



A platform for the development of new technologies and services for the agro-ecological transition

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Philippe POTIER - Prototype & Innovation, Robotics R&D Manager - KUHN

François PINET - Director of Test Beyond Road & Trucks - MICHELIN

Lionel LÉVEILLÉ - Director of Research & Innovation - BUREL PRODUCTION



AGRITECH DAY
By AXEMA

Who are we (Who am I) ?



MANDONNET Bruno

Instrumentation & Quality Engineer
Coordinator & projects monitoring
AgroTechnoPôle platform



POTIER Philippe

Prototype and Innovation Manager
Robotic R&D Manager

KUHN



PINET François

Graduate AgroParisTech
Director of Test Beyond
Road & Trucks
R&D MICHELIN



LÉVEILLÉ Lionel

Graduate in Mechanical, IP & Innovation
Director of Research and Innovation

BUREL PRODUCTION

Sulky - Sky Agriculture - Frandent - Prolog

Summary

1. Introduction
2. General presentation of the AgroTechnoPôle platform
3. Existing means & new infrastructures within the platform
4. Conclusion

01

Introduction



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1- Introduction

June 14th, 2022 : First Strategic Orientation Committee (COS) Meeting

- Under the presidency of Mr Christian HUYGHE (Scientific Director INRAE)
- And the vice-president Mr Gilbert JOUAN (General Manager BUREL PRODUCTION)
- On its privileged site of INRAE - Montoldre (03).



This meeting officially marks the launch of the AgroTechnoPôle in its deployment phase (2022 – 2024)

1- Introduction

Signatories of the consortium agreement

Academics



Professional Collectives



...

Referring Companies



...

* First companies that bring as soon as 2022 their trust and financial contributions to the definition and construction of new infrastructures

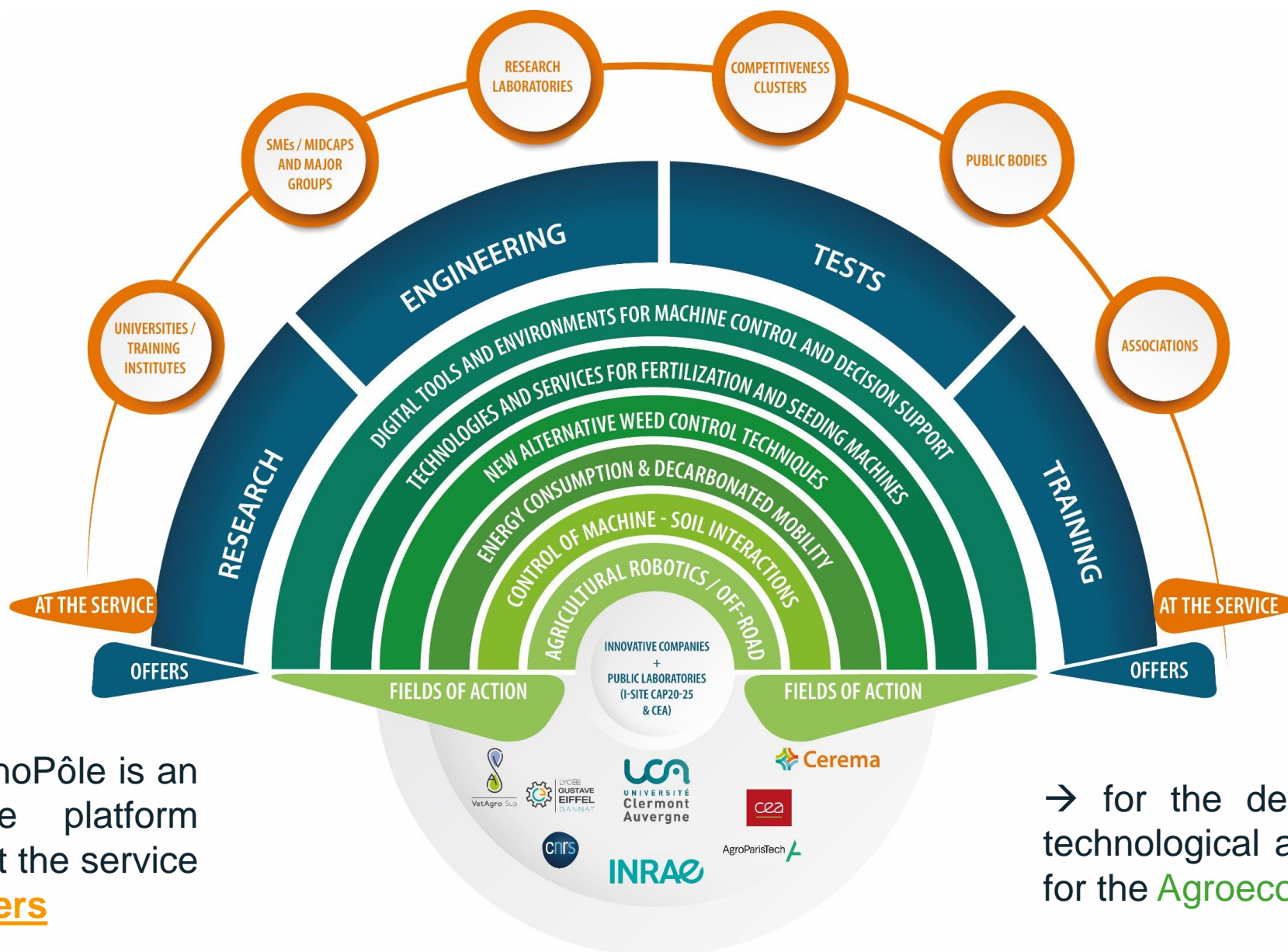
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General presentation



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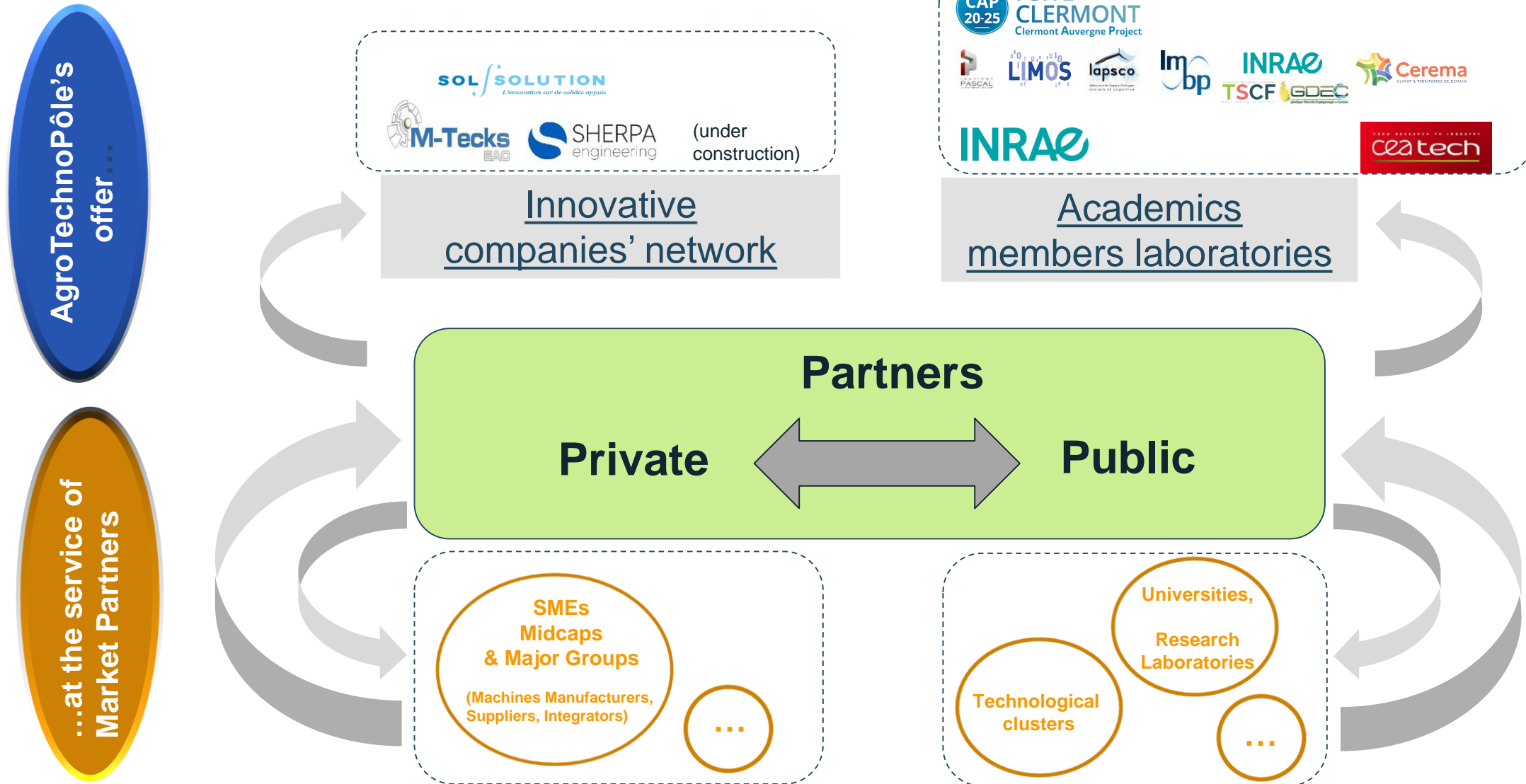
2- General presentation of the AgroTechnoPôle platform



→ The AgroTechnoPôle is an open innovative platform lead by INRAE at the service of all stakeholders

→ for the development of their technological and digital solutions for the **Agroecological Transition**

AgroTechnoPôle Model



Its 6 main fields of application

1 - Agricultural Robotics & Vehicles / Off - Road

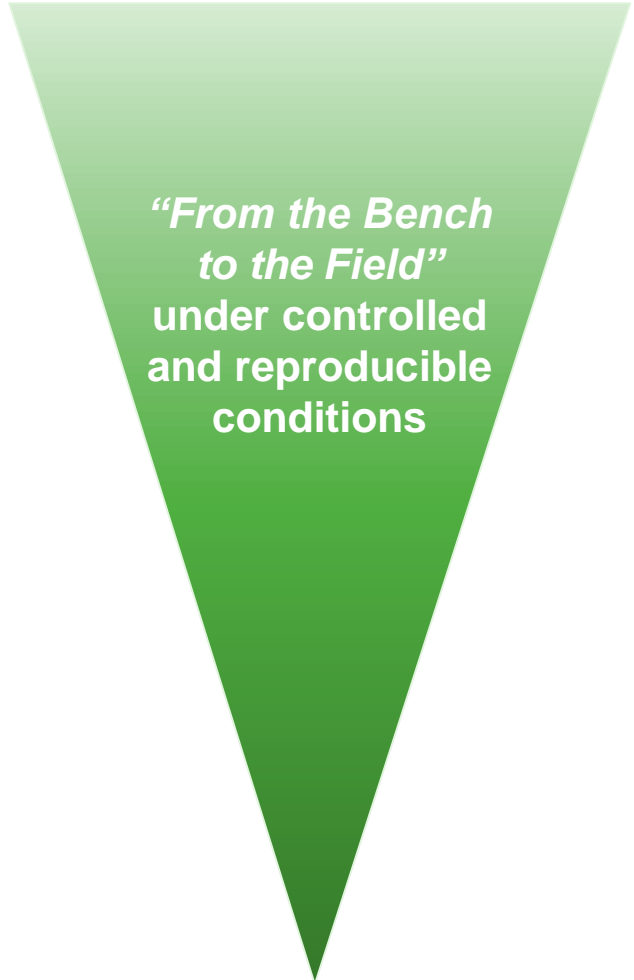
2 - Control of machine-soil interactions

3 - Energy consumption and decarbonated mobility

4 - New alternative weed control techniques

5 - Technologies and services for fertilization and seeding machines

6 - Digital tools and environments for machine control and decision support

A large green inverted triangle pointing downwards, containing text.

*"From the Bench
to the Field"*
under controlled
and reproducible
conditions

03

**Existing means &
new infrastructures
within the platform**



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3- Existing means & new infrastructures within the platform

1 - Agricultural Robotics & Vehicles / (Off – Road)

Some challenges (Agroecological Transition & Technologies)

- New smart machines for new cropping systems and new practices **favouring** the expression and management of **biodiversity**
- Development of **innovative autonomous solutions** for monitoring / diagnosis / **targeted actions** for new crop systems with high spatial and temporal heterogeneities (e.g. combined crops)
- Development of robust and proven technological solutions that provide the required levels of users confidence



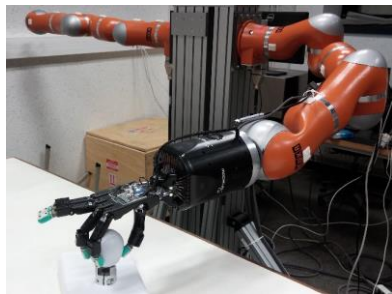
3- Existing means & new infrastructures within the platform

1 - Agricultural Robotics & Vehicles / (Off – Road)

At the partners



Rain/Fog platform



Gripping arm robot



Existing Means (some examples)

On the Montoldre site facilities



Tracks & evolution areas for agricultural vehicles (robotics or not)



Mobile platform



Laser Tracker



Drone

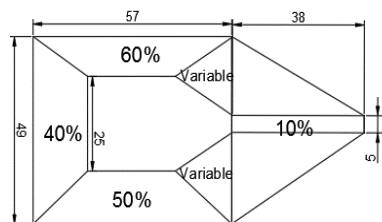


3- Existing means & new infrastructures within the platform

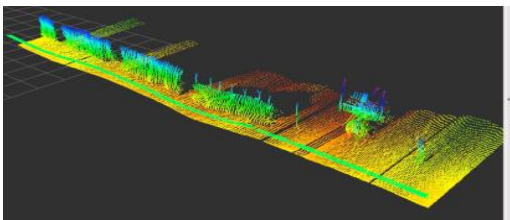
1 - Agricultural Robotics & Vehicles / (Off – Road)

New infrastructures

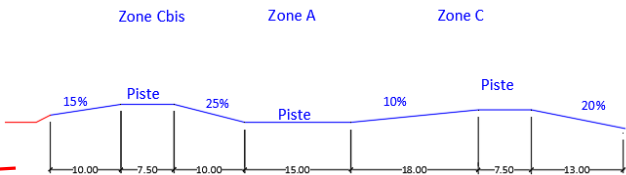
Tracks and other specific areas for robotics and off-road machines mobility



Crossing area



Artificial crop rows



Sloped profiles

Supported by the Referring Companies :



3- New infrastructures within the platform - Witness

1 - Agricultural Robotics & Vehicles / (Off – Road)

Philippe POTIER - KUHN

- Implementation of shared testing means from the beginning for this new generation of agricultural machines
- The means that have been defined are an opportunity to ensure a constant testing benchmark
- A new and complete infrastructure with its different areas
- The ability of carrying out testing in a secure and independent environment
- A possibility to more easily integrate additional participants in the projects



*CENTEOL Challenge
Soil test*



3- Existing means & new infrastructures within the platform

2 - Control of machine-soil interactions

Some challenges (Agroecological Transition & Technologies)

- Increasing the efficiency of agricultural machines to **preserve soil** resilience and sustainability
- **Minimization of impacts** (water stagnation, plant asphyxiation, structure modifications, etc.)
- Ability of machines to **reduce soil compaction** at different depths (topsoil, deep), to adapt to the soil they encounter



3- Existing means & new infrastructures within the platform

2 - Control of machine-soil interactions

Existing Means (some examples) on the Montoldre site facilities



Monoroue



SoilXplorer



3D Laser Telemeter

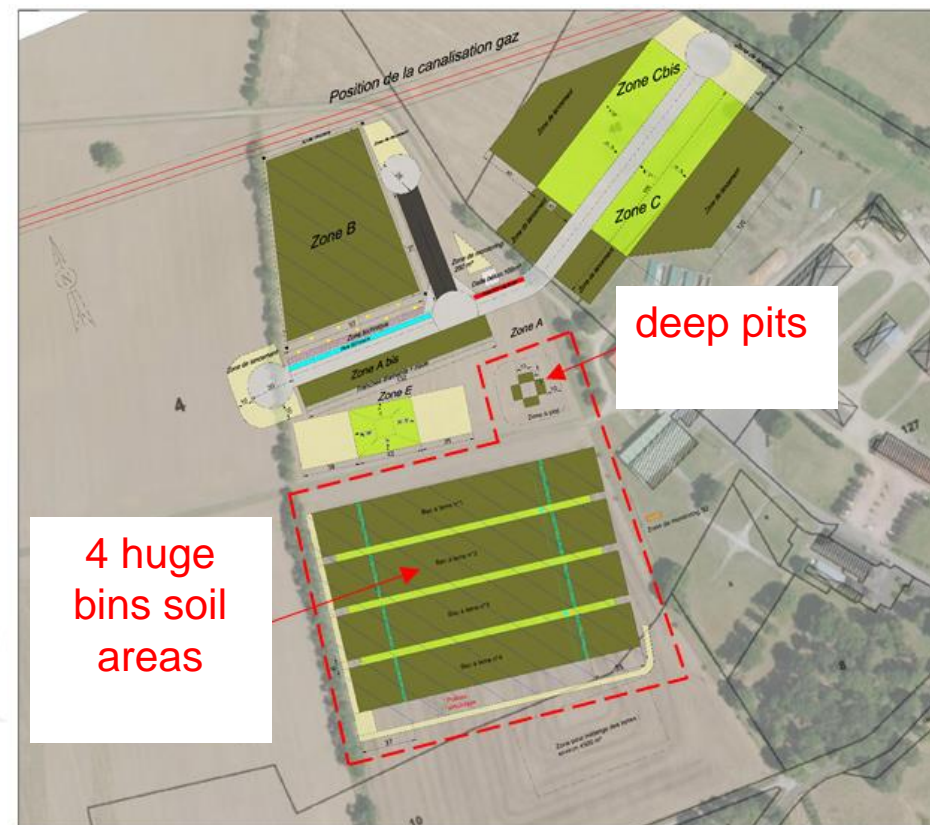
technologies et systèmes d'information
TSCF
pour les agrosystèmes

New infrastructures

Huge bins soil areas



Different rates
of clay : 7 %,
10 %, 25 % &
70 %



3- New infrastructures within the platform - Witness

2 - Control of machine-soil interactions

François PINET – MICHELIN



Traction capacity and **soil preservation** are key focus for R&D Michelin AG

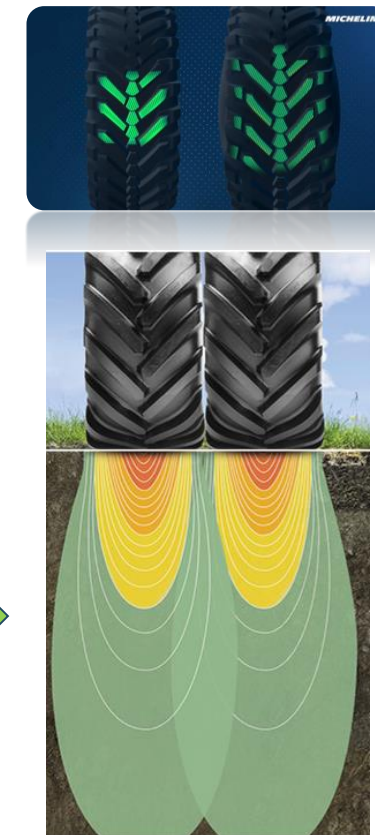
- Low-pressure standards: 20 to 40% less pressure for the same load
- Tires and tracks mobility solutions
- CTIS (Central Tire inflation System)

Testing product innovation on **different soil** at **different season** is a critical step in the development process

- 4 referent soil in the same location is a unique concept
- Permanent soil pits to measure superficial and deep compaction

Key benefits:

- **Faster** and **more efficient** testing campaign
- **Controlled** soil and environment to limit test dispersion
- **Co-testing** with other partners on the same reference location

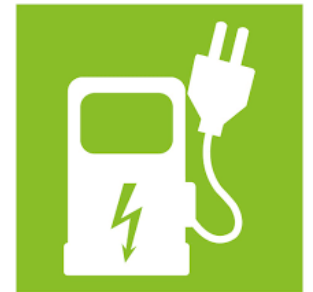


3- Existing means & new infrastructures within the platform

3 - Energy consumption and decarbonated mobility

Some challenges (Agroecological Transition & Technologies)

- Accelerate the implementation of more **virtuous energetic sources** in terms of sobriety and decarbonized mobility
- **Reduce the impact** of agricultural practices by making agricultural equipments more energy efficient (vehicles, implements, sub-assemblies of machines)
- Propose multi-criteria indicators of environmental impacts (including energy criteria)



3- Existing means & new infrastructures within the platform

3 - Energy consumption and decarbonated mobility

Existing means (some examples)

At partners



Bench test
100 kW
for fuel cell



New infrastructure

Energy Test Bench



*dedicated to small and medium power vehicles and robots

Power of machine tested

- Range : 5 à 110 kW
- Max to Hub : 35 kW

Hub torque

- Brake / Engine
- 1 à 600 daNm

Hub speed

- -450 à 450 tr/min

Energy

- Electric
- H2
- Combustion
- Hybrid
- Bioethanol
- CNG

Charging station

- Controlled charging system (EE¹)

Hardware In the Loop

- Possible interfacing with digital simulator

3- Existing means & new infrastructures within the platform

4 - New alternative weed control techniques

Some challenges (Agroecological Transition & Technologies)

- **Suppression** (/ reduce) the massive use of chemical products
- **Characterize** efficiency / **environmental impact** assessment of **alternative weed control solutions**
- Development of breakthrough solutions



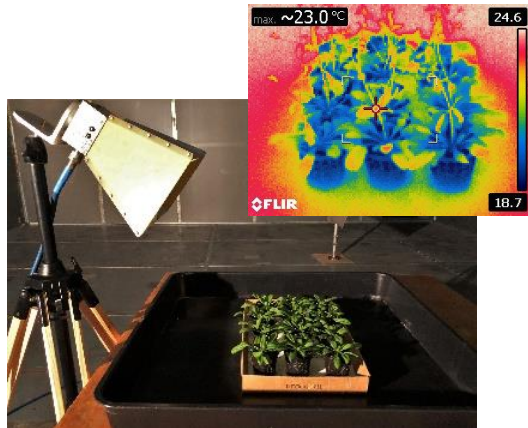
3- Existing means & new infrastructures within the platform

4 - New alternative weed control techniques

Existing Means (some examples)

At partners

on the Montoldre site facilities



Reverberant chamber
for EMC tests

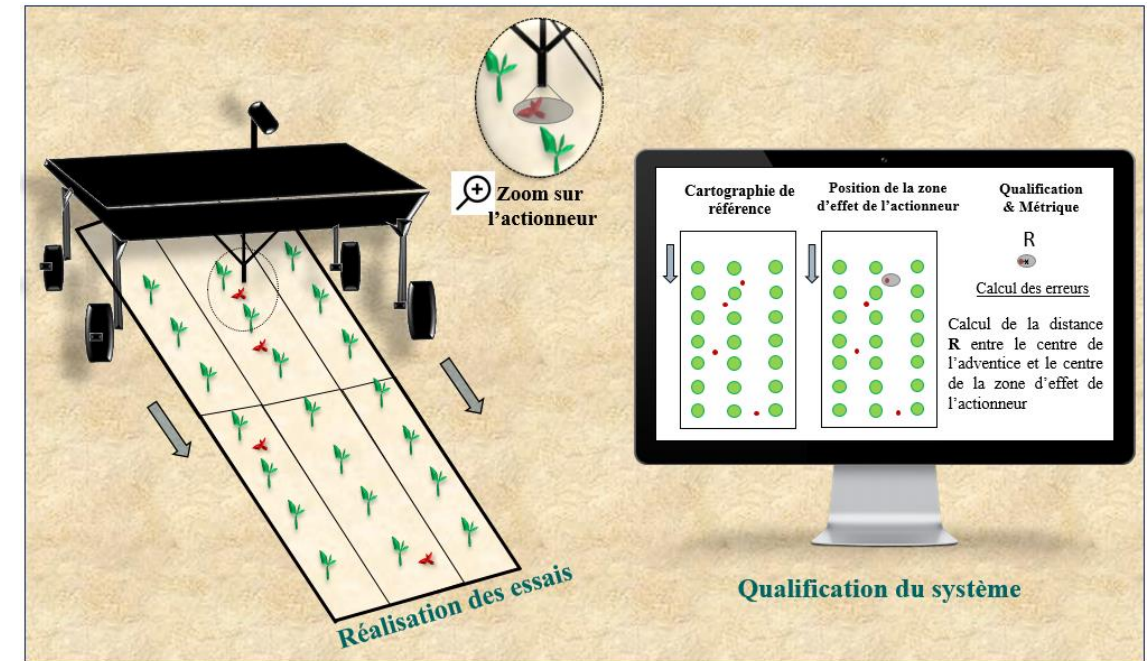


METRICS challenge



New infrastructure

Research and Test Bench for Alternative Weed Control Systems



3- Existing means & new infrastructures within the platform

5 - Technologies and services for fertilization and seeding machines

Some challenges (Agroecological Transition & Technologies)

- **Sowing several plant species** (combined on different rows or on the same row, at different densities / depths, relay crops...)
- **Localized fertilizer** application during sowing
- Ability to operate **on vegetation cover**
- Modulated intra-plot and inter-plot control according to available resources (state and nature of soil resources, water status, etc.)



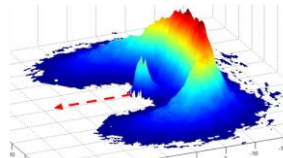
3- Existing means & new infrastructures within the platform

5 - Technologies and services for fertilization and seeding machines

Existing Means (some examples)
on the Montoldre site facilities

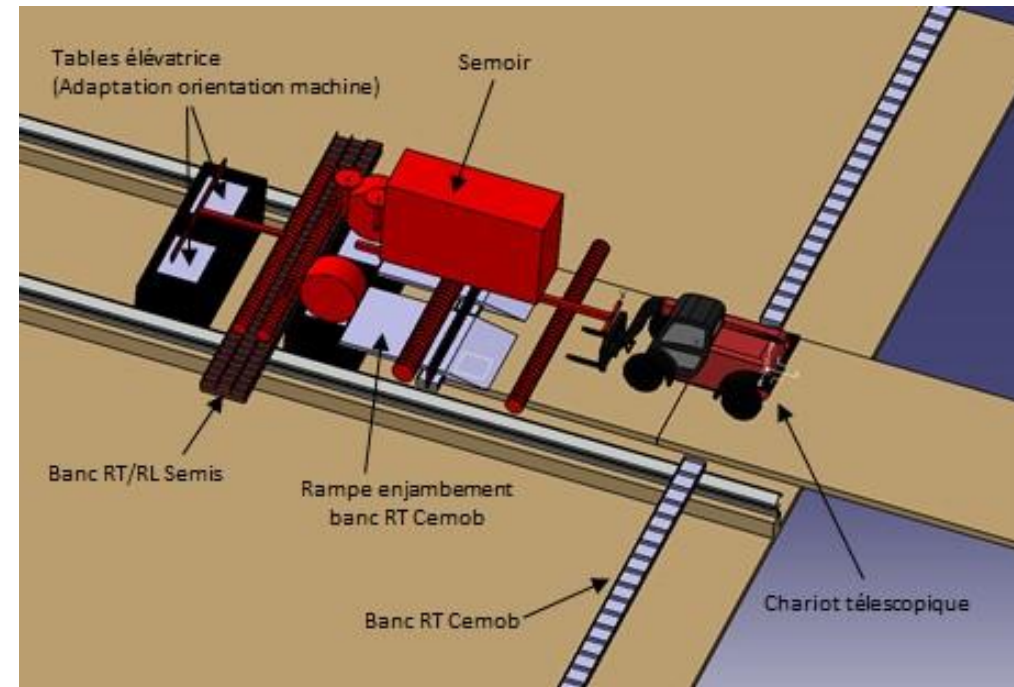


CEMIB



CEMOB

New infrastructure **Seeder Test Bench**



3- New infrastructures within the platform - Witness

5 - Technologies and services for fertilization and seeding machines

Lionel LÉVEILLÉ - BUREL PRODUCTION

- New tools to do experiences at every stage of projects.
- Tools to open some black boxes
- Modern testing facilities hybridized with simulation to reply to agro ecological agriculture
- Create collaborative research projects
- Work together in a *open innovation* way

BUREL
PRODUCTION

*Exemple of a current indoor
test bench for 4 seeds at 2
different seeds placement
(BUREL Production)*

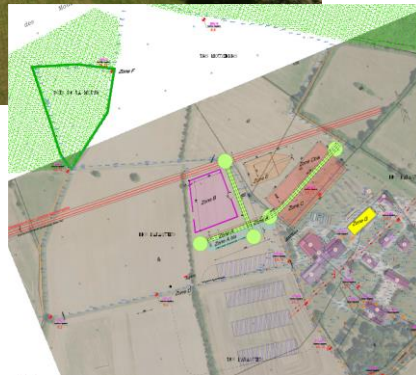


3- Existing means & new infrastructures within the platform

6 - Digital tools and environments for machine control and decision support

New Facilities

Existing and New Physical infrastructures
on the Montoldre site



Digital Twins
(Modelling and simulation tools)



All indoor and outdoor facilities will
have their associated digital twins

4- Conclusion

The AgroTechnoPôle is a platform that is :

- Supported by industrial partners (Referring Companies) through the new defined infrastructures (availability 2024)
- Already operational through several current projects
- Open & scalable platform

How to join us ? :

- Becoming a Referring Company
- Creating a partnership under different kind of projects
- Using the existing and the new infrastructures for Research / Engineering / Tests activities



QUESTIONS & ANSWERS