

## Digifermes®: A laboratory for digital technologies

Focus on the Boigneville and Saint Hilaire en Woëvre Digifermes®

*Delphine Bouttet (1), Pascaline Pierson (2)*

*(1) ARVALIS Institut du végétal, Boigneville Digiferme, France*

*(2) ARVALIS Institut du végétal, Saint Hilaire en Woëvre Digiferme, France*

[d.bouttet@arvalis.fr](mailto:d.bouttet@arvalis.fr); [p.pierson@arvalis.fr](mailto:p.pierson@arvalis.fr)

<https://www.facebook.com/digifermes/>

Twitter: @digifermes

### **DIGIFERMES®: A laboratory for digital technologies**

Agriculture lends itself perfectly to the application of new digital technologies. Given the growing number of initiatives and connected tools and services available to producers or under development, ARVALIS Institut du végétal, in partnership with other research institutes ACTA, IDELE, ITB and Terres Inovia, decided to transform two of its experimental farms (Boigneville, near Paris, and Saint Hilaire en Woëvre in north-eastern France) into DIGIFERMES® (a certification scheme created in 2015). The DIGIFERMES® project is based on a collaborative approach and is open to digital technology companies, start-ups, as well as agricultural organisations.

The Institute and its partners test and assess those technologies under real conditions, with a common ambition: identifying innovations that help to improve the technical, economic, environmental and societal performance of farms. The first results are now available. Some technologies are operational and useful, while others require substantial improvements. The knowledge acquired on those experimental farms helps to improve existing solutions, as well as to develop new ones, with the intention of seeing a massive uptake from farmers and their advisors.

Through an approach focused on open and participative research involving as diverse a set of situations as possible, the Digifermes® certification is open to other experimental farms demonstrating that they carry out significant work in the digital field. Therefore, after inaugurating the first ovine Digiferme® (the IDELE Le Mourier farm in central France) in June 2017, a new call for applications was launched in November of the same year.

## INTRODUCTION

New digital technologies are designed to help farmers gain a better understanding of their farm and its environment, which is the key to refining decisions and ultimately enhancing performance. DIGIFERMES® experiment and assess those new technologies in real situations. Every technology that is implemented must help to improve all aspects of farms' performance, by helping them to become more reactive in an increasingly variable meteorological, economic and societal context. They also evaluate increased user comfort and the role played in ensuring animal well-being. The benefits and operationability of digital technology have been confirmed in various production contexts: in different regions, in conventional and organic systems, and on mixed farms as well as arable ones.

## 4 MAIN THEMES

The national Digifermes® steering committee defined 4 main areas of work for 2017–2020, with a common objective of improving all aspects of French farms' performance.

### **Theme 1 Tactical management: Digital solutions to facilitate crop operation management during the season.**

Managing a farm means taking many decisions in line with long-term objectives (also called strategic decisions), as well as taking some relating to immediate technical actions during the season, as part of crop management (also called tactical decisions).

This theme focuses on all aspects of tactical management: digital solutions to help day-to-day decision-making, including regarding animal husbandry (health, reproduction, etc.), and management of crop operations during the season (sowing, weed and diseases control, fertilisation, irrigation, harvest, and storage).

"Connected" weather stations are currently being tested (various brands). Data quality and reliability are being examined by comparing outputs from decision support tools such as MILEOS® and PREVILIS® (control meteorological data vs meteorological data from the "connected" station). Connectivity, transmission in real time, and data continuity are also areas currently under scrutiny. Ultimately, those connected and increasingly affordable stations could improve the spatial quality of meteorological data and therefore refine the output of agronomic models.

Field sensor prototypes in the shape of "connected" poles are being examined as part of the European H2020 "Internet of Food & Farm" project, in partnership with Bosch, Hyphen and Orange. The aim is to improve, within the next three years, management support services relating to the water comfort and nitrogen status of a parcel.

The data produced by those sensors, used in real time, will help to refine the parameters used by existing models.

Weed localisation tests using drones were carried out on maize crops in Saint Hilaire in 2016 and 2017, and at the intercropping seasons in Boigneville in 2016. They highlighted the fact that this type of service is not advanced enough yet to develop precision spraying solutions. Weed detection and image processing will need to improve and to be linked to a crop growth stage that helps to remove competition. Considering the technologies involved, this service will only apply to the intercropping season and to row crops.

Grass biomass estimation tests through satellite image analysis are being carried out at Saint Hilaire (2017) in order to optimise grazing management and help livestock farms achieve protein self-sufficiency.

A study of temperature, ingestion, activity and calving monitoring sensors is helping to monitor animal health in real time (Saint Hilaire 2017), in order to give the farmer a preventative warning.

### **Theme 2: Digital agricultural equipment**

The aim of DIGIFERMES® is to provide a "playing field" for agricultural equipment and the digital services linked to it. The focus here is to define criteria to choose precision farming equipment, depending on the farm's characteristics, the tools' interoperability, and the variable rate treatment practices used. The DIGIFERMES® are examining digital solutions for steering and sensors on board agricultural machinery or robotic devices.

The steering quality delivered via autosteering or cameras offers new possibilities for mechanical weeding in crops where plants are close together (Boigneville 2010, 2017).

Precision spraying trials are planned for the 2018 season.

Few robotic solutions are currently available for arable crops, but a Swiss start-up's robot, Ecorobotix, is being trialled (sugar beet and oil-seed rape in Boigneville 2017, and pasture in Saint Hilaire 2017).

### **Theme 3: Strategy and economy of a digital farm**

DIGIFERMES® are real size experimental farms, managed using tactical and strategic decision support tools.

System and solution performance are assessed against multiple criteria (SYSTERRE®). This has revealed that by combining the decision support tools that are available, the DIGIFERMES® have achieved significant technical, economic and environmental improvements.

### **Theme 4: Data production and utilisation**

The use of different sensors on a variety of vectors (smartphone, poles, agricultural machinery, animals, input containers, drones, satellites, etc.) will increase the amount of data produced on farms.

DIGIFERMES® share a common objective: to help producers utilise their own or external data in order to optimise their decisions. Successful farm management using digital technologies requires simple data acquisition, in real time and with total transparency, with producers remaining in total control of the choices they make.

Primary data capture or its re-inputting form an integral part of a farmer's daily life if he uses a field management package or decision support tools. Axe-Environnement's Key Field system is being tested (Boigneville 2016; 2017) in order to avoid having to enter plant protection treatment information, and ultimately to reach "0 data capture".

The management of those farms highlighted the current lack of a unique interface that would make the task easier at a global farm level. This led to the launch of the "Tableau de bord connecté" (connected dashboard) project, a free and open source initiative designed to bring together various data sources: IOT, DSTs, market information, technical messaging, social networks, etc. (specifications drawn up by Bordeaux Science Agro's and AgroSup Dijon's Information System Management students).

The flow of data within the farm makes its data information system more effective, but sharing this data outside the farm would enhance its usefulness by benefitting a whole community (of advisory organisations such as cooperatives, merchants, regional Chambers of Agriculture, and research entities). The MULTIPASS project was designed to help farmers to confidently share their data if they wish to do so, by guaranteeing its safe management at all times. This complicated issue is currently the subject of much debate.

## CONCLUSION

On the Saint Hilaire and Boigneville DIGIFERMES®, Arvalis and its partners test and assess connected tools under real conditions, with a common ambition: identifying innovations that are useful to farmers. The first results are now available. Some technologies are operational and useful, while others require substantial improvements. The future democratisation of those technologies as their prices become increasingly affordable added to the ease of use making them accessible to all farmers will form the basis for the digital revolution coming to our rural areas.

Through an approach focused on open and participative research involving as diverse a set of situations as possible, the Digifermes® certification scheme is open to other experimental farms demonstrating that they carry out significant work in the digital field. Therefore, after inaugurating the first ovine Digiferme® (the IDELE Le Mourier farm in central France) in June 2017, a new call for applications was launched in November of the same year. The development of the DIGIFERMES® network will offer new opportunities to quickly find solutions that meet the current and future needs of French farmers, by showcasing the technologies that will help to improve all aspects of French farms' performance.

## BIBLIOGRAPHICAL REFERENCE

- Bouttet D., Pierson P. (2017). Digifermes : un laboratoire des technologies numériques (446), 38-39
- De Solan D., Deudon O., Leprince F. (2017). L'internet des objets impacte tout le secteur agricole (446), 42-45.
- Desbourdes C., Métails P., Chavassieux D. (2017). L'automatisation à le vent en poupe. Perspectives Agricoles (446), 46-49.
- Fountas, S. (2017). SMART-AKIS: European Agricultural Knowledge and Innovation Systems towards innovation in Smart Farming. Agri Innovation Summit, Lisboa.
- Isaac H., Pouyat M. (2015). Les défis de l'agriculture connectée dans une société numérique. Renaissance numérique: Livre blanc. 106p
- Lauga B. (2017). Un tableau de bord pour un pilotage plus efficace (446), 40
- Lauga B. (2018). Faire émerger de nouveaux services pour l'agriculteur dans une chaîne de confiance gérant les consentements d'accès aux données des exploitations. PHLOEME Conference, Paris.