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# SENSORS AND DIGITAL TOOLS FOR EXTENSIVE GRAZING LIVESTOCK SYSTEMS

*Challenges and Opportunities*

**J-B. Menassol**

# Context

PLF systems are developing, supported by frequent breakthroughs in digitalization:

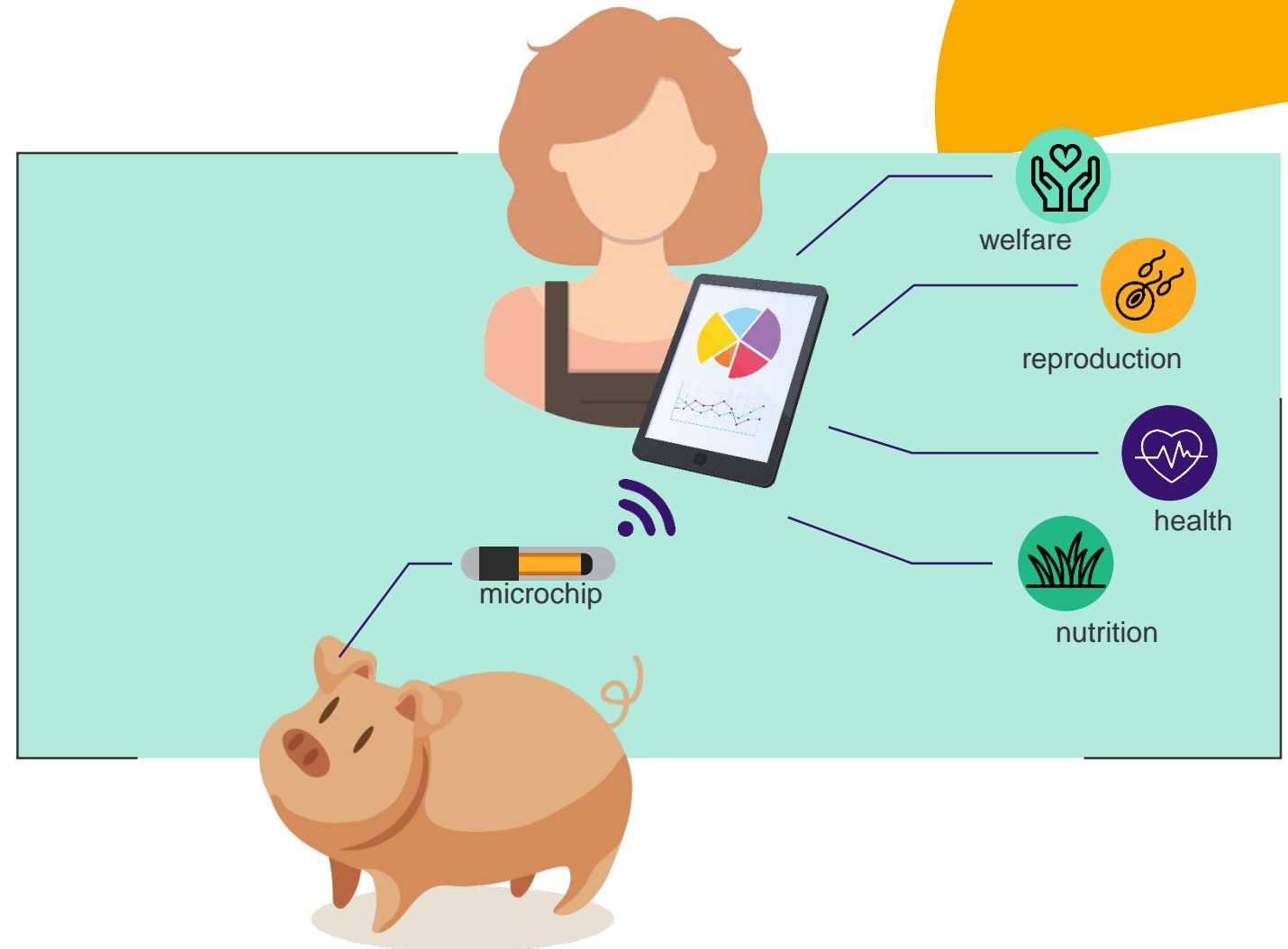
- Sensors
- Communication networks
- Data storage and analysis
- Data visualization
- Automated processes

↘ work hardness

↗ work attractiveness

↗ technical performances

Breeders are in search for a compromise between functions, price and number of animals to monitor simultaneously



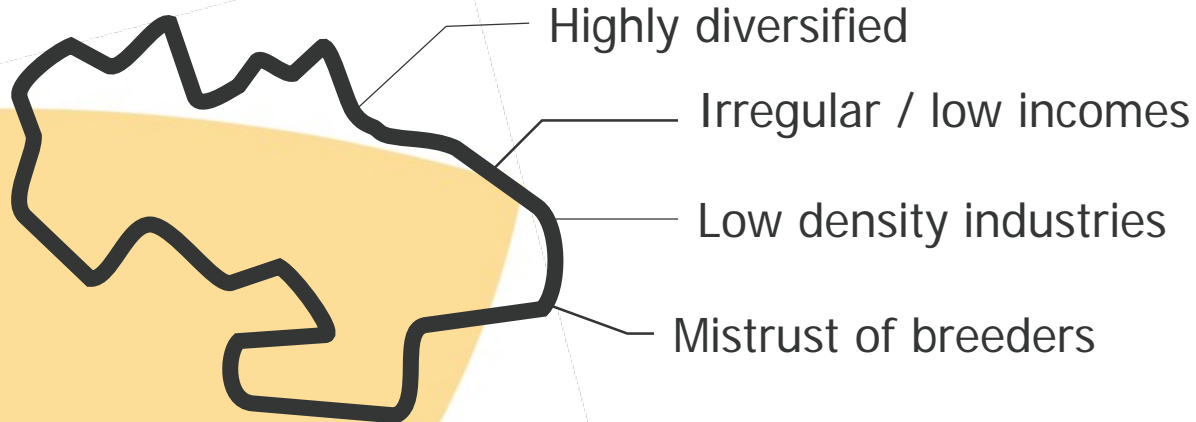
# Context

In this context, specific constraints are associated with extensive livestock farming conditions



- Large flocks
- Mobility of the animals
- Geographic isolation: low networks coverage, difficulty of maintenance
- High autonomy / storage capacity
- Environmental constraints

At a larger scale: lack of available digital tools

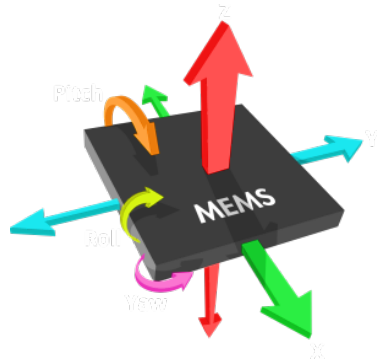


## HOWEVER

**the demand is real** with specific needs:

- Long-term localization and activity
- Land use management
- Welfare management
- Land sharing
- Domestic animals and wildlife interactions

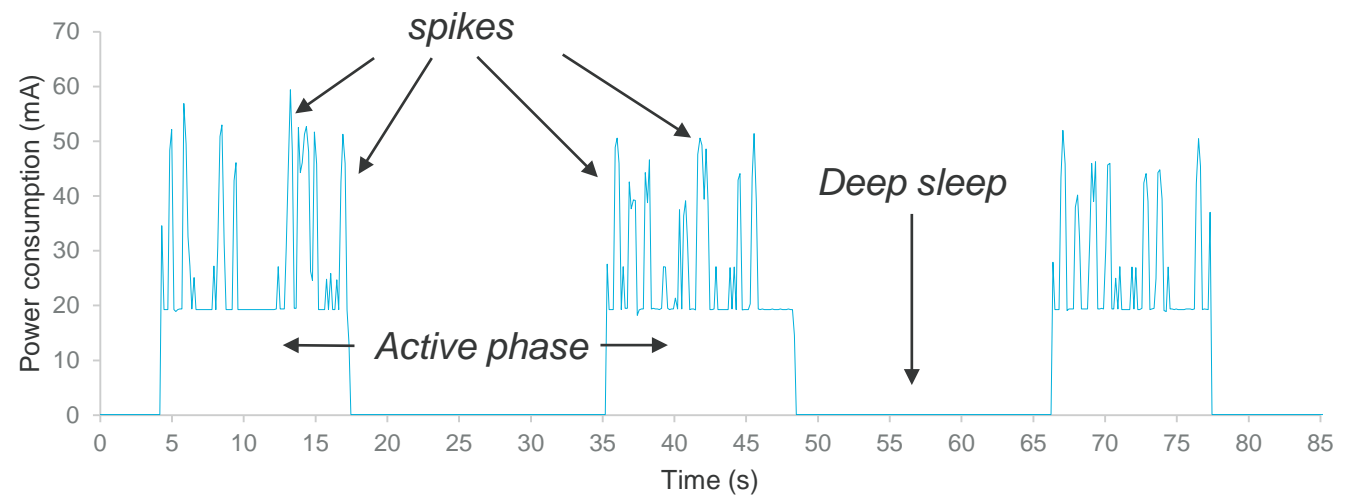
# Sensor challenges



In order to generate reliable and accurate information for the breeder:

- **Robustness** (functions, alerts, etc.)
- **Autonomy** (monitoring time, maintenance, etc.)
- **Transmission** (availability of networks, energy costs)
- **Ergonomics** (for the animal and for the farmer)

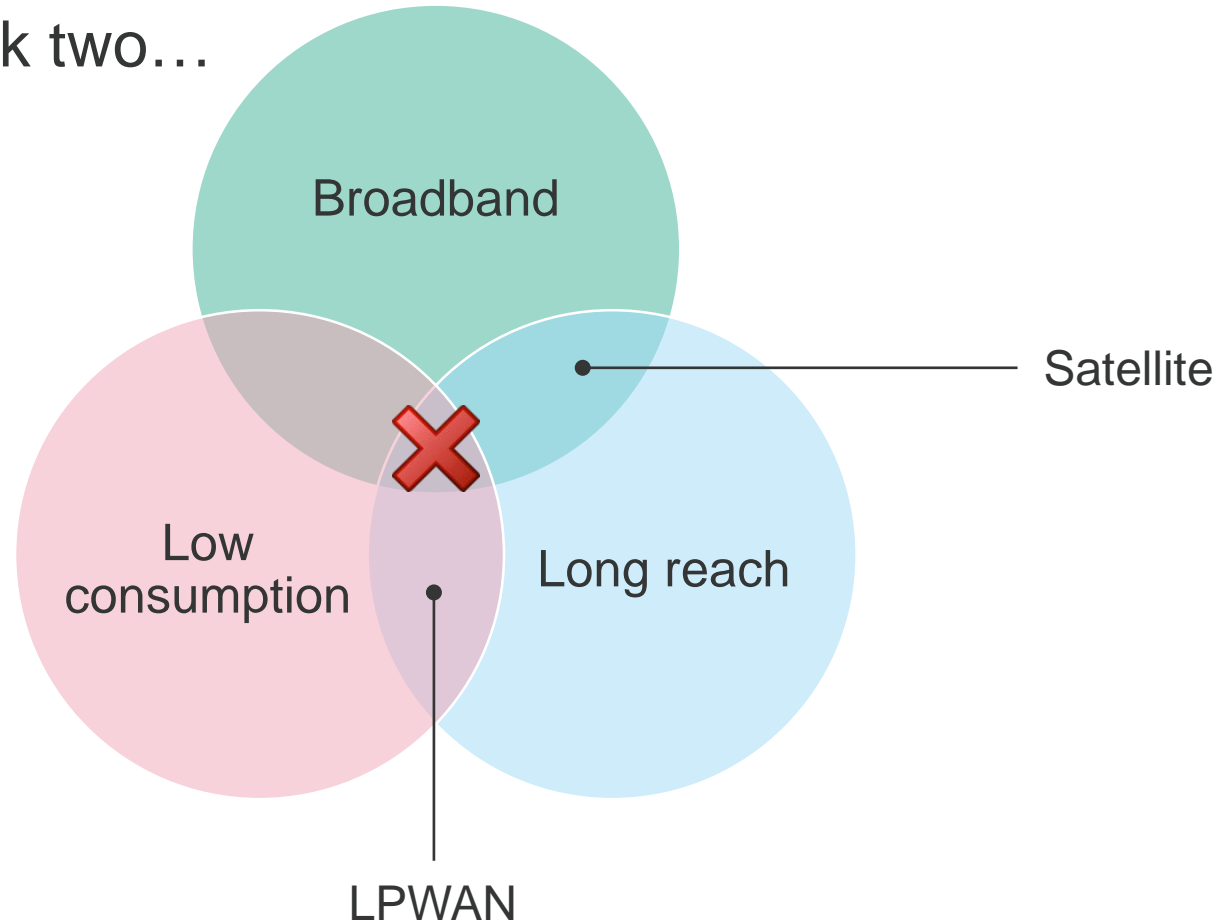
Room for optimization:



# Sensor challenges

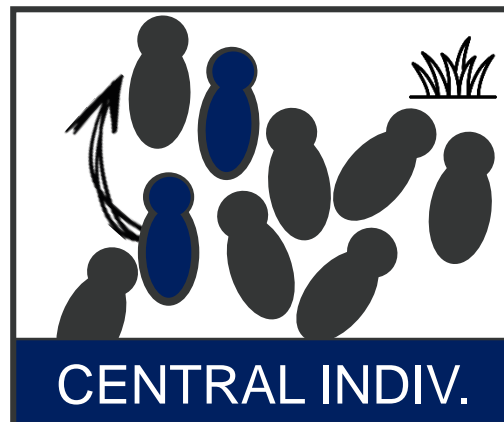
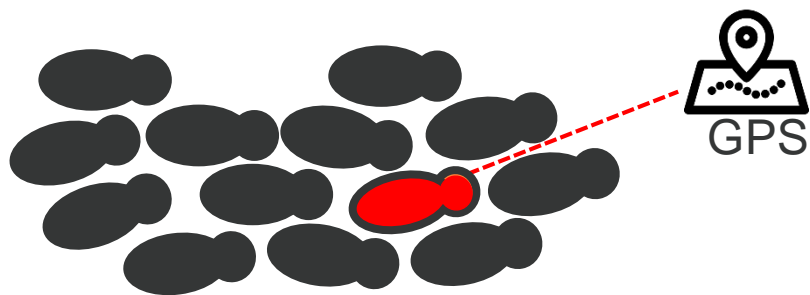
The problem of data transmission

Pick two...



# Sensor challenges

Reducing costs while maximizing robustness: monitoring representative individuals



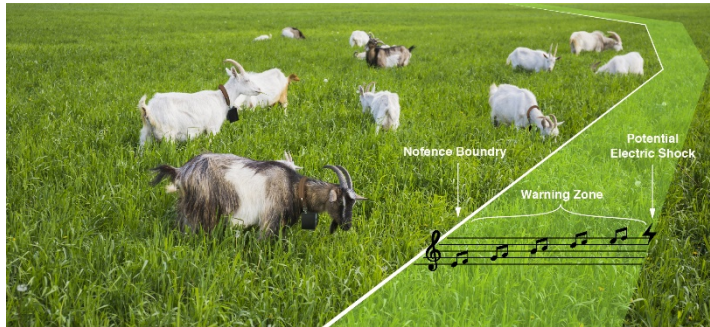
Individual taking initiatives (explorers, movement imitators) can be considered as **markers for the mobility of the flock and identified using simple behavioural tests**

The principles of **parsimony, frugality and robustness** have to be put forward as guidelines for PLF developments applied to extensive breeding conditions

# Sensor challenges

Emerging technologies are centred around the sensors

## Nofence

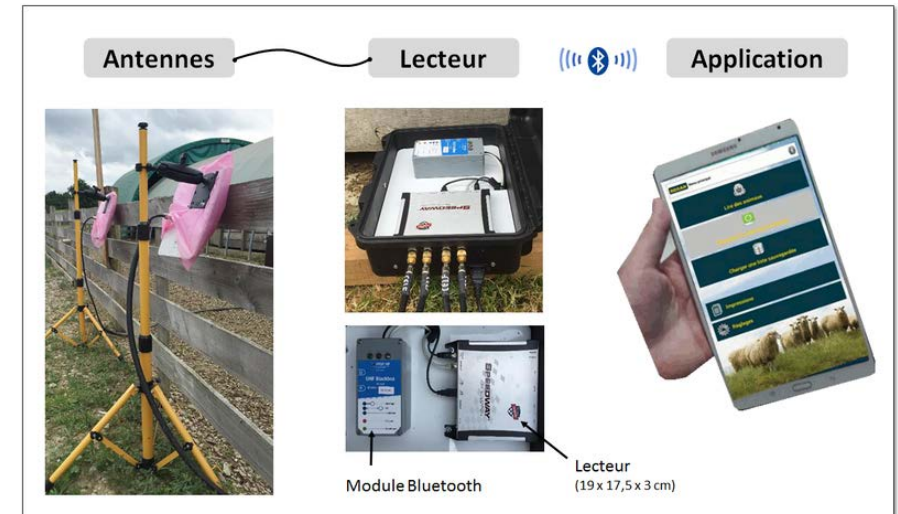


« Le berger du ciel »



<https://youtu.be/4-Z3NbtafJo>

## Broadband animal count and sorting



Idele 2016-2022

# Digital tools challenges

Mostly thematic specificities requiring dedicated algorithms:

Resource use and management

Social interactions and welfare management

...

**→ Managing complex systems (animal, human, resource, ...)  
through intelligent data processing**

One of our main challenge:

**Developing interoperability between tools to  
cross data sensors analyses**





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