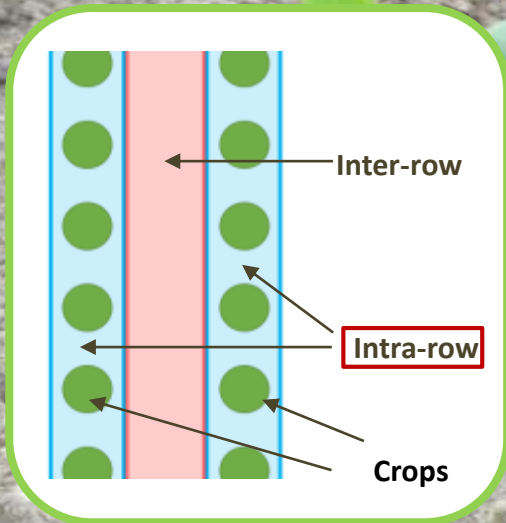


Challenge **Rose**

Robotique et Capteurs
au Service d'Ecophyto

Robotics and sensors at the Service of Ecophyto

By Virginie Barbosa - LNE



Goal : encourage the development of autonomous innovative solutions for **intra-row weed control**

- in **field crops** with wide spacing and,
- in **vegetable crops**

in order to reduce by 50% the use of **phytosanitary products**, and thus contribute to the achievement of the objectives of the Ecophyto II plan.





Four evaluation campaigns



Six meetings in the experimental field

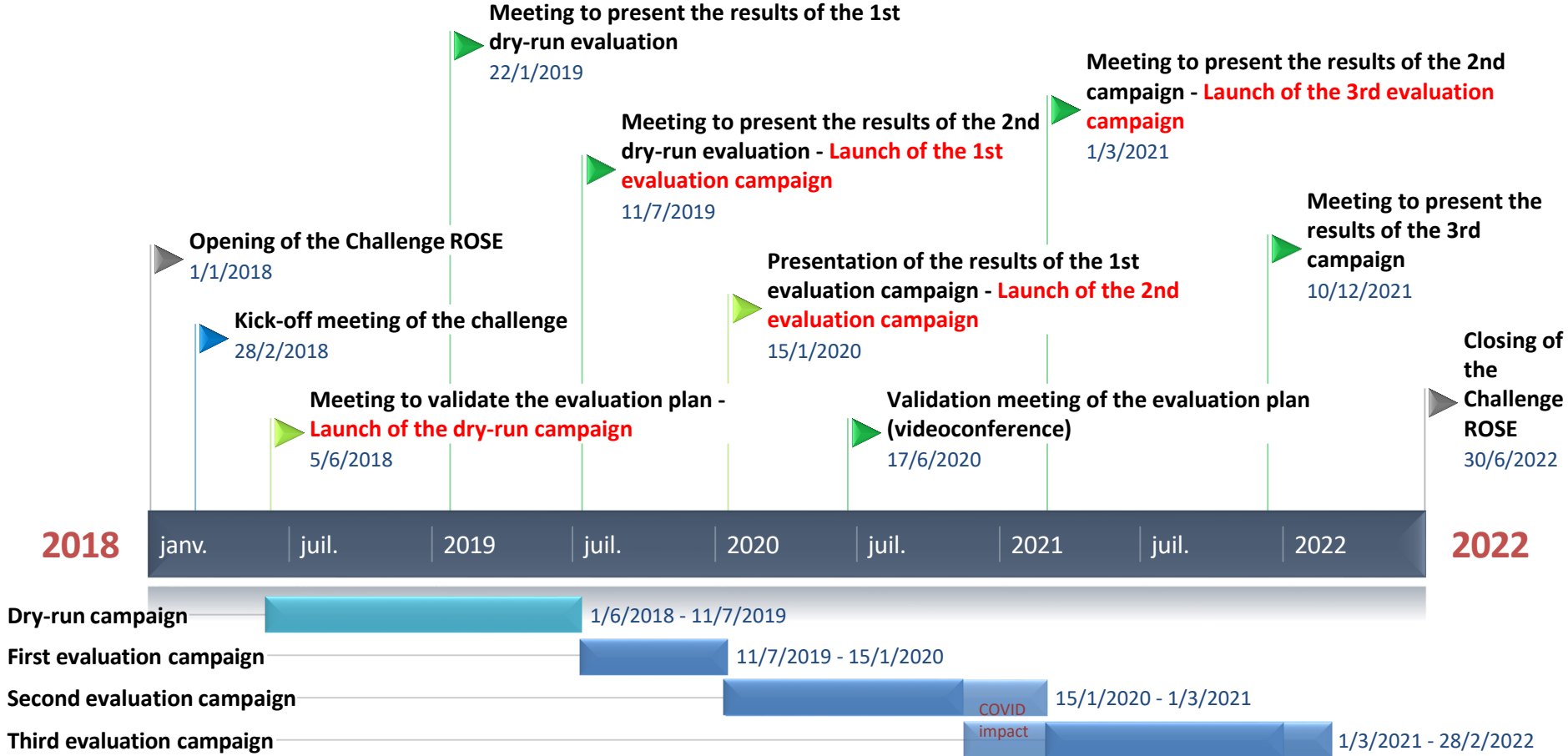


A surface area of four hectares dedicated to experimentation



Operational
organisation





Macro-planning of the ROSE challenge



Detection

- Detecting and identifying plants



Decision

- Decide what to do next



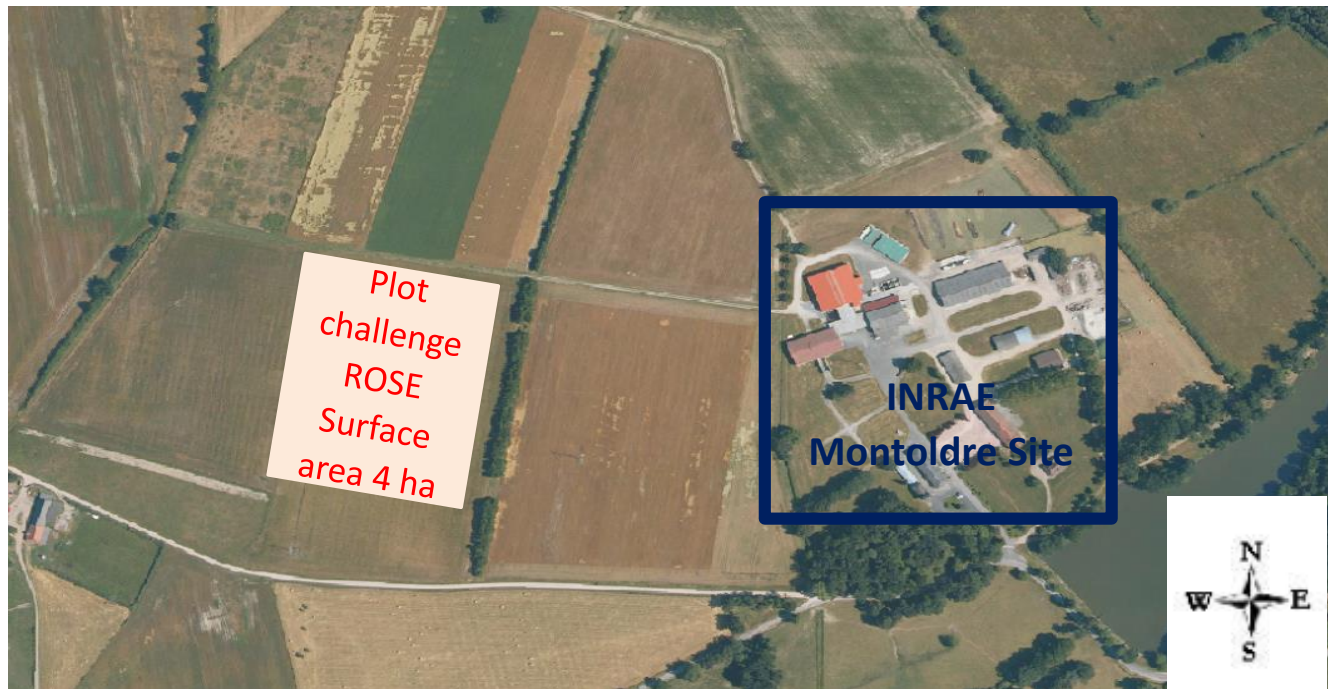
Action

- Carry out the weeding action



AgroTechnoPôle site : INRAE Montoldre

Plot challenge ROSE



Types of crops planted :

- large crop with wide spacing: maize
(row spacing 75 to 80 cm, foot spacing 14 cm)
- field vegetable crops: beans
(row spacing 15 to 30 cm, foot spacing 3 to 8 cm)



Types of “artificial” weeds planted:

spread out (horizontal) :

- Model weeds : mustard
- Natural weeds : matricaria.

with upright (vertical) :

- Model weeds : ray grass
- Natural weeds : goosefoot.





Prototype presented by BIPBIP



Prototype presented by ROSEAU



Prototype presented by PEAD



Prototype presented by WeedElec



Objective: determine the position of weeds and/or plants of interest on the images

Detection

References: manual annotations

Comparison

1. Mapping
2. Calculation of the error rate

Image acquisition by the
4 evaluated robots

Hypothesis: outputs of detection systems

Evaluation of the detection task:
methodology

Development of the DIANNE software (trimming, identification and annotation for Evaluation)

Lot sélectionné
Nom : Lot_01

- IMG_1987.JPG
- IMG_2006.JPG
- IMG_2010.JPG
- IMG_2018.JPG
- IMG_2026.JPG
- IMG_2030.JPG
- IMG_2030_800x600.jpg
- IMG_2043.JPG
- IMG_2045.JPG
- IMG_2046.JPG
- IMG_2046_1000x750.jpg
- IMG_2049.JPG
- IMG_2050.JPG
- IMG_2054.JPG
- IMG_2055.JPG
- IMG_2058.JPG
- IMG_2061.JPG

Ouverture du lot :
2018-09-03 16:16:54
Dernière sauvegarde :
2018-09-06 13:56:15

Image utilisable ?
☒ Oui
☐ Non
Raison :

Plantes visibles ?
☒ Oui
☐ Non

Annotations de l'image
Propriétés du détourage :

Type : ☐ Plante d'intérêt
☐ Adventice
☒ Indéterminé
Nom :
☐ Autre :
Stade de développement :

Centre de la plante

aucun centre de défini
☐ Le centre de la plante n'est pas visible.

Fiabilité des annotations du détourage
☒ Je suis relativement confiant.
☐ Impossible de trancher.
Raison :

☐ L'image est floue mais cela ne gêne pas les annotations.

Détourages visibles

Dernière sauvegarde des annotations de l'image : 2018-09-06 13:56:15

Détourages annotés : 0 / 18



Prototype presented by BIPBIP



Prototype presented by PEAD

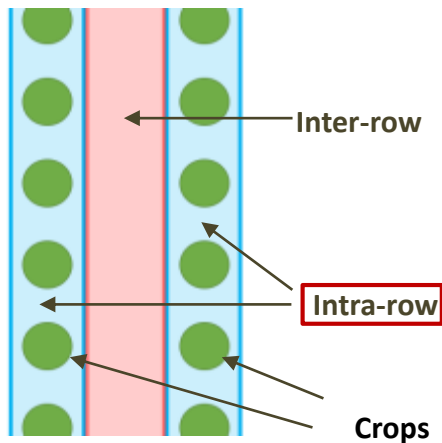


Prototype presented by ROSEAU



Prototype presented by WeedElec

Objective: control weeds indicated by yellow markers without damaging crops indicated by blue markers.

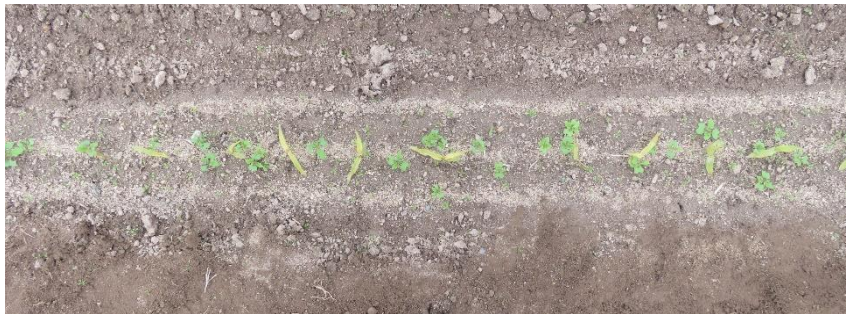
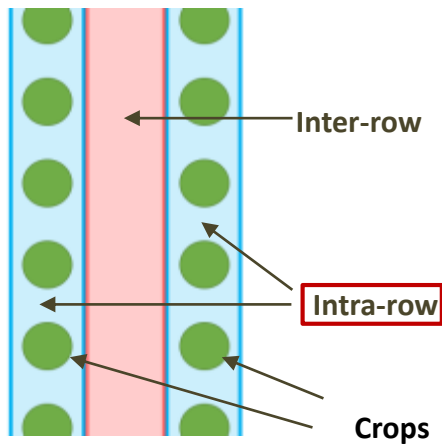


Visual
observation
of each
marked plant



The aim of the markers (easily detectable) is to be as independent as possible from the "detection task"

Objective: weeding entire rows of crops (maize or beans)



Manual counting of crops and weeds
before and after the passage of the robots

up to 4700 raygrass stems
for example → a delicate
and meticulous mission



Other evaluation criteria (*methodology in course of definition or validation*) :

- Environmental impact (soil pollution, carbon balance, soil settlement and compaction effects, energy consumption)
- Techno-economical criteria (working rate, degree of automation, energy autonomy, cost, etc.)
- Acceptability

Common
rules

- Evaluation metrics must be applicable to all robots
- The rules of the challenge well described and the same rules for all participants
- The evaluation of systems capacity must be objective

→ Evaluation plan written and validated by all participants

Homogeneity
of the evaluation
environment

- All participants must have the same level of difficulty (**repeatability** of the environment)
- The evaluator must have reliable, high-quality data at his disposal to guarantee the **comparability** of the systems to be evaluated

→ Guidelines + training/qualification, for each role or type of mission (counting of the plants, positioning the markers, annotating images)

→ double counting or verification

→ Meticulous floor preparation : Decompacting, heat treatment (to avoid « natural » weeds), precision sowing

→ Plot monitoring : sowing protection (meteo but also animals like birds, rabbits..), irrigation



Regular and annual meetings in the field



At least two plenary meetings per year



Joint communication events



Competition
and
collaboration



Definition of a common evaluation methodology and associated metrics



Sharing evaluation and annotation tools

→ See the challenge ROSE website www.challenge-rose.fr



Sharing tools and standards

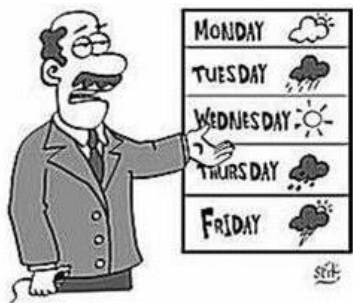
Sharing an annotated image database

First reuse example : competition ACRE – H2020-METRICS



8 workpackages
leaded
by LNE or INRAE





Here's the 5 day forecast. To be honest, after tomorrow, your guess is as good as mine!

Plants are **living organisms** ...

Therefore organizing evaluations in the field is far from being easy:
adaptation (of organizers and participants) is unavoidable !

You can draw up the best evaluation plan, and the best protocols to control many parameters, but ... impossible for the weather!



October 20 (relatively cold weather)

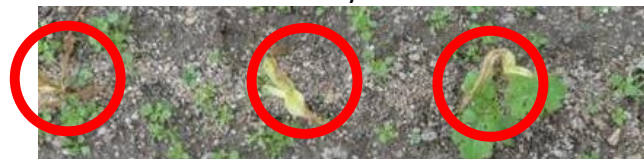


September 19 (relatively hot weather)

October 20



October 20: a few days after the evaluation



Continue to follow us on
www.challenge-rose.fr

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