Content

INRA GAD units location and IT infrastructure

The animal identification (RFID)

Automation, field equipments and applications
Introducing

Since 1985, INRA GAD (Genetics Animal Division) willpower is to improve the data collection on experimental farms by:

- Suppressing the “paper/sheet” experimentation.
- Making the data collection as reliable as possible by minimizing the manual information entry.
- Making the farmer job easier and more secure.
- Increasing the quantity and speed data gathering (high throughput).

With automation, new variables can be now recorded (milking flow, feed quantity...).
Genetics animal units and IT infrastructure in France

Centralized data available everywhere
Structured databases (ORACLE, MySQL, ...) on dedicated servers, located in a data center (CTIG) at Jouy en Josas.

A micro computer client/server software in each experimental farm.

Rugged handled devices and automatic devices for the reliable data gathering.

High speed network connection to interact in real time with the database.

Specific or commercial statistical software for scientist analysis.
Experimental farms

- Rfid tags
- Bar code
- Rugged Pocket PC
- Technical management software

Centralized database (Jouy-en-Josas)

- INRA Scientists (Toulouse)
- INRA Scientists (other research center)
- Other authorized personal

INRA Scientists (Toulouse)

Internet

Technical management software

INRA Scientists (other research center)
Technical management software in farm

For each species, there’s a software management, MARGAUX (cow, pig), GEEDOC (sheep, goat), SIVOL (poultry), GEEL (rabbit).

- Make the interface between farm and data center.
- Make the interface with the automatic and handled devices.
- Manage all the daily routine data and enhance them (average, feeding, birth,... report, livestock inventory).

For more specific and temporary works there is:
SIDEx software for all species, fully user customisable software which manages all the other experimental data.
Radio Frequency IDentification technology

RFID, the main link for automation and traceability
- **Bolus**: only for ruminants, can’t be placed at birth, difficult to get back.
- **Implants**: better for small animals, move during growth, difficult to place and get back.
- **Ear tag**: for bigger animals, easier to get back, but can be lost.
- **Leg Bracelet**: difficult to use from birth to old age.
RFID for duck

Losses are less important if the identification is placed on the neck rather than the wing.

1 day  
6 weeks  
12 weeks  
carcass
The good choice for cattle, sheep and goat

Since 25 years INRA GAD use ear tags for its different farming livestock species, pig, sheep, goat, calf, cow...

Before, read/write ear tag technology was used (Allflex, Nedap), and now according to the legislation, Full ISO animal ear tag read only technology is used (Allflex, Agid).

These ear tags (only for cattle, sheep and goat) are provided by the official French breeding agency which ensures the uniqueness of the identification number.

But for specific animal species (fish, poultry, rabbit...), other RFID support can be used.
Automatic devices and field applications

High throughput, easier, faster and secure
INRA GAD philosophy is:

- To create its own automatic device if it doesn’t exit.
- To buy industrial automatic devices if they suit to the experimentation needs.
- To add extra missing functionalities to the industrial devices if possible.

Some devices have been patented and manufactured by third part companies (small ruminant milking recording, animal weighing system, automatic feeder for duck).

Software applications are mainly developed by INRA due to the very specific need and use.
Applications overview

Birth notification
Operating typical configuration

- BALEA Weighing device
- RFID panel reader
- Temporary Data base, on Linux server
- Recorded datas:
  - Date, Rfid
  - Weight
  - Health statut
  - Number, sex of lamb
  - Birth defects
  - .....

- Lamb weighing
- Ewe weighing
- PPC with RFID
DNA or Blood sampling
DNA or blood sampling operating

DNA or blood sampling allows to:

- Filiation control.
- Sampling conservation for breed preservation or future research.
- Specific gene detection.
- ...

PPc for barcode and rfid reading

Bluethooth barcode reader
Automatic feeding
Automatic feeders monitor the intake of each animal during its growth or milking period. By steady controls (milk, weight, fattening, health...) we can highlight different points:

- The efficiency of all distributed aliments type (pellets, fodder, ...)
- Feed gain ratio and meat quality (carcasses measurement)
- Individual and eating behaviours
- Adapt the feeding to the dairy production
- ...
Automatic pellets distributor

Industrial devices

ACEMO company

Adaptation for INRA

Pig

Sheep and goat

Recorded data for each animal
- Rfid
- Food weight
- Date, time
- Visit duration
- ....

2 operating mode:
- Ad libitum
- Rationing
Individual gate feeder for dairy sheep
INRA development

- Quantity of aliment (all type) measurement.
- Individual food rationing. 1 animal = 1 gate.
- This application is directly related to the milking control to adjust feeding, in line to milk production and quality.
Automatic duck feeder - INRA development

Food and duck weighing at each visit
All species weighing operating
One (typical) weighing workstation

- Rfid tag
- Weighing device with battery
- Weighing platform
- PPe with built-in Rfid reader
Outdoor and stand-alone weighing station

RFID panel reader
Small ruminants milk recording
INRA development
20 years ago, no such registered milk recording for sheep and goat device existed. INRA GAD had to design one which allows:

- Recording all the data, without slow down the high rate milking.
- Making several samples of milk, with any quantity, per animal.
- INRA software management on PDA, connected in Bluetooth and Wifi.
- Automatic cleaning.
Milk recording system

Recorded datas
- Date, Rfid
- Milk quantity
- Latency time
- Flow measurement
- Milking time
- Sample number
- ....

INRA patented with Gely company

Central unit

Wiring

n x electronic meters
Pit and rotary parlours
The sorting device is very interesting for INRA GAD due to the lot of experimentations carried out. For that, it’s necessary to have many groups of animals. Sorting allows to:

- Make the herd management easier by using groups.
- Get quickly the inventory of the herd.
- Weight and sort by infinite criteria.
- Only one person (and a dog) for sorting.
- ....
Sorting device for sheep and goat
Some other systems
Greenfeed

Methane and carbon dioxide measurement system for cow

C-lock company

Pictures from C-lock company
One behaviour test (corridor test)

Position of the sheep in the corridor

Photocells

lamb

ewe
Under development

Water consumption
(INRA Grignon collaboration)

Milk consumption
Adaptation for lamb and kid
Prototypes

Weighing during milk consumption

Weighing for stress measurement
Cardiac rhythm and body temperature recording
(INRA St Gilles AADNC collaboration)
Conclusion:
The goal of automation and data collection

The first innovative developments for automation are focused on animals efficiency, assessed by their ability:

- to use available food resources including new feedstuffs (feeding efficiency).
- to adapt to constraining and changing environments while fulfilling their functions of production and reproduction (animal robustness, plasticity or flexibility, milk production).

Furthermore, automation developments:

- improve data collection, make it very easier, and more reliable
- generate high throughput data in less time and new variables can be recorded.
- improve the farm management (animal behaviour: emotional reactivity, social behaviours and general activity) and decrease staff heavy work.
During 25 years, are electronically identified each year:

- Bourges: 2500 animals
- Langlade: 800 animals
- La Fage: 1000 animals

- UE GAD (sheeps and goats) recording, per year
  - 45,000 weighings
  - 15,000 sortings due to livestock management and experimental sampling (blood, semen freezing, ...)
  - 20,000 milk records and samples, milk flow, milking time...
  - 4,000 births
  - 10,000 body condition scores
  - 10,000 individual intake measurements
  - + other measurements (fleece, teat...)
Thanks for your attention....

Jean-francois.bompa@toulouse.inra.fr