

New trends in data capture and exchange solutions between farms and external partners: the French situation

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Abstract

Data bases are resources for many activities dealing with cattle, including for the farmer himself. Several kinds of solutions are being used for getting cattle data from farms and sending them to external data bases, according to the way they are recorded: periodically (e.g. monthly) by a field technician, or at random moments by the farmer, or continuously by automated milking system or by sensors.

These solutions include: On farm recording and sending, through portals, or by hand held smart devices, File transfer through FTP and Web services.

The paper describes new trends in solutions for capturing and exchanging data at the French level. It describes also the French contribution, in the frame of ICAR, for standardizing data exchange with equipment from every manufacturer, on an international level.

The combination of the solutions used, let the way open for exchanging a wide range of data, and further to build big data.

Keywords: B. Balvay, information system, data exchange, web service, IT....

Introduction

Structure of French breeding of ruminants changed drastically in last years. Number of holdings decreased of around 40 % since 2000 in the three species while average size increased by 60 % for cattle and doubled for sheep. This evolution came along with a strong increase of technological level of breeders in terms of desk computerization, use of automatized equipment (> 3000 milking robots for cattle in 2012), smartphones and sensors. This last equipment is potentially an extremely rich source of data.

This specialization also concretizes in exchanges with more and more technical partners and increasing implication in collective systems of data recording which can be compulsory or voluntary.

Consolidation of all data generated on field, no matter which actor has collected them (automat, breeder or technician) and which IT system they are recorded by, brings a big added

value to the breeders in herd management in particular by calculation of references or genetic values.

To this purpose, data exchanges from and towards holdings must be as effective as possible thanks to adapted technical solutions while staying in respect with a contractual frame dealing with rights and duties of each other. Several projects and realizations which illustrate this search for efficiency were set up by breeding professional organizations.

Chapter 1: Main breeders' partners and corresponding data exchange characteristics

Various organizations work in support to the breeders and produce or use different data which recording systems are sometimes collective, sometimes private but in any case must be connected.

Sub-chapter 1.1: Public authorities, identification and traceability data

In compliance with European regulation, France has a national identification and traceability system based on breeders declarations of movements collected till a national database. Recording these data is mandatory for every breeder who owns at least one animal (cattle, sheep, goat).

Data collection is organized through local/regional databases corresponding to more or less large geographical zone.

Main data collected in this system are identity (identification number, holding of birth, birth date, gender, breed, dam number) and movement data (holding entry and exit date and cause).

National database, centralizing all the data from local data bases, is managed by government services, while local databases are under farmers' organizations responsibility. For these organizations permanent challenge about these data is to develop services to automatize breeders' declarations: from paper to computer and now to mobile devices.

Sub-chapter 1.2: Professional bodies and genetic improvement data

Several technical organizations may collect data collectively used for genetic evaluation. They are organized by activity and type of collected data: performances recording (milk or meat), insemination, parentage certification, racial data (morphology, herd-book). They send technicians on the field and record data to the national genetic information system constituted for cattle by 7 regional databases and a national database.

More and more, these bodies collect additional data which they manage in their own specific information systems.

Technicians' activity requires access to data not only collected by them but also by other families of organizations.

Challenges in terms of data exchanges inside and around these systems are many:

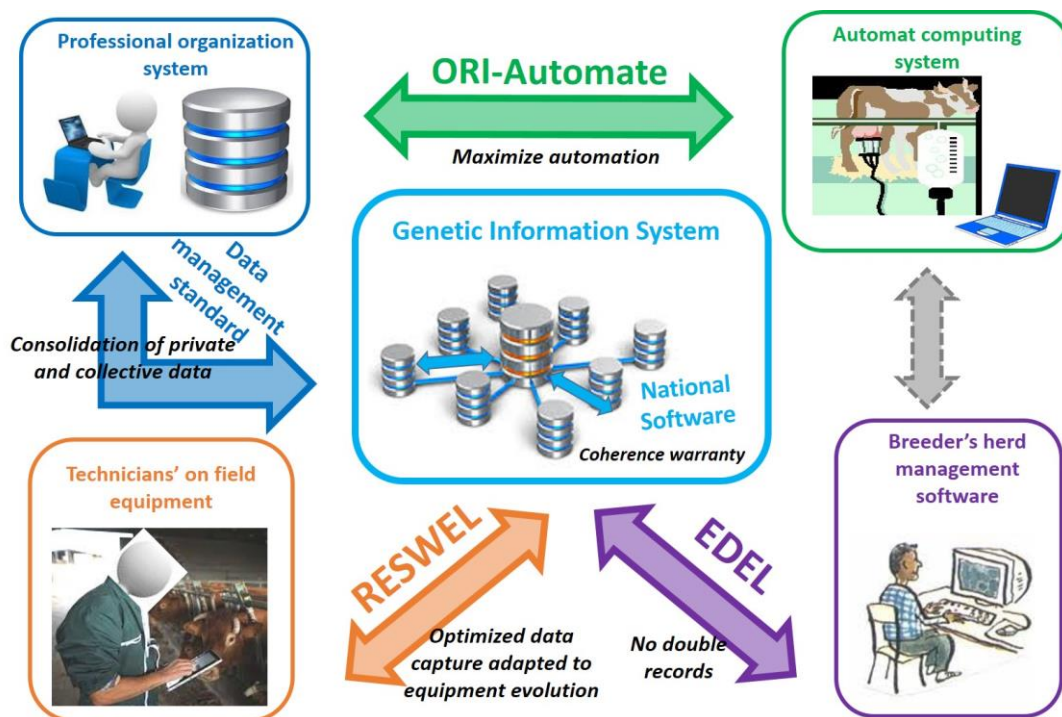


Figure 1. Data exchange challenges for Genetic Information System

Different services have been developed by French organizations to answer these challenges.

Sub-chapter 1.3: e-services suppliers and breeders Internet portals

Professional organizations gathered around IT service providers hosting regional databases, have founded e-services suppliers. They developed Internet portals allowing breeders to record not only regulatory data but also the many technical and economic data relevant to herd management.

These data are enhanced by refunding to breeders many indicators and assessments concerning their herd, and also enriched with data from reference groups.

The development of these e-services requires fluid exchange with all possible data sources on the field: computer, smartphone and controllers.

Chapter 2: Facilitating exchanges between collective databases and breeders' software: EDEL service

France Génétique Elevage, which is the national organization coordinating animal selection industry also deals with the national genetic information system. It initiated in 2009 a project to provide data exchange service between genetic information system and farmers equipped with a herd management software. This service opened with dairy performances and reproduction data for cattle and then enriched with beef performances and goat data in 2012, cattle index in 2013 and soon sheep in 2014. This service is called EDEL.

First component of the service is publishing formats for each species unique throughout the country regardless of the user.

These standard data exchange formats have been developed to meet users' needs with technical work between organizations in charge of data recording in collective system and agricultural software editors.

EDEL syntax is based on messages in .Xml format.

First version uses files exchange in FTP, but the tool for exchanging data about goats was a new step with the transition to Web-services using the SOAP format.

The second component is the development of software for each species ensuring exchanges in 2 directions.

These tools ensure the return to the farmer of data managed in the collective system for animals of his holding. Transmission is triggered on demand or automatically at each new information provided in the collective system.

For goat and sheep, the tool can furthermore handle messages provided by the breeder who can thus record himself some events such as births.

Programs realization and implementation was entrusted to IT centers hosting collective databases, "ARSOE", and the service is sold to farmers by professional organizations in charge of data collection.

Chapter 3: Exchanges and cooperation between systems via WEB services: Framework "RESWEL"

RESWEL (= Network of Web Services for Livestock)

WEB services consist on a normalized technique to make two computers cooperate. One can be in a breeder holding and the other in a partner organization.

They may be:

- Desk management computers or computers coupled with automates (for example ia milk robot). In this last case it periodically transmits milk weights to milk recording organization (MRO) and can receive insemination data from insemination organization.
- Smartphones or mobile tablets
- Enterprise servers

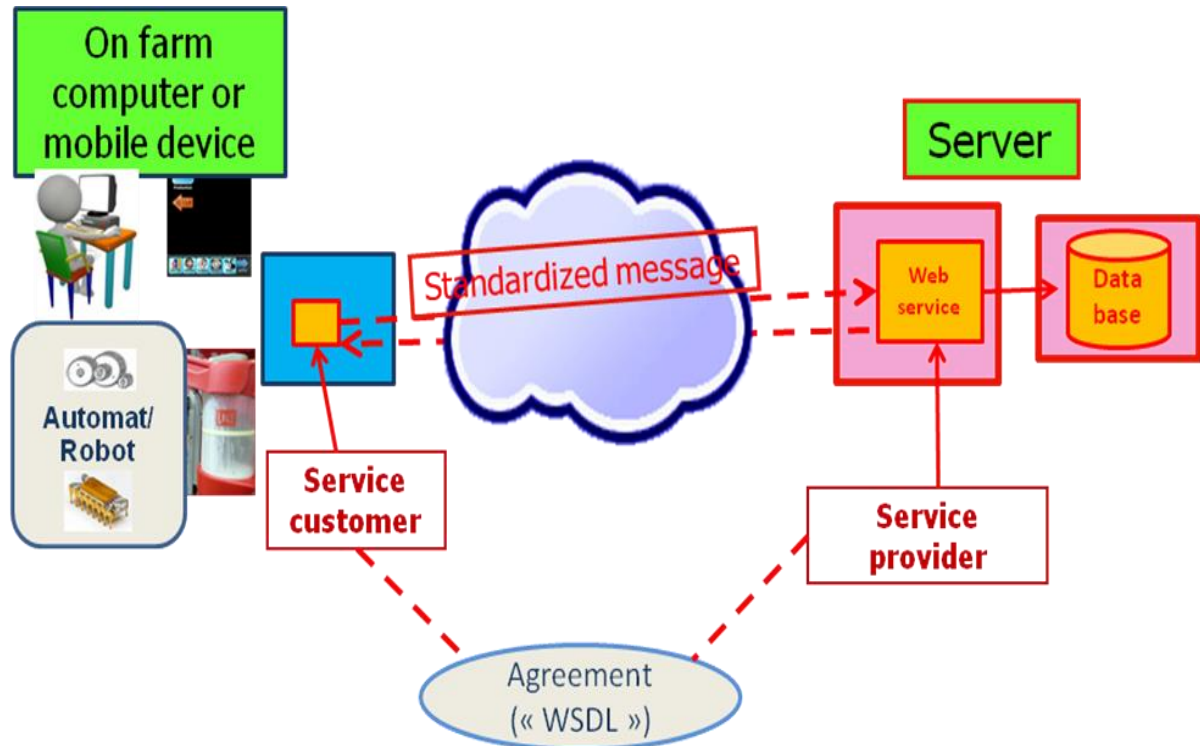


Figure 2. Global architecture of Reswel Web services framework.

Several types of organizations may supply e-services to breeders, to support them in their work. Breeders can use several types of terminals (tablets, smartphones) to call them and they wait for an immediate answer to their demands.

Then, Web Services are an adequate solution. They are implemented on "application servers" (Ex: server TOMCAT). Most of the time, these servers are connected to an animal database (Ex: genetic database).

Breeders' software are considered "customers" of the services which are called via standard Web requests (http). Example of service: Recording a cattle entry or exit in the central database.

French computer network for breeding (FIEA) established a frame (framework RESWEL), for the attention of the developers of these WEB services, and on the other hand software publishers' customers, called to call these upon WEB service.

This frame includes:

- A national quality plan for development of WEB services including SOAP format, Java language and common file naming's rules
- A mode of invocation, via a WSDL (Web Service Data Language) in standard format
- A directory service

WEB services are implemented on one of the platforms which constitutes French Computer network FIEA. The request emitted by breeder's software can be managed towards the ad hoc server by connecting in a unique URL which supports the national directory.

Chapter 4: Concrete example of an interface in link with machines: ORI-Automate

Automation in farming is booming, the demand for convergence of data exchange between herd management system and databases of Milk Recording Organization (MRO), became a necessity.

Following this, the Federation France Conseil Elevage in relation with the manufacturer of milking system, has developed an interface called ORI- AUTOMATE which exchanges data in import and export.

- From data base side:

This interface has defined an XML format to standardize the exchange with MRO database, whether import or export.

- From herd management side:

This interface uses the existing exchange format developed by each manufacturers.

- Exchange in real time:

To update Herd Management and databases, each Central Database has developed synchronization tools or gateway (WebService or FTP) for import and export in real time, new information through ORI- AUTOMATE .

Today in France:

- 500 herd management have been initialized by Ori-Automate (Importation of livestock data on new installations, milking parlor or milking robot).
- 150 herd management are connected and updated daily with Ori-Automate related MRO database.

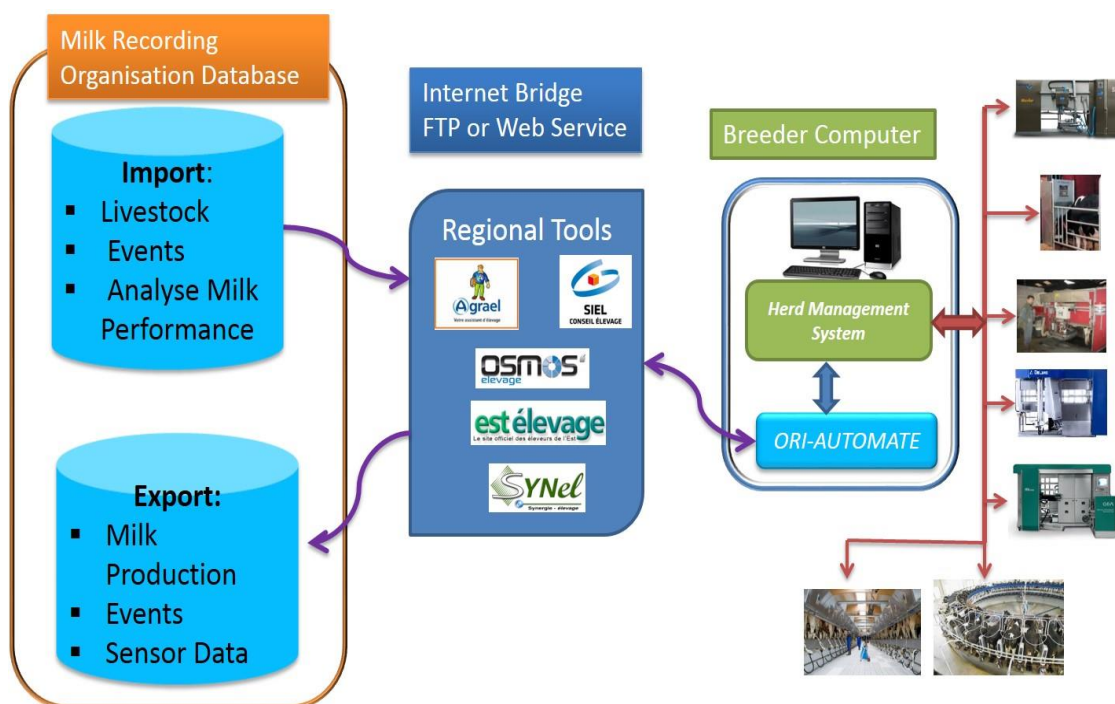


Figure 3. ORI-Automate operating scheme.

Conclusion: Standardization and contracting

Data exchange services offered to farmers in recent years by various organizations promote adoption of IT in livestock breeding and greater technicality of breeders. But new equipment (computers, automats, sensors) become always more efficient and their use is increasing. These tendencies bring automation and data management at the center of breeders' concerns.

Thus, in addition to the search for new technical solutions which are still needed, currently starting projects include more and more systematically a contractual component defining precisely rights and duties of each stakeholders about recorded data.

Finally, animals and farming equipment flowing between countries, data exchange needs exceed single French context, and must be analyzed at international level. This is the purpose of the ICAR working group "Animal Data Exchange" involved in exchange with robots and sensors.

French cattle organizations participate to this project. They are going to test the new ICAR exchange standard. They will implement the ICAR standard as soon as it is available and has been implemented on software that are used by automated milking systems.

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