



## The new infrastructure for cattle and sheep breeding in Ireland

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### **Abstract**

Over the last twelve years ICBF has established a new technical infrastructure for cattle and sheep breeding in Ireland. This involved:

Establishing a philosophy and agreement for the sharing of data and information between a large number of cattle breeding industry stakeholders including AI Companies, Herd Books, Milk Recording Organisation, Research Organisations, Farm Advisor and the Department of Agriculture.

The building of a tightly integrated national cattle breeding data base that utilises a number of technologies for data collection, data storage and information provision.

Developing a shared breeding objective and associated genetic evaluation system for dairy, beef and sheep breeding. Most recent developments are in the use of genomic data in dairy genetic evaluations.

Identifying the optimal breeding scheme design for each breed and implementing a number of novel approaches for achieving more rapid rates of genetic gain.

Farmer participation in beef and dairy cattle recording breeding has increased dramatically.

*Keywords: cattle, sheep, database, genetic evaluation, genomics, recording, infrastructure*

### **1.0 Background**

The purpose of this paper is to describe the technical infrastructure established over the last twelve years for cattle and sheep breeding in Ireland. The main focus is on cattle breeding although, commencing in 2008, the infrastructure established for cattle is being extended to sheep.

In the period leading up to 1998 the infrastructure supporting Irish cattle breeding comprised two main elements. Firstly, multiple milk recording, artificial insemination and herd book organisations providing specialist breeding services to farmers. Secondly, central Government through its Department of Agriculture (DAF) providing within breed genetic evaluations for a limited range of traits. Each organisation maintained its own stand-alone information system with associated data collection and reporting facilities. There were some 40 computer systems providing cattle breeding information to Irish farmers in 1997. The Irish cattle breeding industry, with strong support from DAF, decided to establish a new information infrastructure in 1997 and this gave rise to the formation of the Irish Cattle Breeding Federation Society Limited (ICBF) which commenced operations in 1998.

The mission of ICBF (ICBF Annual Report 2009) is to "achieve the greatest possible genetic improvement in the national cattle herd - Dairy and Beef". It was not until June 2000 that agreement was reached on the current structure for ICBF. Shareholding in ICBF is split between milk recording (MR), artificial insemination (AI) and herd books (HB) each holding 18% and the farm organisations (FO) who hold 46%. The sixteen member Board of ICBF comprises three from each of the service providing member groups (MR, AI, HB), six from the FO and one from DAF. The Board of ICBF sets policy for cattle breeding in Ireland.

ICBF has established a new technical infrastructure for Irish cattle breeding by establishing a basis for sharing a unique database and utilising a number of new and emerging technologies.

## 2.0 Data and information sharing agreement

A single shared database has been established to support the information needs of Irish cattle breeders. The key principles which have enabled the database to be established and to operate are:

- Organisations contributing data to the database, either for its initial creation or as a result of routine operations, retain "ownership" of that data. At any time they can cease participation and receive an electronic copy of all their data.
- ICBF have established an "animal events" data recording service which it provides to herd owners. This service removes duplication in data collection from farms and provides data that is incorporated into a wide range of information services provided by multiple service providers.
- ICBF have electronic data sharing arrangements with organisations that collect data of relevance to cattle breeding as part of their routine operations. Examples include DAFF's calf registration and animal movement system, factories where animals are slaughtered for meat, and milk processors.
- All data held in the database is available for use in approved research and in genetic evaluations.
- All genetic evaluation results are stored in the database and all bull proofs are publicly accessible through the ICBF website (ICBF Website).
- The herd owner controls which service providers can have electronic access to information for their herd.
- A range of specific information services have been developed, and are being continually improved, by ICBF for service providers. These include milk recording, herd book and artificial insemination services.
- ICBF provides the HerdPlus® service (ICBF HerdPlus) to herd owners. This service is focused on genetic evaluations and breeding. It complements information services provided by service providers and gives the herd owner a consolidated view, across all service providers, of all data for the herd.
- All services are provided on the basis of "user-pays" and "full cost recovery" by ICBF.

## 3.0 ICBF's national database

Initially, commencing in 1999, ICBF utilised the NRS developed IRIS database system. This runs on Oracle® using Hewlett Packard® servers. A group of six software developers is employed by ICBF to develop database inputs and outputs. Over time this group have maintained a steady level of innovation both taking advantage of new technologies and providing improved services for farmers. As a result the original IRIS system has been replaced.

Web based technology has been employed to provide herd owners with facilities to directly access the database to record data and to access a comprehensive range of reports and interactive facilities. The move to web based systems has also reduced network costs and enabled to provision of ever more valuable information and facilities to service providers.

The current focus of database developments is its extension to support animal health initiatives, genomic selection for both dairy and beef, and sheep breeding.

## 4.0 Genetic evaluation system

The first step taken by ICBF was to establish a breeding objective philosophy. While this was not a technically difficult task, the implications have been far reaching and dramatic. The philosophy is simple "*to breed cattle that maximise farm profitability*". The emphasis immediately moved from just a consideration of outputs to a consideration of the balance between inputs and output. Establishing a genetic evaluation system that can rank animals on their genetic merit for profitability required a great deal of research involving collaborators and contractors from many countries. It also required very effective and convincing demonstrations and farmer education.

Overall indexes, expressed in euro and comparable across breeds have been developed for dairy, the EBI (economic breeding index), and beef, the SBV (suckler beef value). The EBI is now widely accepted in the dairy industry and has resulted in a reversal of the decline in fertility which had come close to causing a

major loss of confidence in the Irish dairy industry. The SBV was introduced more recently and is rapidly gaining acceptance in the beef industry. Both indexes, and their component traits are reviewed annually and enhancements are being introduced on a regular basis. The main sources of improvements are: improvements in data quality, availability of new data, increased volumes of data and new technology. Genomic technologies are currently delivering dramatic improvements in the accuracy of genetic evaluations for dairy cattle and are the subject of a major research effort for beef.

## 5.0 Breeding Schemes

Achieving the mission of ICBF is dependent on the Irish cattle breeding industry achieving an optimal breeding scheme design. Our initial focus was on research to establish the optimal design for dairy and beef. It turned out that the optimal design, prior to the advent of genomic technologies was remarkably similar. For dairy and beef some 100 bulls should be progeny tested annually on the basis of 100 daughters completing a first lactation. For dairy, utilising genomic technology, the optimum is very similar but much heavier use is made of the young bulls to breed female replacements. Research for beef is still underway.

**GENE IRELAND®** is a bull progeny testing service (ICBF Gene Ireland) that has been launched by ICBF. This service facilitates the progeny testing of dairy and beef bulls from competing AI companies in a group of collaborating herds. This facility will be required into the future as the on-going exploitation of whole genome selection requires frequent re-estimation and a supply of high quality phenotype data.

## 6.0 Funding

A substantial financial investment has been made to establish Ireland's new cattle breeding infrastructure. Funding has come from three sources: DAF, farmers and services. ICBF was established with an initial share capital of €2 million. This capital has been supplemented with National Development Plan (NDP) structural funds covering 70% of eligible costs and a farmer contribution, collected on ear tag sales of €0.42 per animal born giving some €0.8 million annually. Service income was initially very low but has now grown to some €1.5 million per year.

## 7.0 Benefits

The new infrastructure is now providing demonstrable benefits to the stakeholders in Irish cattle breeding.

For Government & the wider community these include: cost savings through not having to provide services, increased tax income from a more profitable industry, more effective research investments primarily due to the availability of ICBF database, and better quality cattle for future farmers.

For the cattle breeding industry and service providers: increased uptake of services, better quality services, improved export potential, and cost savings.

For farmers and breeders: more rapid genetic gain worth some €20 million per year cumulative for dairy and some €5 million per year cumulative for beef, better quality information for decision making, and more rapid availability of the benefits of new technologies (eg genomics).

Currently 90% of the 1.1 million dairy calves and 1.0 million beef calves born annually in Ireland are participating in the new Irish cattle breeding infrastructure.

## 8. References

ICBF Annual Report 2009. [http://www.icbf.com/publications/files/Annual\\_Report\\_for\\_2009.pdf](http://www.icbf.com/publications/files/Annual_Report_for_2009.pdf)

ICBF Gene Ireland. <http://www.icbf.com/services/geneireland/index.php>

ICBF HerdPlus. <http://www.icbf.com/services/herdplus/index.php>

ICBF Website. [www.icbf.com](http://www.icbf.com) – go to “bull search” and enter “GMI” for dairy bull or “CF52” for beef bull to access detailed information.