

International beef evaluation for Carcass traits

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Abstract

Since the early 1990s, different initiatives have emerged worldwide to establish beef across-countries genetic evaluations. The experiences involving Ireland, France and the UK served as a precursor for today's Interbeef Working Group (WG). Interbeef is a WG of ICAR and offers, through the Interbull Centre, international beef cattle evaluation services for 12 countries, five breeds and three trait groups including adjusted weaning weight (aww), calving (calv), and since 2023, also carcass (carc). The evaluation of carcass traits has been an objective of Interbeef WG since its origin. The results of a survey carried out in 2014 verifying the status of this group of traits at the European level, determined that the main traits to be included in the evaluation would be carcass weight, fat and conformation. The first data call was carried out in 2018, and after several research evaluations and modifications to the model, a final pilot evaluation was performed in December 2022. The results were considered satisfactory, and the evaluation of carcass traits became a routine service run starting in October 2023.

Key words: beef cattle, across countries genetic evaluations, carcass traits

Introduction

Interbeef is a Working Group (WG) of the International Committee for Animal Recording (ICAR), whose main objective is to develop and promote genetic and genomic evaluations of beef cattle at the national and international levels. In this regard, the Interbeef WG acts as a worldwide network for the improvement of beef cattle, in permanent dialogue with the different sectors of the industry, and develops international evaluation systems. On the other hand, it also has a role in coordinating and collaborating in scientific research related to beef cattle breeding (ICAR, 2022).

Through the Interbull Centre, Interbeef offers international services to participating countries for five different breeds, including Aberdeen Angus, Charolais, Hereford, Limousin and Simmental, and three trait groups including adjusted weaning weight (adww), calving (calv) and, since 2023, carcass (carc). Female fertility is an important trait group currently under development and is intended to be introduced as a service in the coming years.

All trait group services follow specific steps for their development, which may vary subtly given the requirements of the different traits. This article summarises the development

process of the carcass trait service, from its idealisation to the recent first routine evaluation.

Brief history of Interbeef

The collaborative way of service development within Interbeef is related to its history and conception.

The ambition to perform joint beef cattle evaluations for groups of countries dates back to the early 1990s. Since then, several projects have been conducted in different regions worldwide (Bullock et al., 2003; Reverter et al., 2002; Journaux et al., 1996).

In 1999, a collaborative research project brought institutions together from three European countries: the Irish Cattle Breeder Federation (ICBF) from Ireland, the Institut de l'Elevage (IDELE) from France and the Meat Livestock Commission (MLC) from the United Kingdom. The main objective of the project, called European International Beef Evaluation (EUBEEVAL), was to develop methodologies to obtain estimated breeding values (EBV) between European countries, accounting for the differences between production systems, and, in the other hand, to study the best way to compare

EBVs obtained in different systems (Journaux et al., 2006).

One of the most important results of the project was the determination of the best model for international across-countries evaluations. In beef cattle production systems, the use of artificial insemination (AI) is limited; consequently, the connection between countries is also weak. In this context, it was determined that the best model to apply in beef international genetic evaluations is an Animal Model accounting for Across Countries Interactions (AMACI) (Phocas et al. 2004). Following this system, phenotypes, different models for each country and across-countries covariance are used.

The efforts made in the framework of this project laid the foundation for the formation of Interbeef WG. The Interbull Centre team carries out the services offered by the WG, which currently consists of beef international evaluations for adjusted weaning weight, calving traits (calving ease and birth weight) and carcass traits (weight, fat and conformation) with the participation of 12 countries.

Carcass traits service

There are several stages in introducing a set of traits into the routine evaluations performed by the Interbull Centre.

When community interest in a set of traits is identified, a working group will conduct the investigation on their possible inclusion as a service.

Although the latter stages have to be done with the resources of the Interbull Centre, part of the development and the estimation of the variance components are carried out in national genetic centers. This was the case with adjusted weaning weight developed mainly by ICBF in Ireland, calving traits at the Institute of Animal Science, Czech Republic, and fertility traits under development at Vereinigte Informationssysteme Tierhaltung (vit), Germany. Adjusted weaning weight and

calving traits have been part of routine evaluations since 2013 and 2016, respectively.

Carcass traits have been an Interbeef WG's goal since the beginning, and studies of this group of traits began at the initiative of Scotland's Rural College (SRUC) and then continued through the ICBF and Interbull Centre. Figure 1 presents a timeline from the first steps until the carcass traits routine evaluation.



Figure 1. Timeline of the development of the Carcass traits service.

As a first step, SRUC surveyed the participating countries to diagnose the status of national evaluations for carcass traits. The survey covered different aspects, such as proxy traits measured on the live animal, traits measured directly on the carcass, and breeds and models of the evaluations in the different countries. It identified carcass weight and EUROP grades of carcass conformation and fat as the most recorded traits (Table 1). Another important finding was the high number of crossbred individuals recorded in several countries, and some countries commented on the importance of carcass traits in beef from dairy systems.

Table 1. Carcass traits recorded by countries. Adapted from SRUC survey.

	CHE	CZE	DNK	FIN	SWE	FRA	GBR	IRL
C. Weight	✓	✓	✓	✓	✓	✓	✓	✓
C. Conformation	✓	✓	✓	✓	✓	✓	✓	✓
C. Fat	✓	✓	✓	✓	✓	✓	✓	✓
Individual Primal Cuts							✓	✓
Total meat yield								✓
Tenderness								✓
Age at slaughter						✓		

CHE = Switzerland, CZE = Czech Republic, DNK = Denmark, FIN = Finland, SWE = Sweden, FRA = France, GBR = Great Britain, IRL = Ireland.

Given the importance of the participation of crossbred individuals in this trait group, the WG postponed the data call until the conclusion of studies to incorporate this type of information in the international evaluations of Interbeef.

The data call was finally presented in September 2018 for the three recommended traits, carcass weight, fat and conformation, including three breeds: Charolais, Limousin and Simmental.

The first research evaluations were performed on data from 4 populations: Ireland (IRL), Great Britain (GBR), Switzerland (CHE), and Denmark, Finland and Sweden (DFS) with a set of (co)variance components estimated by ICBF (Ireland). In 2021, new data was collected via the Interbull Data Exchange Area (IDEA) and new research runs were conducted within the Interbull Centre. Finally, in December 2022, a new set of (co)variance

components was prepared by ICBF, and the carcass traits pilot run was performed with acceptable results.

For example, Figure 2 presents a comparison of carcass weight EBVs of bulls with reliabilities over 0.7 from the Interbeef pilot evaluation and the Irish domestic evaluation for the three evaluated breeds. The correlation between the EBVs from each evaluation was approximately 0.7 in all of the breeds. Therefore, the Interbeef WG decided to include this trait group in the April 2023 Interbeef test run.

The 2023 test and routine runs

Even though four populations participated until the pilot run, for different reasons, only Ireland and Great Britain went ahead with the April 2023 test evaluation. The countries submitted a total of 1,620,279 records for Charolaise, 1,619,571 for Limousin and 450,708 for Simmental (Table 2). A total of 1,232,423, 1,276,613, and 361,419 individuals for Charolais, Limousin and Simmental, respectively, were included in the evaluation. The test and posterior routine evaluations used the set of (co)variance components estimated for the pilot run. Table 3 shows the correlations across Ireland and Great Britain for the three traits included in the evaluation. In general, the correlations are in a medium range, between 0.56 and 0.75, with the highest (≥ 0.7) for carcass fat and the lowest (≤ 0.62) for carcass conformation.

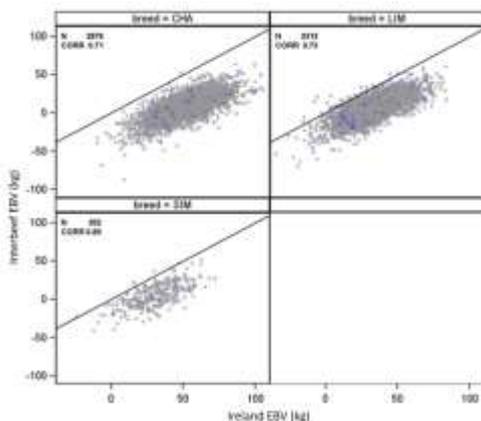


Figure 2. Comparison of carcass weight EBVs from bulls with reliability >0.7 from Interbeef pilot and Irish evaluations. Courtesy of Thierry Pabiou, ICBF.

Table 2. Number of records submitted to the April 2023 test evaluation.

		Number of records per trait
CHA	IRL	388,500
	GBR	151,593
LIM	IRL	386,257
	GBR	153,600
SIM	IRL	48,230
	GBR	102,006

Table 3. Carcass genetic correlations between Ireland and Great Britain.

	CHA	LIM	SIM
C. Weight	0.61	0.65	0.69
C. Conformation	0.60	0.62	0.56
C. Fat	0.70	0.75	0.72

The October routine evaluation counted with the participation of both countries, and an increase of 1.6% in the number of performance submissions was observed.

Future developments

Regarding future developments of the carcass evaluations, it is expected that more countries will be interested in participating in the evaluation, given the importance of this trait group for beef cattle breeding.

It is also possible to expand the evaluation to Aberdeen Angus and Hereford when requested by the participating countries.

Concerning potential new carcass traits to include in the evaluation, in the framework of the European GenTORE project, some research has been carried out on the evaluation of age at slaughter. This trait of interest can also be included in the future after a short research and pilot evaluation.

On the other hand, Interbeef WG is currently discussing the development of international genomic evaluations. When discussions conclude on how to carry out the genomic evaluation, all current trait groups under evaluation are expected to be included.

As previously mentioned, the SRUC survey identified many countries linking carcass traits to beef on dairy systems. Given the economic

potential it represents this is also a topic of great interest within the beef cattle industry. Recently, a study conducted by Jo Newton (2023) under the ICAR Brian Wickham Young Person Exchange Program, identified the opportunity for international evaluation of beef on dairy through the Interbull Centre, whereby carcass traits could be the first trait group to be tested in a beef on dairy system.

Conclusion

After many years of development and testing different models, the carcass trait Interbeef evaluation has been successfully introduced as a service in routine evaluations.

In the near future, more countries are expected to participate, as well as expansion of the evaluation to more breeds.

The international carcass traits evaluation has great potential for the development of an international evaluation of beef on dairy.

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