the use of chemical products**

- Politecnico di Milano
- Institut national de recherche pour l'agriculture, l'alimentation et l'environnement
- Università degli Studi di Milano
- Laboratoire national de métrologie et d'essais



POLITECNICO
MILANO 1863

INRAE



UNIVERSITÀ DEGLI STUDI
DI MILANO

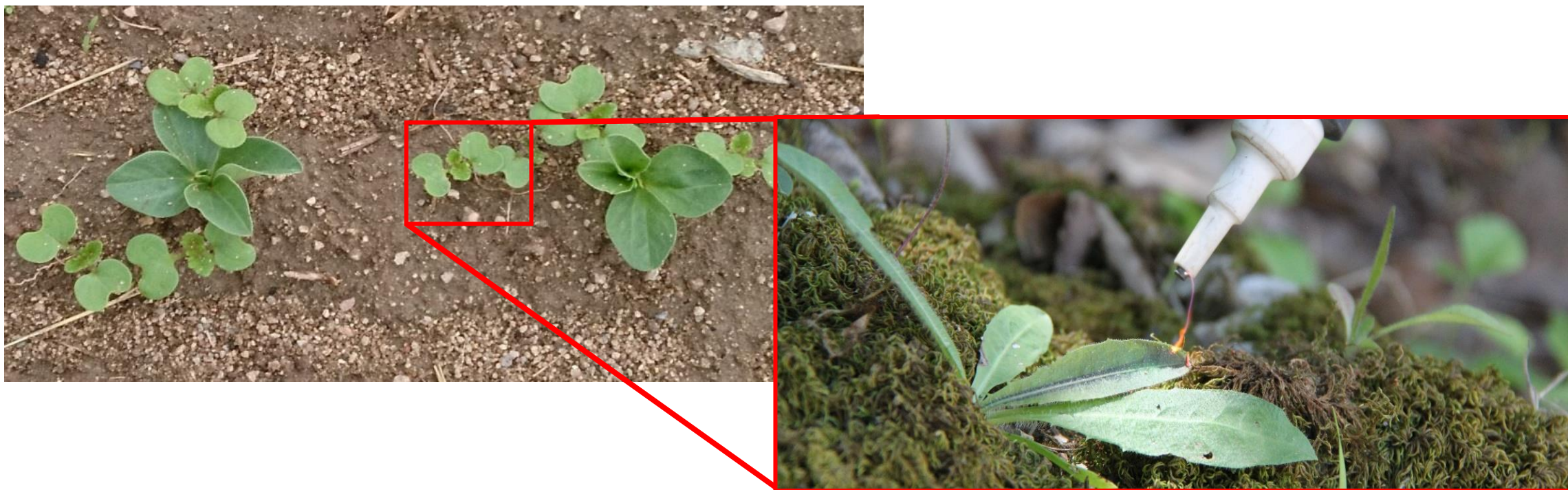
LABORATOIRE
NATIONAL
DE MÉTROLOGIE
ET D'ESSAIS

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THE ACRE CAMPAIGNS

Agri-Food Campaigns for Robot Evaluation focus on **autonomous weeding robots** as an **alternative to the use of chemical products**





THE ACRE CAMPAIGNS

Agri-Food Campaigns for Robot Evaluation focus on **autonomous weeding robots** as an **alternative to the use of chemical products**



CHALLENGE ROSE EXPERIENCE



BIPBIP team

« Bloc-outil et Imagerie de Précision pour le Binage Intra-rang Précoce »



PEAD team

« Perception Et binage Autonome des cultures en agriculture Durable »



ROSEAU team

« RObotics SEnsorimotor loops to weed Autonomously »



WeedElec team

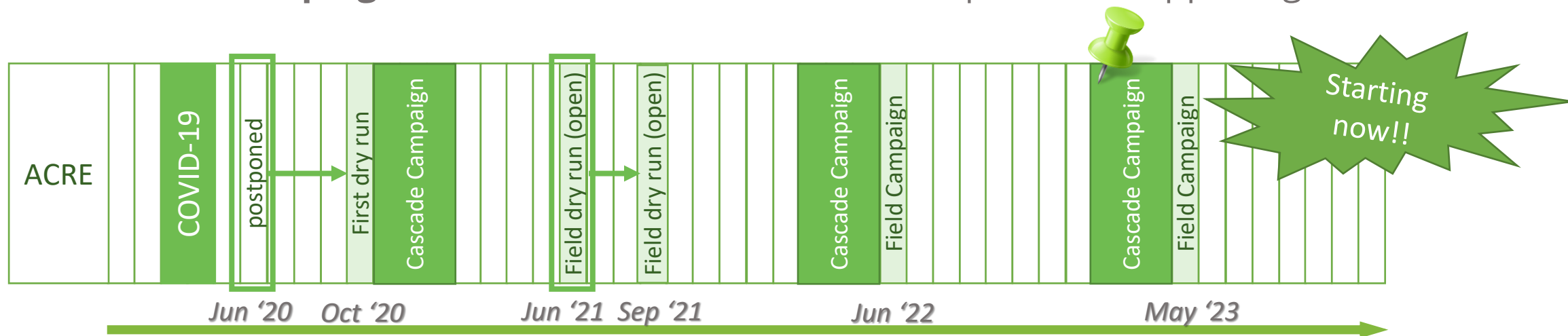
« High voltage electric weeding by robot localized »



THE ACRE CAMPAIGNS SCHEDULE

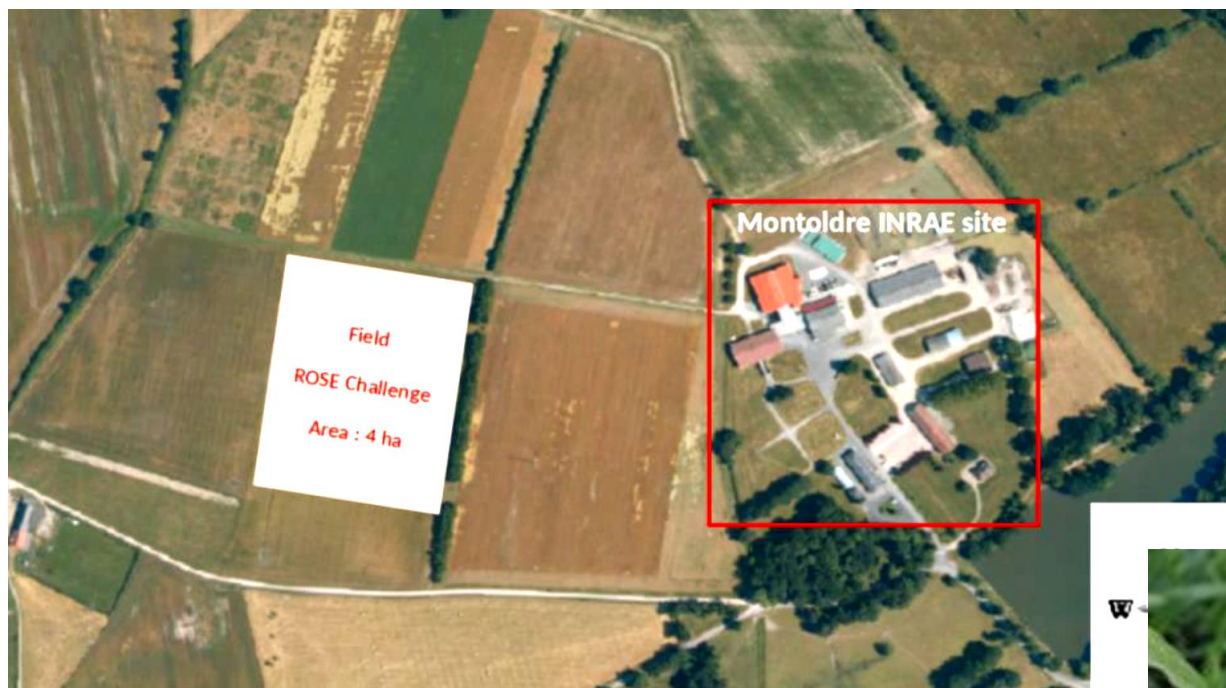
ACRE organizes 1+1 dry-run campaigns, 2 field campaigns, 3 cascade campaigns (based on the field campaign data)

- **Field campaigns** are performed physically, open to public, and will involve robots
- **Cascade campaigns** are data-based AI/Robotics competitions happening online





1ST ACRE FIELD CAMPAIGN (2022)



June 2022 in Montoldre (France)



Green bean



Maize

Two main crops (bean and maize)



Ray-grass



Mustard



Chenopodium



Matricaria



Six main weeds plants

2ND ACRE FIELD CAMPAIGN (2023)



May 2023 in Cornaredo (Italy)





2ND ACRE FIELD CAMPAIGN (2023)



May 2023 in Cornaredo (Italy)



New main crops (bean, maize, and ...)



New main weeds plants

2ND ACRE FIELD CAMPAIGN (2023)



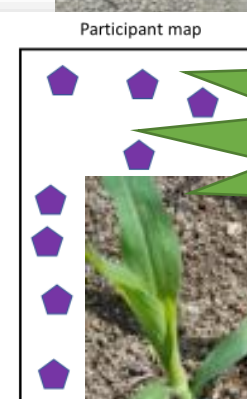
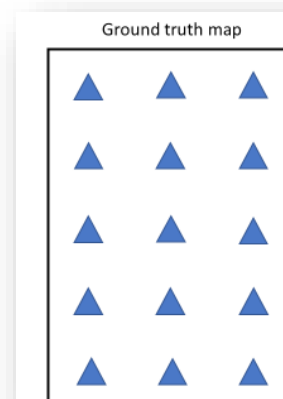
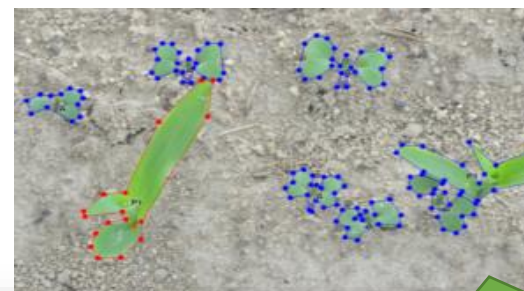
May 2023 in Cornaredo (Italy)





THE ACRE CHALLENGES (FBM & TBM)

- Robot **perception**
 - Plant / weed discrimination (FBM)
 - Leaf area / biomass estimation (FBM)
- Robot **navigation**
 - Field Navigation (FBM)
 - Crop Mapping (TBM)
- Robot **actuation**
 - Weed Destruction (FBM)
 - Autonomous Weeding (TBM)



New 2023 ACRE
Evaluation Plan!



Crops & weeds markers

ACRE Evaluation Plan (<https://metricsproject.eu/agri-food/>)



PLANT / WEED DISCRIMINATION

Goal: Detect which plants of an intra-row are weeds and which are crops to take informed decisions when performing weeding.



Ray-grass



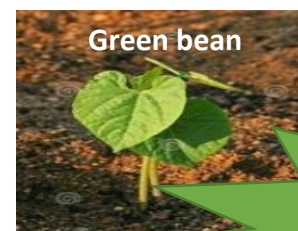
Mustard



Chenopodium



Matricaria



Green bean



Maize

Six main weeds plants

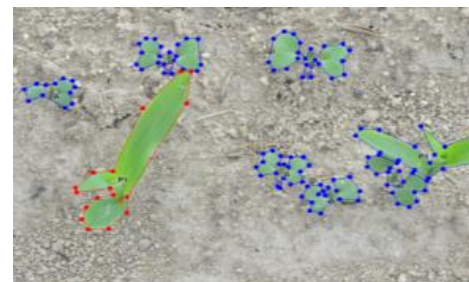
FBM: Weed Destruction



Crops & weeds markers

Two main

FBM: Plant Discrimination



Manual annotation



Hypothesis : Mask return



PLANT / WEED DISCRIMINATION



Ray-grass



Mustard



Chenopodium



Matricaria

Four main weeds plants



Green bean



Maize

Two main crops (bean and maize)



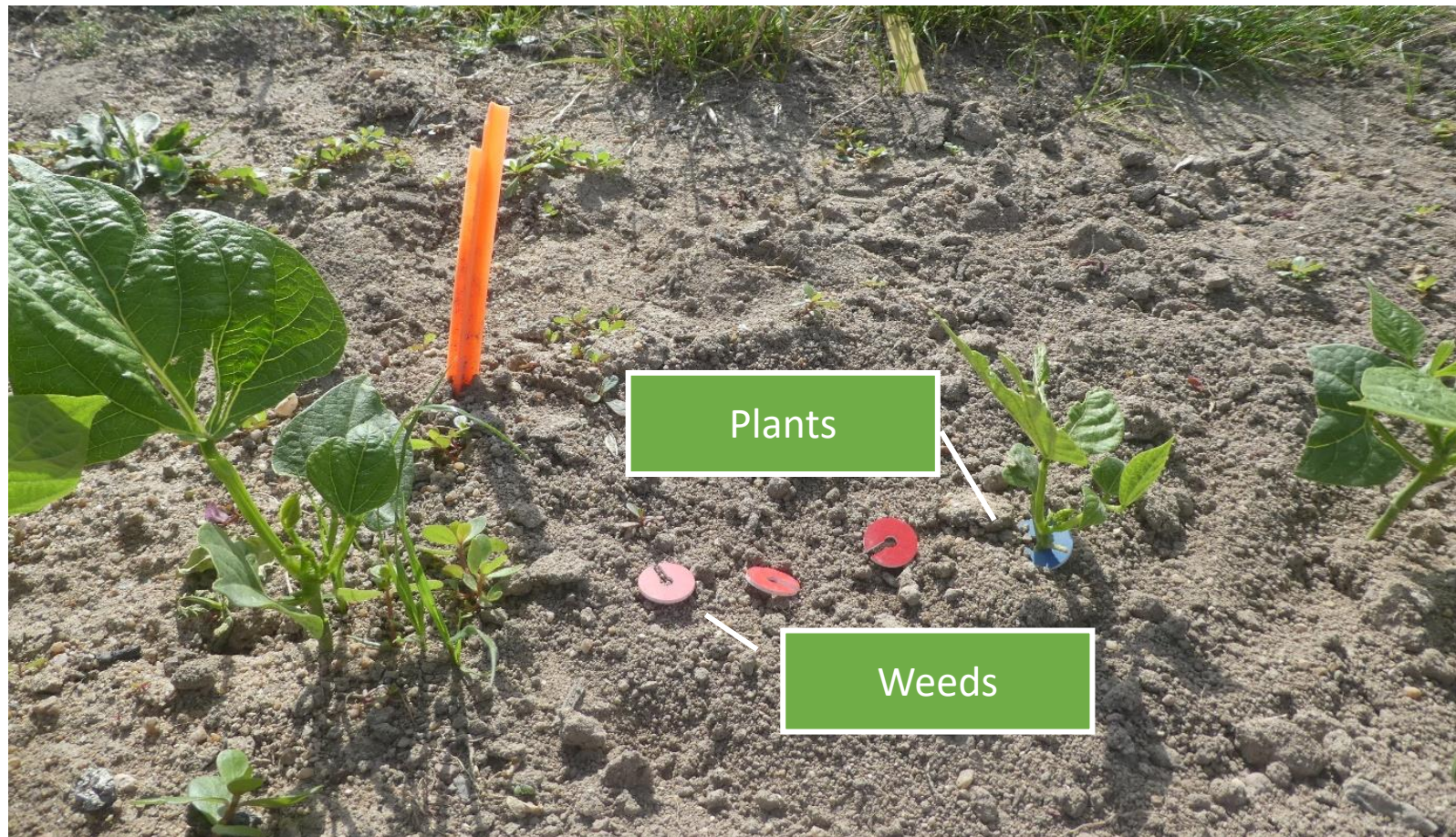
FBM: Plant Discrimination



PLANT / WEED DISCRIMINATION



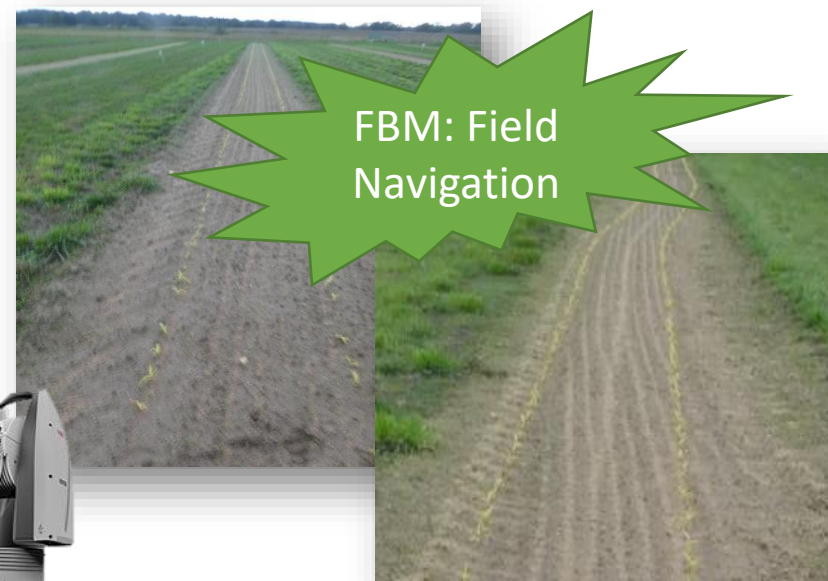
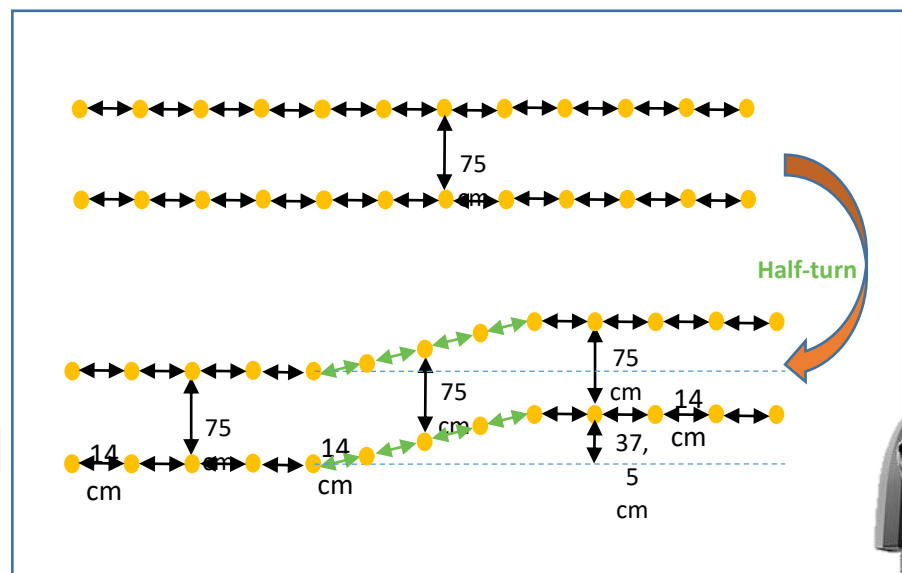
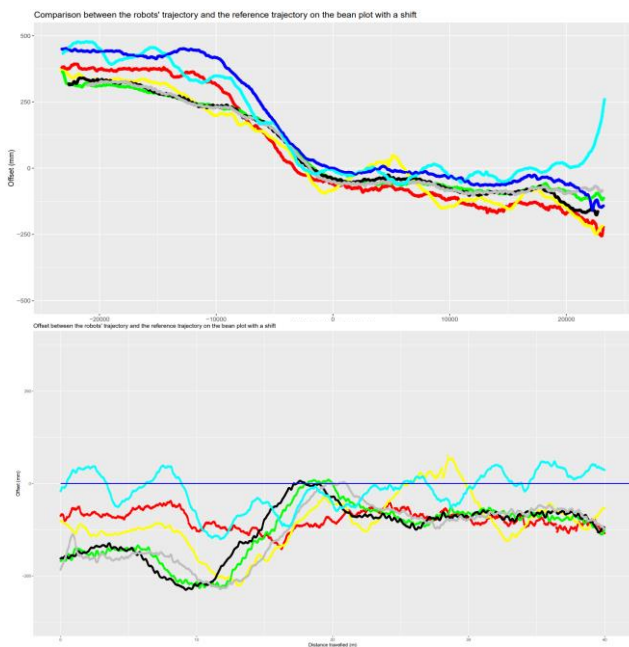
FBM: Weed Destruction





ROBOT AUTONOMOUS NAVIGATION

Goal: Being able to navigate through rows of crops in a field, or other cultivated area without causing damage to the crop.





ROBOT AUTONOMOUS NAVIGATION





ACRE CASCADE CAMPAIGNS

Online Competitions based on **Dataset** from the field campaigns

- Targeted to Robotics and AI communities
- Based on field benchmarks and datasets

1st Cascade Campaign (Dry-run) launched in October 2020 and based on Rose dataset

2nd Cascade Campaign in February 2022 on the extended Rose dataset (2019-2021)

3rd Cascade Campaign in March 2023 on data from ACRE Field Campaign in Montoldre

Rose





WANT TO BE PART OF IT?

- As **Competing Team** you could:
 - Participate with a Robot to the Field Campaigns
 - Participate online to Cascade Campaigns
- As **Sponsor** you could:
 - Support the organization of specific benchmark
 - Support team participation and travels
 - Sponsor prizes and collateral events
- As **Dataset Provider** you could:
 - Help us designing new online Cascade Campaign
- As **Stakeholder** you could ...



THANK YOU

www.metricsproject.eu | acre@metricsproject.eu

