Valorisation of AI data on farm by AI technicians: French experiences

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Summary

The purpose of this paper is to present initiatives taken in France in term of equipment of AI technicians to improve their capacity of valorisation of recorded AI data and to develop services to farmers. A brief description of collective valorisations of AI data at national level is also presented.

***Key words**: Artificial Insemination, AI technicians, Databases, Valorisation.*

Introduction

Artificial Insemination (AI) is organised in France as a service to farmers, provided by AI centres, companies in legal form of AI co-operatives or unions of co-operatives. The goal of this collective organisation is to provide AI service to any farmer whatever it's location on the national territory, the herd size, the breed, along with bull semen fulfilling it's needs according to it's production system. This is like a public service. In France the average number of heads by holding is relative small is the European context: 39 cows, with few small herds and few large herds. Therefore an efficient network of AI technicians, employees of co-operatives, has been set up to render services to any farmer all around the year. In average a herd owner demanding AI service gets 50-60 visits of AI technicians each year (33 1rst AI / year /herd). Therefore AI technicians are well considered as essential partners by farmers and are important relay for proposing services. As a consequence, besides AI, AI centres through their technician network, offer a large range of services according to companies' strategy: semen sale, prevision of matting including organisation of progeny testing, oestrus synchronisation and pregnancy diagnosis, infertility monitoring and reproduction improving programmes, sale of feedstuffs. AI technicians are also involved in the embryo transfer programmes offered by AI centres.

Semen units are produced by AI companies carrying out selections programmes including progeny-test on behalf of AI centres providing AI services, from bulls either on progeny test either proven with a good reliability. It should be mentioned that changes in regulation and in advanced molecular technologies (implementation of MAS) will have as consequence that bulls without progeny test but with good reliability may be proposed for AI service (major dairy breeds). At the present time

selection programmes are implemented for 16 breeds (1 000 bulls progeny tested) in order to satisfy the needs of the farmers in dairy and beef breeds. AI technicians play an important role in implementing selection programmes: test AI, breeding dam sires, collecting blood samples for various purposes.

Valorisation of AI technician work needs computer equipment

Taking the advantage of the existing network, AI centres have developed some initiatives to enhance efficiency of their technicians. Equipment with laptops computers is a part of this strategy.

Reasons for equipment

The first AI centres that decided to equip AI technicians have several goals.

- Technical reasons:
  - To record accurate AI data including official female identification for any cow (it was a new idea in the eighties), and other items to describe the act. This includes a checking process at farm level to avoid transmitting wrong data in the company's database.
  - To reduce processing delay was also a goal for a better management of companies (figures by bulls and technicians) and reproduction programmes (Non Return Rates).
  - To develop tools for farmers for a better management of reproduction and fertility issue, and then to propose new services.
- Management and commercial issues:
  - To improve administrative management at farmers level (billing, booking)
  - To get a better follow up of clients activity and to propose services
  - To propose AI services for non users.

History of equipment

A reflexion has been developed beginning the eighties to think about the opportunity to build special devices dedicated to AI technicians. But technical development made available micro-computers on the market and then the first attempts took place in mid eighties.

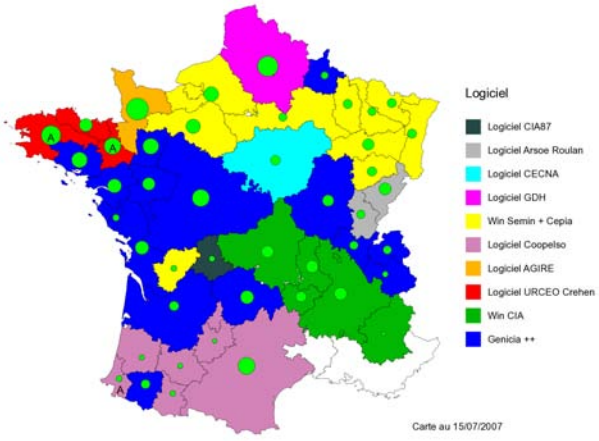
Large developments occurred when lap tops computers with enough capacity and speed became available in the nineties. Beginning the century, PDA became available: a new possibility to equip AI technicians came up.

Then the decision taken by *UNCEIA* to organise systematic reading of bar-codes on semen straws, was a strong sign to generalise equipment of AI technicians.

Today, equipment of AI technicians in on way of generalisation, with various systems and software (*logiciels*) according to companies strategy (see map below, where circles are proportional with AI activity).

Two main strategies to equip AI technicians

The data processing systems of AI centres is organised in taking into account the existence of the National Information System for Genetic Data (*SNIG*) and the National Identification and registration data base (*BDNI*). National system consist in shared software and data bases implemented on 11 computing sites to manage data before transmitting and computing breeding values at *INRA*. There are in these data bases any information coming from the herds on recording schemes (parentage, milk records, type, AI…) and identification of cattle, births and movements of any



herd. Access rights have sorted out between the ministry of agriculture and the professional bodies so that AI centres have access to these data along with their partners.

To facilitate access to any data and to organise services farmers organisations have used the "*Minitel*" developed by the national phone company (little computer terminal available to any costumer), which is an ancestor of the Internet. This has shaped the organisation of various companies and created an "electronic" culture in some regions of France.

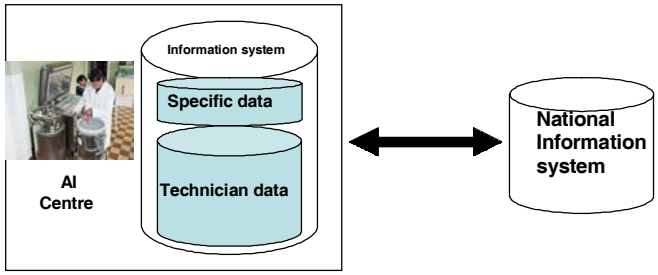
Two main strategies have been developed by AI companies to equip technicians with computers according to the envisaged role and responsibility:

- Maximum responsibility to AI technicians. Then their laptops include a large data base and software to take in charge any potential task (administrative, technique, service). It is described below as the "*bottom up* scenario".
- To secure AI data recording. Recording AI and billing is prepared at AI centre head quarter and then transmitted to AI technicians that finish recording after work on farm. It is described below as the "*bottom down* scenario".

Bottom up scenario (*Genicia* ++ on the map)

- Organisation (see scheme below)
  Farmers call AI technician who organise its daily round (1). Data base of AI technicians contains any data useful on farm: client ID, ID of female bred or not bred by AI, reproduction history-calving-AI-oestrus synchronisation-pregnancy diagnoses, ID AI bulls + breeding values, semen stocks, prevision of matting, accounts, invoices, money collecting, for any herds of clients , including DIY farmers, on AI centre area.
  If technicians are organised by group, each of them has the same data set.
  Records of an activity period (day) are sent by a special line from technician home to a central data base (2) that process records and then transmit new data to any technician to refresh their data base (3). This database exchanges continuously with specific data of the AI centre and the National Information System.

- On farm
  Procedures are available to AI technicians to choose female to be inseminate and requested bulls by scrolling. Then AI records are validated by consistency of data against laptop database and central data base.
  Software executes then billing and booking process, before printing invoices and technical documents: AI form, fertility issues (alerts -abnormal calving-AI intervals, % of cows with 3 AI and more- analysing reproduction records, report and propositions).
  Semen storage and movements are automatically recorded for traceability.
- Other
  Data recorded for reproduction issues are available for farmers.
  Records on oestrus synchronisation and pregnancy diagnosis are processed like AI records.Software takes in charge sales (semen units, feed stuff etc..)



- Integration in data processing systems.
  - AI centre runs a central data base that gets any records mostly overnight. Field technical and booking data are then rapidly available for easy processing programmes.
    AI centres transfer specific company's data to technicians –prices-bulls and semen stocks-accounting situation when necessary.
  - The National data processing system transmit to AI centres females ID and movements, calving, some performance data genetic evaluations of bulls and cows. It receives then AI records from AI centre.
- Organisation (see scheme below)
  In this scenario demands for service are managed by the AI centre thought the Internet today (*Minitel* in the past). Farmers call the AI centre and are connected to it's database (1).

Bottom down scenario (*Logiciel URCEO* on the map)

The AI centre system downloads from it's database only data necessary for technician round of the particular day (females ID to be inseminated, pre-allocated semen…) and these data are transferred to the technician's PDA data base (2), which contains clients ID and data common to any farmer, such as bulls ID, price list etc.
Back home AI technicians connect PDA to the AI centre database for validation and up-dating (3).
As in the bottom up scenario, AI centre database exchanges continuously with the National Information System to get ID, performance records, GE...

- On farm AI technician confirms pre-recorded data after AI, by validation and establishes invoice(s), billing and booking being mostly done by company. Then he prints AI forms, other technical documents and invoices. Software records semen movements for traceability.
- Other
  Thanks to functions of PDA, AI technicians may sale services and semen to farmers, but reproduction issues are tackled by other technicians of the AI centre.
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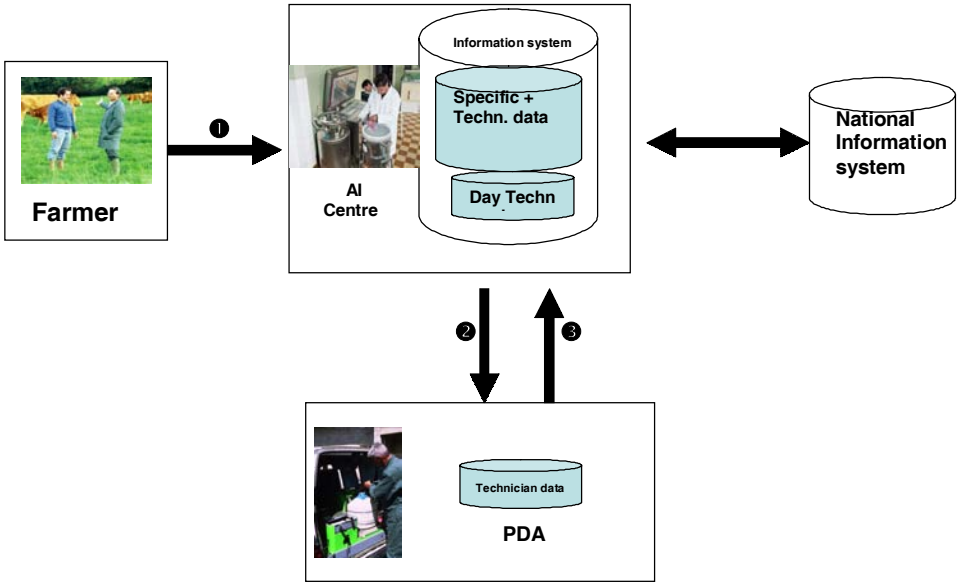

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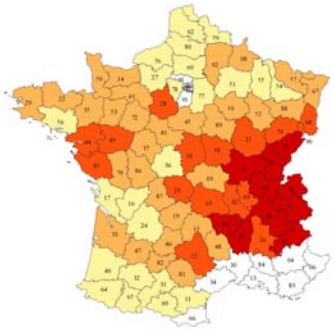
Collective valorisations

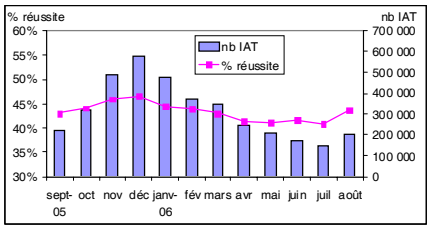
1. Improvement of parentage recording.
   Even if there are no systematic figures on it, one may assume that quality and accuracy of AI records have been improved through automatisation of recording (mainly on female ID). A next step will reach with the bar-code reading of semen straws. Therefore quality of parentage recording mainly based on mating records will improve.

2. National research project on fertility
   The systematic and exhaustive transmission of AI data of good quality to the national data base render possible large scale studies on non return rates (NRR). Below is reproduced a summary of such a study on the various differences of NRR on the national territory (best NRR in dark, poorest in light colour). It shows difference between territories, breeds, months, climate, reproduction management and suggests causes for further research project.

3. Genetic evaluation of fertility.
   Genetic evaluation on fertility has changed in 2007 in France. Trait on evaluation is then the conception: was AI successful or not ? All AI and calving data for cows and heifers are used for the genetic evaluation. The evaluation is carried out with very large set of data: 40 millions of AI records, 90 millions animal ID movements and pedigrees, 90 millions lactations (350 test records). Below is a table presenting distribution of AI records by breed and parity in 2007.

Non return rates : why they differ?





Existing differences: breed, production systems, climate reproduction management, (season linked or not), average age of herds, yield performance…

Conditions +	Conditions -
Montbéliarde	Holstein breed
High % AI in winter	Distributed AI over year (many AI in spring)
High % AI on heifers	Low remplacement rate
Average yield level	High yield level
Few AI with Holstein bulls	AI with Holstein bulls
Genetic make-up? Feeding systems ?	

Breed	AI on cows	AI on heifers	Total animals
Prim Holstein	11 128 315	9 308 126	21 189 286
Montbeliarde	1 883 919	1 602 059	3 182 955
Normand	1 729 154	1 405 035	2 925 477
Abondanc	76 300	55 016	131 355
Pie Rouge	52 591	36 382	88 754
Brune	83 625	61 996	134 492
Tarentaise	32 595	21 934	48 504
Simmental	80 641	57 495	118 630

The model used is the animal model with a bi-variate evaluation cows/heifers fertility. It should be mentioned that other traits like production are taken into account for the GE.

Thanks to AI processing many effects related to AI records are taken into account: month, day of week of AI, year x technician, interval AI- calving intra x caving rank for cows, calving rank before AI. The other important effects are genetic effect unknown parents (introduced in 2008), Permanent environment, year x herd effect, heifer age, breed of bulls, bull x year, inbreeding % of cow and calf to be born.

Conclusion

As a practical result of the organisation of AI data processing and recording thanks to AI technicians devices, it should be mentioned that in February 2008 all AI records have been registered in the national database 7 days after the day of AI which is a remarkable figure, in full line with the above settled goals.

Generalisation of equipment of AI technicians has many causes such as consolidation of the industry in France, the willingness to trace semen doses as much as possible, the development of tools to provide better services to farmers.

Valorisation of AI data is then a continuous process and a challenge in a more competitive industry.