The 2ⁿᵈ ACRE COMPETITION

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THE 2ND ACRE FIELD CAMPAIGN

As in the case of the previous edition, the field campaign is open to teams from all over the world.

The competitions are focused on autonomous weeding robots to reduce or eliminate the use of pesticides.

Performance evaluation is based on objective benchmarks and offer the opportunity to compete on more challenges.
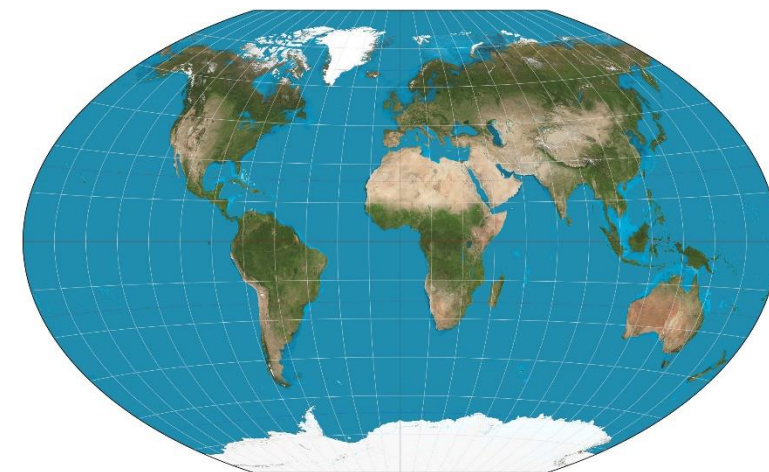
In this edition, the ACRE competition will offer the opportunity of exhibiting agricultural robots dedicated to different fields than weeding and high-tech solutions for agriculture

THE 2ND ACRE FIELD CAMPAIGN

Second Field Campaign will be May 25th and 26th, week 21

More details and information on the benchmarks execution in the Evaluation Plan online:
https://metricsproject.eu/agri-food/

THE 2ND ACRE FIELD CAMPAIGN

- **Participants can access the venue and set up from May 22nd.**

- **Additional plots dedicated for testing the robots are available, participants can use them from May 22nd. They will be prepared in the same way as the competition plots.**

- **Until the competition starts (24th May), the plots used for the competition can be viewed and inspected by the participants, but the robots will not allowed on them.**

- **Please let us know if you have requests regarding accommodation, logistic, and additional services.**
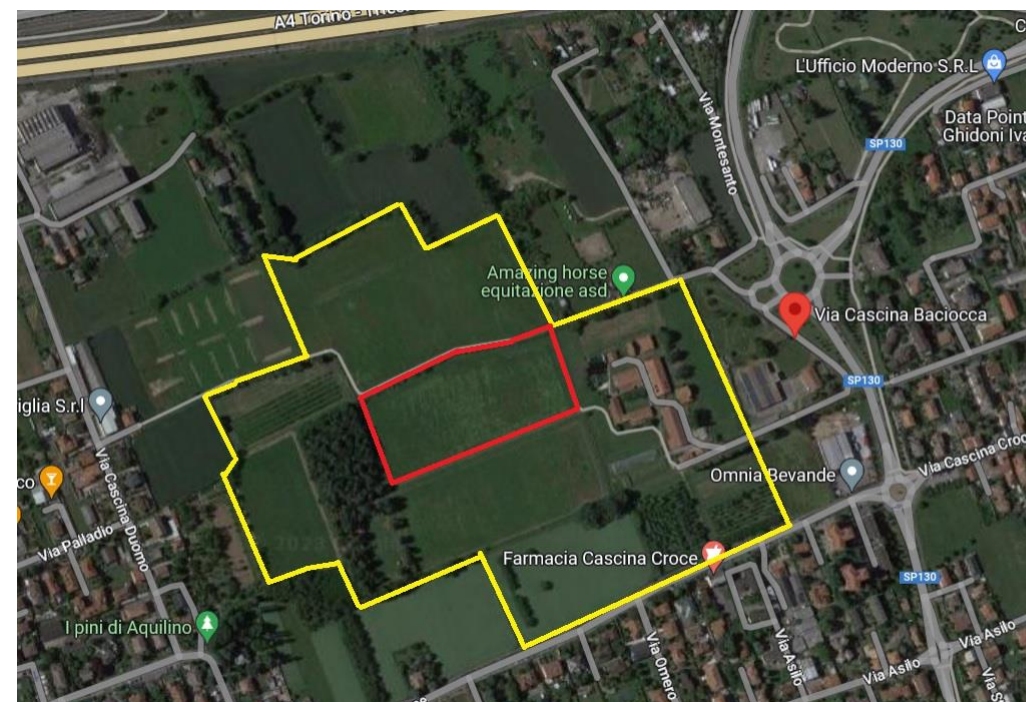
THE 2ND ACRE FIELD CAMPAIGN

Where?

At "Azienda Agricola Ciro Menozzi – Cascina Baciocca – Cornaredo (MI)".
An experimental farm of the Department of Agricultural and Environmental Sciences - Production, Landscape, Agroenergy of the University of Milano.

An experimental field of around 3 ha (in red)
- conditions: sandy soil with (a lot of) stone
- suitable for evaluation experiments in real conditions

Aerial view of C.na Baciocca experimental field

The 2ND ACRE Field campaign

**The experimental field will have an accurate preparation
but unfortunately in Cornaredo we have a soil very rich in stone**

We will add a passage with a stone burier to allow easier transit even for a smaller robot

THE 2ND ACRE FIELD CAMPAIGN

**Most of the farm is fenced off.
It offers several technical buildings, one greenhouse and halls to allow the participants to securely store their equipment** *(prototypes, autonomous solutions, smart implements, robots, …).*

THE 2ND ACRE FIELD CAMPAIGN

A horticultural crop such as lettuce (Lactuca sativa), zucchini (Cucurbita pepo) or beet (Beta Vulgaris) can be added in this edition.

The most requested crop by the end of March by the participants will be selected as the third crop for the competition.

THE 2ND ACRE FIELD CAMPAIGN

If requested by the teams, additional weeds will be added to the plots. These weeds were not present in Montoldre. The possible new entries are:

**Johnson grass
(Sorghum halepense)**

**Slender foxtail
(Alopecurus myosuroides)**

**Sterile Oat
(Avena sterilis)**

THE 2ND ACRE FIELD CAMPAIGN

**Another difference:
In order to obtain equivalent plot-tests,
all the weeds will be sown separately in special nurseries and transplanted into the field just before the event.**

THE 2ND ACRE FIELD CAMPAIGN

A plot with a requested crop (not just the ones in the images) can be prepared for participants to demonstrate their solution outside of the competition. We can also prepare a plot with no crops, for example, for seeding or crop transplanting.

We need to know which crop is needed before the end of march

SPECIFICS OF FUNCTIONALITY AND TASK BENCHMARKS FOR THE MAY 2023 FIELD CAMPAIGN

- **Just like the previous edition, the benchmarks are organized as:**
  - **Functionality Benchmarks** (FBMs): independently evaluate specific capabilities of a robot.
  - **Task Benchmarks** (TBMs): evaluating the execution of complex tasks involving multiple functionalities.

- <u>**Participants can chose to take part in any number of Benchmarks**</u>.

- **Exhibitors can also provide demos in the field.**

- **We gladly accept exhibitors to sponsor the campaign (for example by helping us to provide technical services).**

BENCHMARKS FOR THE 2ND ACRE FIELD CAMPAIGN

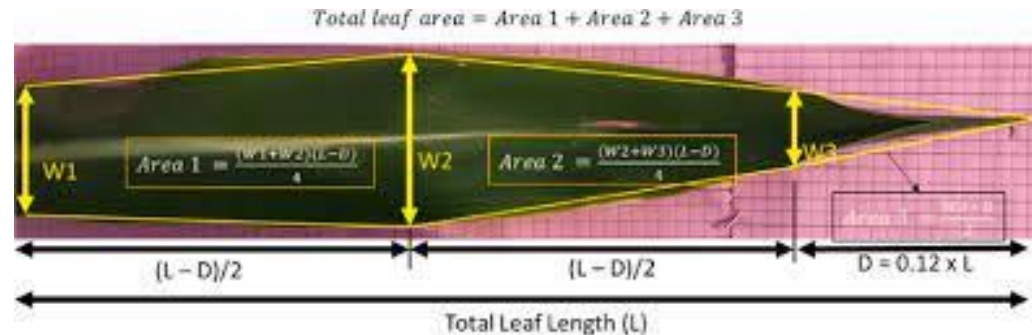**Selected Benchmarks for the field campaign**

- **Plant discrimination (FBM)**
- **Weed destruction (FBM)**
- **Field navigation (FBM)**
- **Intra row weeding (TBM)**
- **Crop mapping (TBM)**
- **Leaf area estimation (new FBM)**
- **Biomass Estimation (new FBM)**
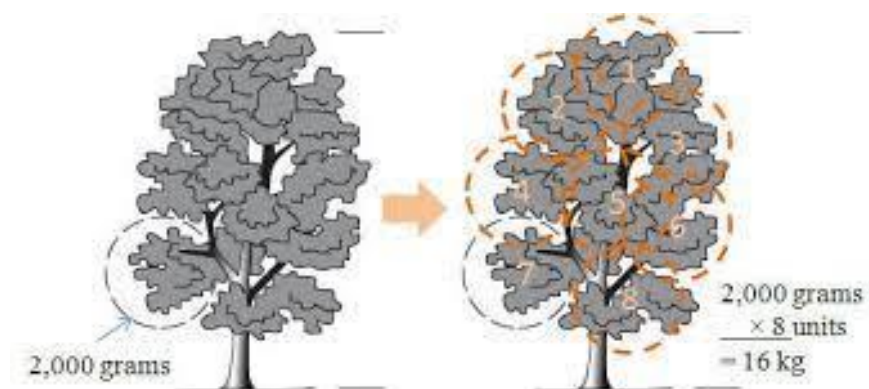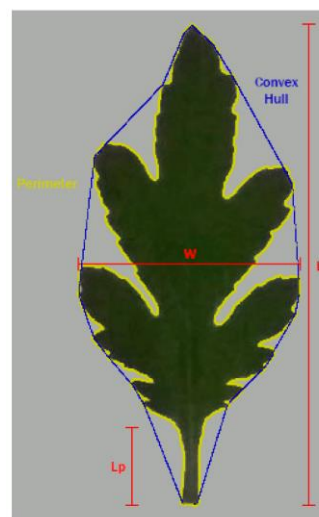
The new Functionality Benchmarks will be added to the field campaign if any participant requests to execute them.

LEAF AREA ESTIMATION (FBM)

Total leaf area = Area 1 + Area 2 + Area 3

$Area\ 1 = \frac{(W1+W2)(L-D)}{4}$

$Area\ 2 = \frac{(W2+W3)(L-D)}{4}$

$D = 0.12 \times L$

Total Leaf Length (L)

- **Goal:** estimate the leaf area of the plants along a cultivated row.
- **Execution:** the test environment is a linear row with approximately 20-50cm high plants. The challenger has to move along the row and use its own perception to estimate leaf area along the length of the row.
- **Evaluation:** performance metrics are based on a comparison between the ground truth leaf area estimated by human experts with a measurement tool.

BIOMASS ESTIMATION (FBM)

- **Goal:** estimate above-ground crop biomass
- **Execution:** challengers have to make a pass over a prepared field using its sensors to perceive the plants and provide an estimation of the fresh weight of the above-ground parts of the plants.
- **Evaluation:** the estimate provided by the robot is compared with the ground truth obtained by weighing the plants after all participating robots have executed the benchmark (destroying the cultivation).

THE 2ND ACRE FIELD CAMPAIGN

We will provide an RTK correction signal and data about soil and weather conditions

but it's possible to evaluate additional facilities if requested by the competitors before the end of March. For example additional network infrastructure, parking space for your vehicles, etc.

The 2ND ACRE Field campaign

A Leica laser tracker will be used as measurement system, but the data from this sensor will not be available to the teams during the benchmark execution.

CAMPAIGN **2023** PARTICIPATION

Registration form: https://forms.gle/5PSMwv4a4ptyUnPX8

Campaign participation deadline:

April 2ⁿᵈ, 2023

THANK YOU

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