Support Services to Precision Dairy Farming, Based on Data Sharing Between Collective Cattle Data Bases and Computerized Milking Systems

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For a few decades, French cattle organizations have been working with breeders to collect and valorize breeding and production data. At first, data were manually collected and directly recorded in collective information systems that were mainly dedicated to calculation of genetic value, and in a second time, to elaboration of various technical results for herd management. For at least 10 years, NTIC have been arriving in farms both in the form of personal computers and various breeding automats (e.g.milking robots, milk meters). The challenge for organizations is to adapt the modalities of data recording and data getting back to these new technologies so that farmers get the best return on their investment. To take up this challenge, organizations are cooperating with software editors and automats manufacturers.

Services to Dairy Farmers

Dairy breeders traditionally get services from various organizations realizing breeding operations (AI, sanitary treatments) which deserve to be recorded, or directly recording production data (milk recording organizations). These data are consolidated in collective databases, used for genetic evaluation and returned to breeders through periodic technical reports (e.g. on fertility, milk production, mastitis state of herd).

Adaptation of these services to NTIC began by equipping technicians with laptops that permitted them to record and process data on the farm. Then, they could give farmers immediate personalized advices, (e.g. calculating individual feed ration according milk yield, prediction of milk yield). Then NTIC allowed to us to speed up exchanges between breeders and organizations by using SMS or EDI for returning laboratory analysis results or ordering insemination for example.But now, breeders expect more from organizations, they want completely automated data exchanges between their computer or automat and the external collective system.

Data Exchanges Between Herd Management Systems and Collective Databases

Farmers equipped with a herd management software have to type in data. They have the legitimate wish to avoid double data typing. So, when data are already recorded for the collective system, they want an automatic system to feed their software with electronic messages. Such a system must transmit both elementary data, as they're collected on farm and elaborated data which historically were returned by paper. A national project (named EDEL) was set up to define standardized modalities for exchanging data between cattle databases and farm software. Under the responsibility of genetic French interprofession, the project gathers breeding organizations (milk recording, AI), computing centers and software editors.

An XML message was designed. It can transport in both direction (from the farm to the breeding organization or in the other direction) data about events occurred in the farm and milk analysis :

- Milk production data
    - test day : 24 hours individual milk yield
    - individual milking data : milking time, milk yield, temperature, …
    - milk composition : fat, protein percentage, …
    - mastitis and other health events
    - Lactation result and other elaborated data
- Reproduction data: AI, calvings

The farm system exchanges data by a FTP protocol with a central data base.

Data Exchange With Robots and Other Computerized Systems

With wide development of animal RFID, automats can link sensor captured data with animal identifier. So, more recently a second project has been set up to permit data flows in both directions: (1) to feed the robot linked computer : herd inventory, milk yield and composition and (2) to export data to the collective information system : every milking milk yield, reproduction and health events. Data received from the central data base are automatically submitted to the robot computer by using international syntax formatted requests (ISO ADIS 11787).

Two complementary ways of automating these exchanges may be pursued: developing interface software to manage diversity on one hand, looking for a standardization of the exchanged data on the other hand. Concerning this 2nd way, it is important to note that in addition of ADIS standard, most of manufacturers use different versions of ISO 11788 ADED which propose a data dictionary. Updating ADED to answer actual needs could be an effective way of facilitating automatic exchanges.
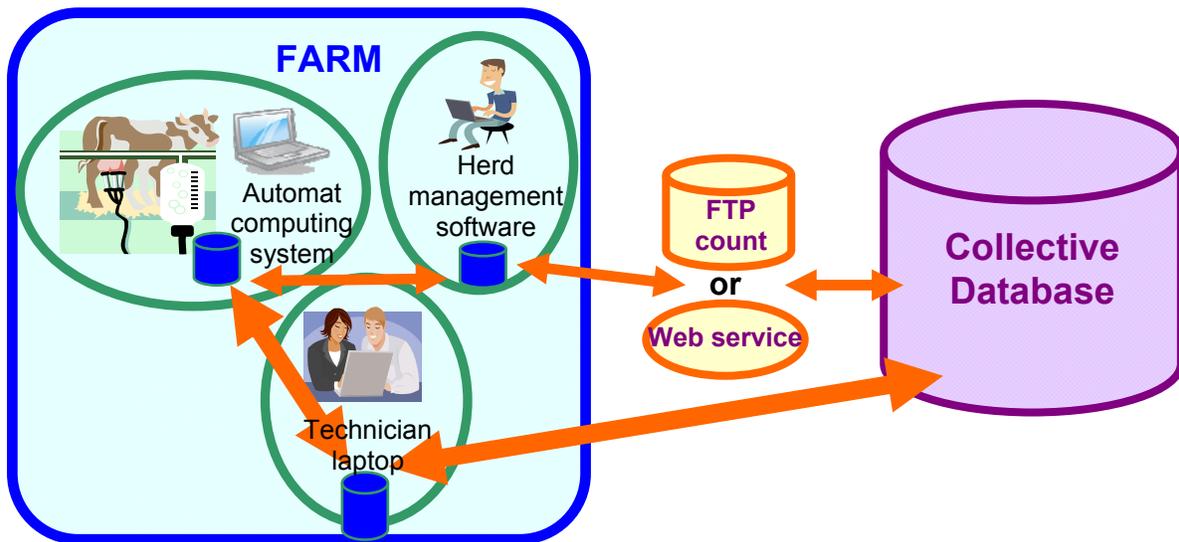
Data flows between partners

Conclusion

In such an organization, a new type of collaboration takes place between the cattle farmer and his service providers (1) he automatically sends them recorded data and orders: for instance, the IA technician may be automatically asked to intervene, when heat has been automatically detected by a sensor; (2) in the other direction, service providers send him automatically data and alerts.

The herd consultant, freed of data collection tasks, may focus on problems that require reflection and dialogue with the farmer. This synergy benefits individual and collective objectives (Cattle breeding).