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CLUB OF BOLOGNA

*strategies for the development of agricultural mechanisation*

FEDER UNACOMA
Italian Agricultural Machinery Manufacturers Federation

# 32nd Members' Meeting of the «Club of Bologna »

# *Agricultural Mechanization: Urgency for Food Security*

*12-13 November 2023*
*Hannover, Germany*

Agricultural mechanization, one of the solutions making it possible to reconcile the scarcity of agricultural land, a decline in the number of farmers and an increase in the world population in a context of climate change

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**How to produce more and better, with less people, taking account of land scarcity climate change?**

Produce more?

- Increase cultivated surfaces? => land scarcity…
- Increase yeld?
- Increase work productivity
- The competition between
  - Human/animal feeding
  - Food/non-food production

Produce better?

- Animal/vegetal proteins => modification of diets…
- Decrease use of chemical fertilizers and pesticides
- Increasing quality of life => increasing of product quality requirements
  => increasing of working conditions

Climate change and agriculture

- Impact of CC on agriculture => incremental/breakup adaptation
- Impact of agriculture on CC => carbon neutrality of agriculture?

# The levers of agricultural progress

Improvement of knowledge in agricultural sciences / agronomy
Improvement in varietal selection / genetics
Use of fertilizers
Use of pesticides
Mechanisation
- animal traction
- mechanical traction

Digitalization / Computer sciences / Sensors => precision agiculture
Robotics / Artificial Intelligence

=> Research / Innovation
=> Education
=> Extension services

# Agroecology a way to tackle the challenges

Agroecology : a framework for transition and adaptation

Combining agronomy and ecology

enhancing the self-regulatory capacities of ecosystems

allevating the pressures placed on ecosystems by human activity

⇒ Reduce use of synthetics inputs

⇒ Use of principles of ecology and functional diversity

# Agroecology at a large scale? A new challenge…

⇒ agroecological ecosystems more complex than those of traditional agriculture
⇒ need of careful management
⇒ need to know how to manage intercropping, know our soils, microclimates, microorganisms better,…

**Impossible without digital tools!**

Example of « digital twins » on farms


Crop growth view on Field Digital Twin in Akkerweb a.k.a. FarmMaps.

# Which needs of mechanization for agroecology?

Example of "*French Recovery Plan Renewal and development of agroequipment necessary for the agroecological transition and adaptation to climate change*"

⇒ A conversion bonus encouraging farms to acquire precision equipment

- ⇒ to optimize practices by **reducing the quantities used or substitution equipment to integrate alternative practices to the use of inputs**.
- ⇒ to allow investment in equipment facilitating **new practices such as that of combined crops**,
- ⇒ to allow the **improvement of the rate of plant cover of the soil** or in storage places and in logistics.

Pascal Xicluna / agriculture.gouv.fr

# Which needs of mechanization for agroecology?

⇒ sprayer equipped with anti-drift nozzles,
⇒ hoeing machines,
⇒ weeding harrows,
⇒ soil working robots,
⇒ mechanical soil working tools,
⇒ direct seeding equipment under permanent cover,
⇒ sowing equipment under cover before harvest,
⇒ stripp till to limit tillage on the sowing row,
⇒ equipment allowing sowing of combined crops
⇒ harvest sorting equipment, compatible with the development of mixed crops (wheat-peas, etc.);
⇒ equipment for spreading fertilizers, in a logic of circular economy and reduction of ammonia emissions in the air;
⇒ equipment enabling the deployment of interoperable technologies and decision support and data sharing tools (operational assistance, traceability, etc.);

Sowing companion and undersown crops in addition to the main cash crop © Amazone

# Robotics for agroecology?

⇒ Agroecology needs more precise, frequent and numerous actions
⇒ Agroecology needs less wide agricultural plots than conventional agriculture

⇒ Agroecology needs more work time than conventional agriculture

⇒ With less people involved in agricultural work a solution robotics is a solution :
  ⇒ Adaptative capabilities of robots
  ⇒ High-precision performance
  ⇒ Substitution to manual execution of complex tasks

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# Digital technology in farming

By improving production, tracking products, and cutting down on labor-intensive tasks, digital technology is now a fact of farming life.

**1** Satellites enable data transmission and help monitor individual land parcels, providing information on land use, yields, and crop development.

**2** Collars fitted with transmitters allow cows to move freely between the cowshed, the milking parlor, and the fields. They transmit information on the behavior of both individuals and the herd.

**3** Robots not only provide automated milking but also analyze the milk itself. Information on protein content, density, or the presence of antibiotics or parasites goes directly to the farmer via a server.

**4** Data on milk production levels, veterinary visits, herd numbers, and forage supplies help farmers to manage their farms.

**5** Weather stations measure air humidity, temperature, and wind strength. These factors determine the growth of meadows and crops.

**6** Guided by leaf colour, robots identify whether a vine is diseased and apply targeted spraying.

**7** Robots follow pickers during harvesting for fruit and vegetables, relieving them of their loads.

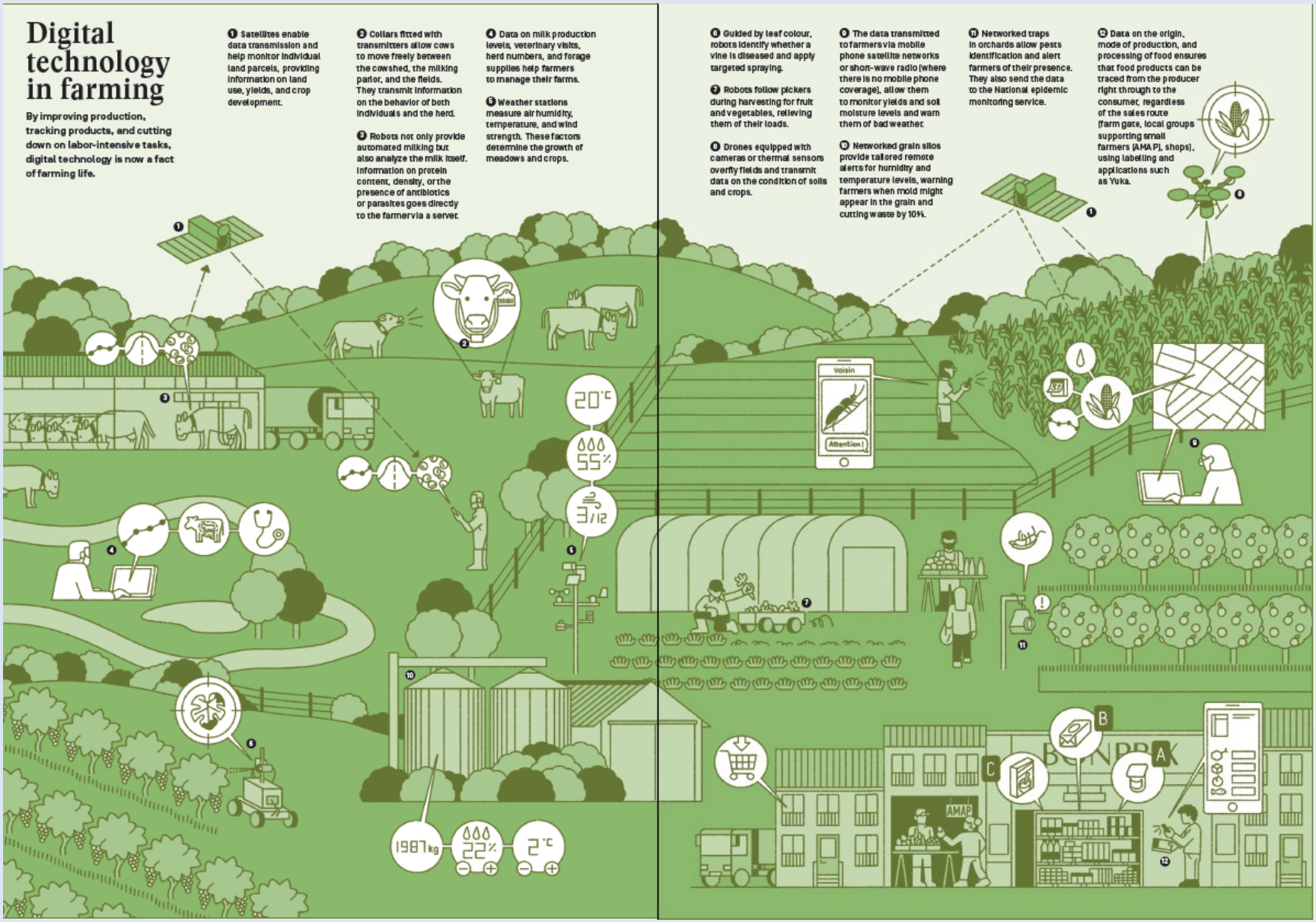
**8** Drones equipped with cameras or thermal sensors overfly fields and transmit data on the condition of soils and crops.

**9** The data transmitted to farmers via mobile phone satellite networks or short-wave radio (where there is no mobile phone coverage), allow them to monitor yields and soil moisture levels and warn them of bad weather.

**10** Networked grain silos provide tailored remote alerts for humidity and temperature levels, warning farmers when mold might appear in the grain and cutting waste by 10%.

**11** Networked traps in orchards allow pests identification and alert farmers of their presence. They also send the data to the National epidemic monitoring service.

**12** Data on the origin, mode of production, and processing of food ensures that food products can be traced from the producer right through to the consumer, regardless of the sales route (farm gate, local groups supporting small farmers (AMAP), shops), using labelling and applications such as Yuka.



# In developing countries?

**MecaWAT (Mechanization and Work in Agroecological Transitions).**
In three countries : Ivory Coast, Benin and Ghana),
structured around three objectives:

1. Analyze practices and understand the organization of work and mechanization at different scales to identify the constraints to the implementation of mechanization and agroecological systems, as well as the needs;
2. Identify innovations, co-design and experiment with mechanized technical solutions facilitating the implementation of agroecological routes;
3. Contribute to the establishment of an ecosystem favorable to mechanization accompanying the agroecological transition.

# Conclusion

**The main challenge of agriculture : feed the planet in a changing and uncertain environment**

Mechanisation is a part of the solution to tackle the challenge

- Digitalization
- IA
- Robotics

Possible ?

- education
- acceptable cost of the access to the technology