



Taking advantage of responsible digital for sustainable livestock farming systems

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The European day of digital agriculture

Trends, opportunities and use at EU level



Boosting innovative Digitech Value chains
for Agrofood, forestry and environment



Taking advantage of responsible digital for sustainable livestock farming systems

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Challenges for livestock farming systems

- Economic and political context
- Increasing demand for animal products (in the world)
- Intensification of production
 - Larger farms -> more animal / farmer and less time available / animal
 - Increasing productivity of animals and work
- Environmental impact
 - Energy consumption
 - Feed production
 - Excretion / emission of pollutants
- Increasing concerns about animal health and welfare
- New demands and views of livestock farming by consumers and society
- Social expectations of farmers (workload, attractiveness)



Evolution of livestock farming system

- **Growing importance of agroecology**
 - aims to stimulate natural processes to design agricultural systems that are weakly artificialized, productive, environmentally friendly, and less dependent on chemical inputs (Dumont et al., 2018)
- **Five principles to extend and apply agroecological concepts to livestock farming systems (Dumont et al., 2018):**
 - adopting management practices aiming to improve animal health,
 - decreasing the inputs needed for production,
 - decreasing pollution by optimizing the metabolic functioning of farming systems,
 - enhancing diversity within livestock farming systems to strengthen their resilience,
 - preserving biological diversity in agroecosystems by adapting management practices
- **“One Health/One Welfare” concepts**
 - Animal health and welfare considered in a holistic approach integrating animals, humans, and their environment, and across scales (local, national, and worldwide)

General digital evolution

- **Revolution in digital new technologies**

- In society in general
- In agriculture



- **More and more advances electronic systems (wearable, autonomous, reactive)**

- IoT, connected objects
- Robotic / cobotic
- Virtual / augmented reality
- Data and information flow / Big Data



- **Methods for data analysis (high throughput , dynamic, AI, machine learning...)**



“

*How to combine these concepts
and technologies for sustainable
livestock farming systems?*

Decreasing the inputs needed for production

- Importance of environmental impact of animal feed production
→ improve efficiency of feed utilisation to reduce inputs in livestock systems
- Identification (RFID), connected weigh scales, milking robots, automatic feed dispensers... as support for precision feeding
= individual and daily adjustment of feed quantity and / or composition to individual nutritional requirements

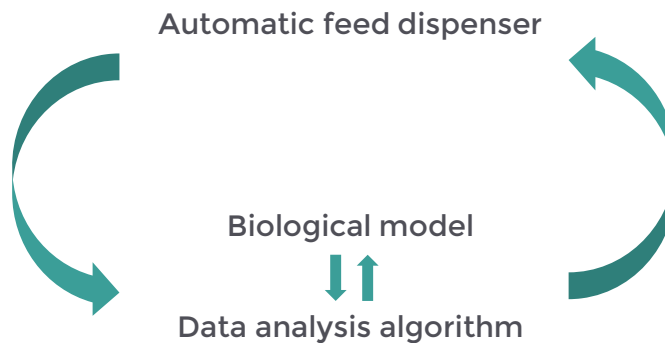


Lelty



Decreasing the inputs needed for production

Example of precision feeding in sows



- Adaptation of feed composition depending on reproduction performance, feed intake, body composition... in gestating or lactating sows

➔ *reduction of 18.5 and 9% of nitrogen and phosphorus excretion and of 4% of feed cost per gestation*

Integrated management to improve animal health and welfare

- Integrated management of farm animal health:
 - ➔ needs knowledge on
 - local environment
 - physiology and behaviour of animals
- Digital tools, based on a combination of various sensors, can be used to improve the acquisition, management, processing, and sharing of a complex information (different criteria, scales) in support to action, depending on algorithm quality
 - Assistance to improve prophylactic and curative treatments
 - Early detection of disease or welfare issues
 - Improvement of quality, quantity, targeting of treatments

Integrated management to improve animal health and welfare

- Panel of digital solutions to acquire measures to be aggregated
 - automates such as feeders, scales, milking robots...
 - wearable sensors (accelerometers, internal sensors...)
 - machine vision
 - sound analysis



- To be adapted to purposes and characteristics of livestock system
 - for all systems: concerns on disease, heat stress...
 - pasture based systems: undernutrition, parasitism...
 - indoor production: postures, interactions between animals...
- While avoiding overmedication and ensuring confidence in tools

Well-being of farmers

- One health / One Welfare includes wellbeing of farmer
- Automates, robots and sensors can allow farmers to save time by replacing physical tasks, simplifying monitoring while bringing flexibility and reducing stress through anticipation



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www.pellon.fi



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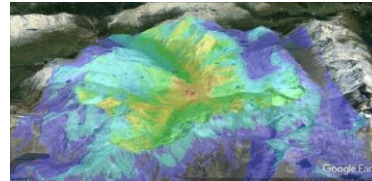


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- Changes in relationships with animals positively or negatively depending if saved time is reported to animal care
- Changes in the farmer's job
 - More attractive (new tools and skills, modern image)
 - Mental load regarding complexity, alerts, breakdowns
 - Loss of some skills and content if less close to animals...

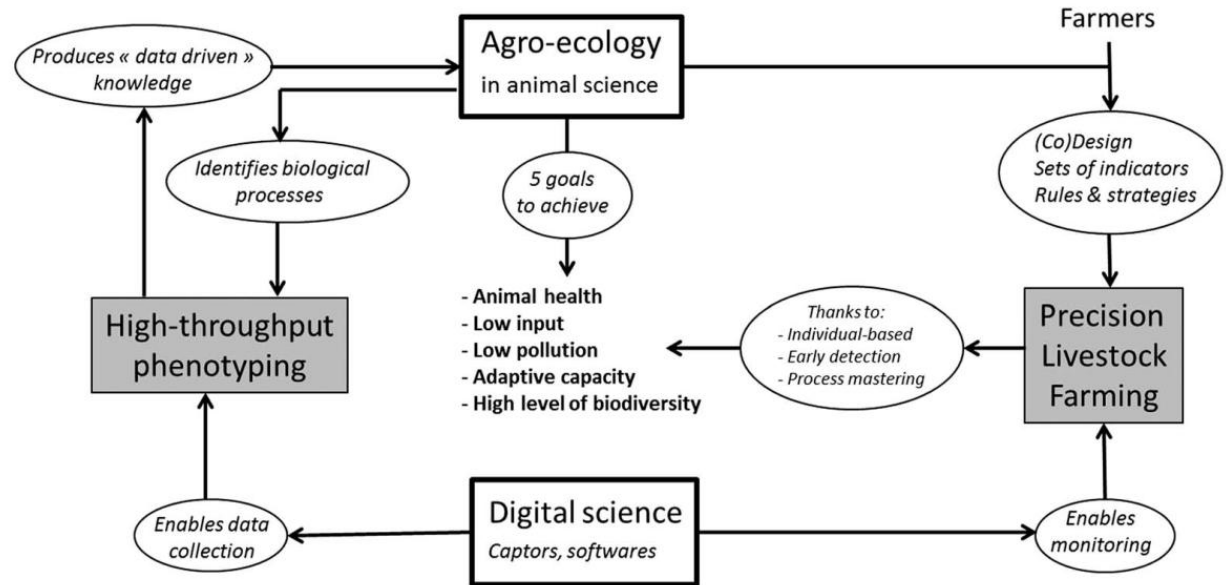
Digital for a diversity of livestock farming systems

- More freedom for animals with outdoor access in livestock farming systems changing towards agroecological concepts
→ *digital can help to continue to monitor animals and to understand effects of this evolution on welfare, health... (e.g., accelerometers, GPS, pedometers)*
- Mountain farming, pastoralism can benefit from such devices to help simplifying labor, monitoring and protect animals, managing resources (e.g. virtual fencing), traceability of products



Conclusion

*Digital as a support but not a driver
for agroecological transition
in livestock farming systems*



Ingrand et al., 2018

Conclusion

*Digital within agroecological livestock farming systems:
a balance to find between
positive internalities and negative externalities*

- **Possible limitation of sustainability of digital solutions**
 - lack of interoperability, risk of standardization (technics, animals...)
 - negative environmental impacts (extraction, waste management...)
 - resource consumption (electricity...) and limitation of resources (raw materials for plastic, electronic components)
 - costs/benefits for farmers
- **Potential for effective use to assist inputs and management at different scales (animals, waste production, market...) while being compatible with agroecology concepts)**

➔ *The integration of digital tools within agroecological livestock farming systems should be considered by taking into account this balance*

Thank you!

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