

Interbull Centre



Activity Report

2023



INTERBULL CENTRE

ACTIVITY REPORT 2023

INTERBULL CENTRE
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The Interbull Centre is the operational unit of ICAR's permanent sub-committee Interbull and the Interbeef Working Group.



The Interbull Centre holds the status of European Union Reference Centre (EURC) - Zootechnics.



Interbull Centre services are provided under the controls established by a Bureau Veritas Certification approved management system that conforms with ISO 9001:2015. Bureau Veritas Certification Certificate Number N° SE008278-1



N° SE008278-1



INTERBULL CENTRE ACTIVITY REPORT 2023

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inter  **genomics**

GEN  **EX**
International Genotype Exchange Platform

The Interbull Centre is the operational unit for Interbull, a permanent subcommittee of the International Committee for Animal Recording (ICAR). It is a section of the Department of Animal Biosciences (HBIO) of the Swedish University of Agricultural Sciences (SLU). The Interbull Centre is also the operational unit for Interbeef, a working group of ICAR, and operates as the European Union Reference Centre-Zootechnics. This Report describes the Interbull Centre activities in 2023.

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FOREWORD

In 2023, many of the Interbull community met during the 2023 Interbull Technical Workshop in Rome, the ICAR meeting in Toledo and the 2023 Interbull Annual Meeting in Lyon. We thank the organisers of these events and look forward to the 2024 Annual Meeting which is co-organised with ICAR in Bled, Slovenia.

At the meeting in Lyon, the Interbull Steering Committee (SC) provided a new model for Interbull Service fees to be implemented in 2025, and started the work on a new strategic plan. While the composition of the Interbull SC remained unchanged in 2023, we welcomed two new members to the Interbull Technical Committee – Jan-Thijs van Kaam and Andres Legarra – and two new members of staff to the Interbull Centre – Anahit Nazari and Simone Hazas.

It is pleasing as always to see that the team at the Interbull Centre delivered all scheduled services on time and to a high standard. Also during the year, we expanded the service to exchange genetic traits to the Brown Swiss breed and delivered 4 webinars – to name but a few activities.

We would like to express our sincere thanks to the Interbull Centre Team, and all Committees, Working Groups, Task Forces, organisations and other individuals who continue to contribute to the successes of Interbull, Interbeef, GenoEx and the EU Reference Centre throughout the year.

Warm Regards,

Matthew Shaffer,

Toine Roozen,

Chair, Interbull Steering Committee

Interbull Centre Director

1. PEOPLE

1.1. Interbull Centre

Until 31 December 2023, the Interbull Centre was situated within the Department of Animal Breeding and Genetics (“HGEN”), Faculty of Veterinary Medicine and Animal Science of the Swedish University of Agricultural Sciences (SLU). Due to a reorganisation within the Faculty, HGEN merged with two other departments from 1 January 2024, to form the Department of Animal Biosciences (“HBIO”).

Interbull Centre Team

At the end of 2023, the Interbull Centre Team consisted of the following members of staff:

- Toine Roozen (MSc, MBA) – Director
- Valentina Palucci (MSc) – Service and Quality Manager
- Simone Hazas (PhD) – Administrator

Genetic Data Analyst (*Genetics*):

- Anahit Nazari (PhD)
- Fernando Macedo (PhD)
- Katrine Haugaard (PhD)

Genetic Data Analyst (*Information Technology*):

- Marcus Pedersén – Systems Administrator, IT Coordinator
- Carl Wasserman – Systems Developer
- Jan-Erik Strömqvist – Programmer

Staff changes in 2023

After having worked at the Interbull Centre as a Genetic Data Analyst for 8 years, **Joanna Sendekka** left the Interbull Centre in July 2023. We kindly thank Joanna for her work and wish her all the best in her future career.

Anahit Nazari joined the Interbull Centre in April 2023 as a Genetic Data Analyst. Anahit brings a wealth of experience in animal breeding and genetics, and participates in the Centre’s International genetic and genomic evaluations. During 2023, she was responsible for updating Interbull Centre’s PREP database.

Simone Hazas joined the Interbull Centre in April 2023 as Interbull Centre Administrator. Prior to joining the Interbull Centre Team, Simone was a Data Sciences Project Administrator at Lancaster University (UK).

1.2. Consultants and Suppliers

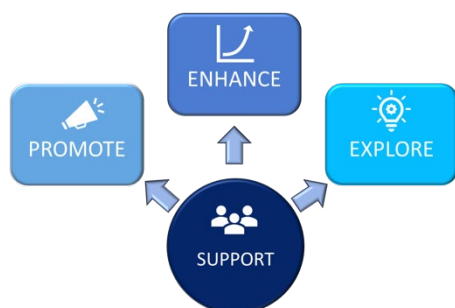
The Interbull Centre continues to collaborate with experts in different time zones:

- **Pete Sullivan** (Lactanet, Canada): works as a part time consultant for the Interbull Centre. During 2023, Pete’s activities were related to supporting GMACE and MT-EDC software, and Key contributions to the “Genomic Pre-selection and Future MACE” (§10.3) and “Validation” (§4.1 and §10.4) Working Groups.
- **Thierry Pabiou** (ICBF, Ireland): supplies international genetic parameters for Adjusted Weaning Weight (AWW) and Carcass traits (CARC) for Interbeef evaluations (§5.0 and §11.4) to the Interbull Centre.
- **Zdenka Vezela** (CMBC, Czech Republic): supplies international genetic parameters for calving traits (birth weight, calving ease) for Interbeef evaluations (§5.0) to the Interbull Centre.
- **Chris Murphy** (Chris Murphy Advisory PTY Ltd, Australia): Creating materials for Interbull Service descriptions and benefits (§3.0) and moderating the Interbull strategic planning process (§2.1).
- **Emely Leenders - van Rossum** is a certified ISO 9001 lead auditor: During the internal audits for the ISO 9001 standard in August 2023, Emely reviewed processes such as Management, Service, and Applied Research (§3.2).
- **Michael Verne** (Bureau Veritas Certification Sverige AB, Sweden): Appointed as Interbull Centre’s external auditor for the ISO 9001 standard. Michael visited the Interbull Centre on 10 November 2023 to perform the second surveillance audit for the new re-certification period (§3.2).

2. GOVERNANCE

2.1. 2024-2026 Interbull Strategic Plan

The **2024-2026 Interbull Strategic Plan** was drafted with input from Interbull Steering Committee Members, Service Users, Interbull Centre staff, ICAR and additional stakeholders. The 2024-2026 Interbull Strategic Plan, which will be presented during the 2024 Interbull Annual Meeting in Bled, has four strategic pillars which support its delivery of results:



1. Promote expansion of existing services to current and new service users.

2. Enhance existing services to increase value and relevance to current and new service users.

3. Explore diversified service options to underpin Interbull's future.

4. Support capability and collaboration to effectively deliver and share Interbull's success.

2.2. Interbull SC Terms of Reference

As a follow-up to the 2021 Governance Review, the **Interbull SC Terms of Reference**¹ (ToR) were updated, with the inclusion of term limits, and a clarification of how countries using Interbull services can be represented by a SC member. The ToR were approved by the ICAR Board in its meeting of 28 March 2023.

2.3. Interbull Steering Committee (SC)

The Interbull Steering Committee (SC) determines the policies and sets the strategies to deliver on the vision of the Interbull Centre: to be the worldwide network providing information services for the genetic improvement of livestock. The SC ensures that policies and systems are in place to manage strategic risk and ensure high standards of accountability and ethical behaviour. Members of the SC have varying backgrounds and are selected by their regions on the basis of the skills and capabilities, which are needed at the SC and to fulfil various roles on the SC and on its other committees. SC members are appointed by the ICAR Board.

During the Interbull Business Meeting on 26 August 2023, **Gerben de Jong**, **Gert Pedersen Aamand** and **Urs Schnyder** were re-nominated as Interbull Steering Committee members, and subsequently endorsed by the ICAR Board during its meeting in October 2023. Gerben de Jong represents Flanders, Ireland, The Netherlands and the United Kingdom, Gert Pedersen Aamand represents Denmark, Finland, Norway and Sweden, and Urs Schnyder represents Austria, Germany and Switzerland.

Matthew Shaffer and **Brian Van Doormaal** were re-elected as Chair and Vice-Chair of the Interbull SC during its meeting on 26 August 2023.

¹ <https://interbull.org/ib/termsreference>

Table 2.1: Interbull Steering Committee membership (December 2023).

Name	Representing	End of term
Daniele Vicario	Italy, Portugal & Spain	2024
Brian Van Doormaal (Vice-Chair)	North & South America	2024
Marija Klopčič	Central & Eastern Europe	2025
Ezequiel Nicolazzi	North & South America	2025
Matthew Shaffer (Chair)	Africa, Asia & Oceania	2026
Laurent Journaux	France & Wallonia	2026
Gert Pedersen Aamand	Denmark, Finland, Norway & Sweden	2027
Urs Schnyder	Austria, Germany & Switzerland	2027
Gerben de Jong	Flanders, Ireland, Netherlands & UK	2027

2.4. Interbull Technical Committee (ITC)

The Interbull Technical Committee (ITC) provides counselling to the Interbull Steering Committee on technical questions related to international genetic and genomic evaluations of dairy cattle breeds and the related services released by Interbull Centre. Moreover, the ITC may be requested to provide long-term views and strategies on matters relating to the service. The Interbull SC appoints ITC members. Members of the ITC have varying backgrounds and are selected on the basis of the skills and capabilities which are needed at the ITC and to fulfil various roles on the ITC and its Working Groups. The composition of the ITC has remained very stable for many years. As a follow up to the 2021 Governance Review, the Terms of Reference for the ITC have been renewed, resulting in formal terms for ITC members, and a process for appointing ITC members being rolled out in 2023.

We are grateful for the valuable contribution of **Esa Mäntysaari**, who – following retirement – stepped down from the ITC in 2023.

After Expressions of Interest were publicised and received, two new ITC members were identified: **Andres Legarra** and **Jan-Thijs van Kaam** were welcomed to the ITC in 2023.

The Interbull SC appoint the ITC Chair from the SC members; Gerben de Jong has been the ITC Chair since 2019.

Gerrit Kistemaker was one of the original members of the ITC when it was established in 1999. Gerrit stepped down from the ITC at the end of 2022 to fight a battle against cancer. He passed away on 28 February 2024. Rest in Peace, Gerrit

Table 2.2: Interbull Technical Committee membership (December 2023).

Name	Organisation	End of term
Paul VanRaden	USDA, USA	2024
Tom Lawlor	Holstein USA, USA	2024
Zengting Liu	vit, Germany	2025
Raphael Mrode	SRUC, United Kingdom	2025
Valentina Palucci	Interbull Centre, Sweden	2026
Pete Sullivan	Lactanet, Canada	2026
Gerben de Jong (Chair)	CRV, The Netherlands	2027
Andres Lagarra	CDCB, USA	2027
Jan-Thijs van Kaam	ANAFIBJ, Italy	2027

2.5. Business Funding Models Task Force

Following the Interbull Business Meeting held in Montreal, Canada in June 2022, the focus of the BFMTF activities has been a review of the current fee structure applied to MACE services provided by Interbull to the 30+ participating organizations/countries.

Based on the analyses conducted, the key proposals for change to the current service fees that were introduced during the 2023 Interbull Business Meeting² are:

² https://interbull.org/ib/2023_bm_lyon

- The current MACE Production Fee structure be amended to use “5-Year Increase in Milk Daughters” as the underlying metric instead of “No. of Milk-Recorded Cows”, and the Basic Fee calculation for each country be revised from the current basis of “No. of Countries” to “No. of Data Providing Organizations”. Additional discussion will be held during the 2024 Interbull Meeting, prior to the proposed introduction of these changes in 2025.
- Further dialogue on the value of introducing a fee structure for GMACE services that is separate from the fee structure applied for MACE.
- The Genetic Traits Exchange service be available to the Holstein and Brown Swiss breeds, at a service fee of €1000 for participation for one breed and €500 for each subsequent breed. This fee has been introduced at the start of 2024.
- In order to cover costs for delivering TMACE, the TMACE fee be increased, or the service be carried out with a minimum number of participating organisations only.
- The Interbull Centre finalise the GenoEx-GDE service offering (for Genotype Data Exchange), and service fees be established for groups of GenoEx-GDE service users (rather than at individual service user level).

2.6. New Traits Pipeline Working Group

The Interbull SC-appointed New Traits Pipeline Working Group (NTP WG) aims to assist with the identification and introduction of traits to be added to the Interbull portfolio.

The PREP database (see §7.1) represents the main hub around which the NTP WG built the New Traits Pipeline; Information provided to PREP by National Genetic Evaluation Centres and Interbull Service Users on nationally evaluated traits has been reviewed. A report was prepared and shared with the Interbull SC in December 2023.

Three trait groups have been identified as potentially suitable for inclusion in Interbull’s portfolio, and will be investigated further in 2024:

- Claw Health, including (inter)digital dermatitis, interdigital hyperplasia, white line disease, sole haemorrhage and sole ulcer,
- Metabolic disease, including Milk fever/hypercalcaemia and (sub)clinical ketosis, and
- Reproductive traits; gestation length.

2.7. Codes of Practice

Together with the relevant communities, Interbull Centre staff develop and maintain ‘Codes of Practice’ which guide the Interbull Centre and its Service Users in an efficient implementation and delivery of services.

Interbull Code of Practice

The Interbull Code of Practice³ has been updated on the basis of decisions by the Steering Committee. Following the Interbull SC decision to offer the genetic traits exchange service as a paid service, and due to the changes in the terms of the agreement, the following parts of the Interbull Code of Practice were changed in 2023:

- Chapter X – service fee: reference to the new fee applied to the genetic traits exchange service.
- Appendix XI - Genetic Traits Exchange: clear description of the service, including reference to both BSW and HOL genetic traits and minimum requirements for participation.

³ <https://interbull.org/ib/codeofpractice>

Interbeef Code of Practice

The Interbeef Code of Practice, available through the ICAR website⁴, was updated in 2023, based on decisions from the Interbeef Working group, notably:

- Chapter 7: Data Exchange and time of evaluation: Review of the service calendar and changes in the test genetic evaluation policy.

Together with the Interbeef Code of Practice, the “Interbeef Guidelines” provide useful information for new organisations interested in joining Interbeef Service regarding the necessary actions and relevant files required. Both documents are available on the Interbeef page on the ICAR website⁵, selecting “File and formats for the Interbeef international genetic evaluations”.

GenoEx-PSE Code of Practice

No changes were applied to the GenoEx-PSE Code of Practice⁵ during 2023.

2.8. ICAR Guidelines

The “Interbull Guidelines” (ICAR Guidelines’ “*Section 09 – Dairy Cattle Genetic Evaluation*”) were reviewed during 2022 - adding more recent information regarding genomic evaluations and latest recommendations from trait harmonisation - and approved by the ICAR Board in January 2023. The latest version of the guidelines is available on the ICAR website⁶.

⁴ https://wiki.interbull.org/public/wholeBCoP_toPrint?action=print&rev=3

⁵ https://interbull.org/ib/pse_cop

⁶ <https://www.icar.org/index.php/icar-recording-guidelines/>

3. SERVICES & OPERATIONS – Interbull Centre

Since the start of international evaluations in 1995, the service portfolio and output at the Interbull Centre has increased significantly; both through expansion of the international genetic evaluations to include new populations and new traits, and through the addition of new services.

Early in 2023 a detailed description of Interbull Services and their values and benefits was produced. This was presented during an open session at the 2023 ICAR Annual Conference in Toledo, covering services related to:

- Evaluations: MACE, GMACE, InterGenomics and Interbeef
- Validations: TMACE, Conventional Breeding Values, GEBV-test, EURC Validation
- Data Exchange: GenoEx-GDE, GenoEx-PSE, Genetic Traits, and
- Collaboration: PREPdb, Interbull Bulletin, International Guidelines and Meetings Workshops and Webinars.

3.1. Global Reach

The Interbull Centre provides international genetic evaluation services for dairy and beef cattle in 34 countries from 5 continents; 26 countries in Europe; 3 in the Americas; 2 in Oceania; 2 in Asia and 1 in Africa.

Figure 3.1: Interbull's Global Reach (December 2023)



3.2. Quality Management

The Interbull Centre gained ISO 9001 certification in 2016. All external audits to date have been concluded with total absence of non-conformities found. We are keen to keep these excellent results also for the next certification periods through periodic reviews of our procedures and by keeping high focus towards our customers' satisfaction.

During the internal audits in August 2023, processes such as Management, Service and Applied Research were reviewed by Emely Leenders-van Rossum, certified ISO 9001 lead auditor within the Westfalen Medical BV in the Netherlands.

The external audit on 10 November 2023 was the second surveillance audit of the second re-certification period. The surveillance audit, conducted by Bureau Veritas' auditor Mikael Verne, went successfully - with absence of non-conformities found.

Interbull Centre's ISO Certification in brief

- Original certification: 13-01-2016
- Standard: ISO 9001
- Scope of supply: Provides international breeding values (genetic information service) and applied research for improvement of livestock
- Quality Manager: Valentina Palucci (certified ISO Auditor)



3.3. Interbull Centre Annual Operating Plan

The six Key Goals from the Interbull 2020-2023 Strategic Plan⁷ formed the basis of the **2023 Interbull Centre Annual Operating Plan**, which included Interbull Centre's planned Service and R&D activities for Interbull, Interbeef, EU Reference Centre, and ICAR. At the end of 2023, the 2024 AOP was prepared based on the Interbull 2024-2026 Strategic Plan (§2.1). The latest 2024 AOP is available on the Interbull website⁸.

Figure 3.2: Key Goals in Interbull 2020-2023 Strategic Plan.

	Meeting future data service needs		Continuously improve core services
	Defining a new traits pipeline		Strengthening governance
	Providing international evaluations in the genomic era		Driving branding and marketing

3.4. Service Calendars

Schedules for International dairy and beef evaluations at the Interbull Centre are released upon approval by the Interbull Steering Committee and the Interbeef Working Group respectively. The Service Calendars are scheduled well in advance so that national genetic evaluation centres and the Interbull Centre can plan their activities accordingly. The latest service calendars are available online:

- Interbull service calendar⁹;
- Interbeef service calendar¹⁰.

⁷ https://interbull.org/static/web/Interbull_2020-2023_Strategic_Plan.pdf

⁸ <https://interbull.org/ib/itbcreports>

⁹ <http://www.interbull.org/ib/servicecalendar>

¹⁰ <http://www.icar.org/index.php/technical-bodies/working-groups/interbeef-working-group>

4. INTERNATIONAL DAIRY BREED EVALUATIONS - INTERBULL

4.1. Validation of National EBVs and GEBVs

Validation of national EBVs and GEBVs remains one of the top priorities towards reliable National and International, genetic and genomic evaluations. The portfolio of validation methods offered by Interbull consists of five (5) different validation methods:



- four methods aimed at assessing the quality of conventional national evaluations, namely Trend Validation Tests (Methods I, II, III) and Mendelian Sampling Variance test, and
- one assessing the quality of genomic national evaluations; GEBVtest.

The Interbull Validation Working Group created an enhanced version of the GEBVtest which can perform a more accurate comparison of the input data. The new software has been shared with the members of the Validation Working Group and the Interbull Technical Committee for preliminary testing and has been extensively addressed both during the 2023 Interbull Technical Workshop in Rome (Italy) and the 2023 Interbull Annual Meeting in Lyon (France). The new software, and its instructions, is expected to be made available to all users in early 2024 and become official in August 2024. This gap between its release and its official introduction in August 2024 is created to enable countries to adjust with the different requirements in matters of input files needed with the new software.

4.2. MACE Evaluations

MACE Routine evaluations were performed in April, August and December 2023. MACE Test evaluations were performed in January-February 2023 and September-October 2023. Tables 4.1 and 4.2 show statistics on Interbull MACE evaluations.

Table 4.1: Size of the Interbull Centre operations for Multiple Across Country Evaluation (MACE)

	Dec 2020	Dec 2021	Dec 2022	Dec 2023
Countries	33	33	33	33
Evaluation breeds	6	6	6	6
Country-breed-trait combinations	1961	1985	1985	1984
Breed-trait evaluations	181	184	184	184
Animals in the pedigree database	38 286 074	46 224 599	48 102 774	50 710 608
Submitted national EBVs	13 907 511	14 204 345	14 521 600	14 791 261
Qualified national EBVs	7 518 415	7 642 967	7 845 907	7 986 193
Calculated international EBVs	312 433 664	325 106 802	332 245 627	336 885 191
Distributed international EBVs	114 804 143	117 662 597	119 484 986	120 396 330

	Sept 2020	Sept 2021	Sept 2022	Sept 2023
Estimated across country genetic correlations	13 043	13 452	13 432	13 522
Validation tests*: Trend Validation Tests (Methods I, II, III); Mendelian Sampling Variance Test; GEBVtest	252	345	443	622

* Subject to natural fluctuations

Many changes in national and international evaluations were introduced in 2023. All such changes are described in the service reports which are published after each subsequent routine evaluation on the Interbull Centre website, under MACE service reports¹¹.

Table 4.2: Degree of Participation to MACE evaluations as for April 2023

	Prod (3)	Conf (max 33)	Udder (2)	Long (1)	Calv (4)	Fert (5)	Work (2)	CMA (1)	Total (50)	2304r vs 2204r
BSW	11	9	10	9	6	10	7	3	65	+1*
GUE	5	4	5	4	-	5	-	-	23	0
HOL	29	24	29	21	18	21	15	5	162	-1**
JER	12	10	10	9	-	9	6	2	58	0
RDC	15	11	14	12	7	11	7	-	77	0
SIM	12	-	11	5	-	-	-	-	28	0
Total	84	58	79	60	31	56	35	10	413	
Change	0	0	0	0	0	0	0	0		0

Routine international genetic evaluations for Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental were computed as scheduled in April, August and December 2023. Actual number of traits per trait groups are reported between brackets.

The following changes in participation occurred during the April 2023 Routine evaluations:

*BSW: First time for USA (SNP training);

**HOL: NLD no longer participating (SNP training).

4.3. Truncated MACE (“TMACE”)

National genomic evaluations are increasingly dependent on Interbull MACE results due to the inclusion of foreign genotypes without national phenotypic information in the reference population. The only source of phenotypic information available for such animals are de-regressed MACE EBVs on the scale of interest. The latest MACE EBVs are used for regular estimation of SNP effects. However, obtaining appropriate MACE de-regressed values for validation purposes is not a straightforward task.

In order to assist countries with improving the national genomic prediction and validation, Interbull introduced Truncated MACE (TMACE) as an additional service. Truncated MACE is performed annually in October. The TMACE evaluations performed in October 2023 with current reduced data provided by the country-breeds-traits are identified in Table 4.3.

Table 4.3: Country-breed-trait combinations in the October 2023 TMACE evaluation								
Country	Organisation	HOL	JER	BSW	GUE	RDC	CAM	Traits
Germany and Austria	LFL and ZuchtData			✓				All
USA	CDCB	✓	✓	✓	✓	✓		All
Japan	NLBC	✓						All
Canada	Lactanet	✓	✓	✓	✓	✓	✓	All
Italy	ANAFIBJ	✓						CONF, LONG, MAS

4.4. Genomic Multiple Across Country Evaluation (GMACE)

Genomic Multiple Across Country Evaluation (GMACE) is an international genomic evaluation of young bulls which, to date, is carried out for the Holstein breed only. All 33 countries that participate with Holstein data in MACE are included in GMACE; 13 countries submit national genomic breeding value estimates (GEBVs) for up to 38 traits, while the remaining 20 countries enter GMACE with their latest MACE proofs. Statistics on GMACE evaluations are presented in Table 4.4.

¹¹ http://www.interbull.org/ib/maceev_archive

GMACE Test evaluations were performed as scheduled in January-February 2023 and September-October 2023. GMACE Routine evaluations were performed in April, August and December 2023.

Table 4.4 - Size of the Interbull Centre operations for GMACE

Genomic Multiple Across Country Evaluation (GMACE)	Dec 2020	Dec 2021	Dec 2022	Dec 2023
Countries	33	33	33	33
Evaluation breeds	1	1	1	1
Country-breed-trait combinations	399	388 ⁺	388 ⁺	389 ⁺
Breed-trait evaluations	38	38	38	38
Animals in the pedigree database	38 286 074	46 224 599	48 102 774	50 710 608
Submitted national EBVs	32 020 628	34 518 839	35 779 884	39 102 178
Qualified national EBVs	20 240 812	20 761 359	19 927 617	21 654 534
Calculated international EBVs	185 107 347	193 663 067	179 195 268	194 856 809
Distributed international EBVs	410 872	406 726 ⁺	403 026	439 131

+ A mismatch between MACE- and GMACE-base definitions and directions of scale caused some country-breed-trait combinations to be excluded from the December 2021, 2022, and 2023 evaluations.



4.5. InterGenomics

Interbull Centre conducts international genomic evaluations of Brown Swiss dairy cattle populations (“InterGenomics-BSW”), and (small) Holstein populations (“InterGenomics-Holstein”). Statistics on these evaluations are presented in Tables 4.5 and 4.6.

InterGenomics test evaluations were performed as scheduled in January-February 2023 and September-October 2023. InterGenomics Routine evaluations were performed in April, August and December 2023.

The Genomic Data Exchange module of the International Genomic Exchange Platform (GenoEx-GDE) has been in use for sharing genotypes by the organisations involved in the InterGenomics-Brown Swiss evaluations since 2021; Since January 2023, GenoEx-GDE is also officially used for pooling of genotypes for the InterGenomics-Holstein evaluations.

Table 4.5: Size of the Interbull Centre operations for InterGenomics (BSW & HOL)

InterGenomics	Dec 2020	Dec 2021	Dec 2022	Dec 2023
Countries	13+5*	12+1*	12+1*	12+1*
Breeds	2	2	2	2
Breed-Country-trait combinations	369	375	377	377
Unique submitted genotypes	86 043	101 589	111 850	120 962
Genotypes entering imputation & genomic evaluation	53 945	59 156	64 289	71 639
Distributed international GEBVs	12 442 915	13 785 838	15 124 006	16 687 677

InterGenomics-Brown Swiss countries: Canada, France, Germany, Austria, Italy, Slovenia, Switzerland, USA

InterGenomics-Holstein countries: Ireland, Israel, Slovenia, South Korea, (Portugal)

* Original contributing countries for InterGenomics-Holstein (2020): France, Denmark, Finland, Sweden, Germany

Ongoing contributing country: Germany

5. INTERNATIONAL BEEF EVALUATIONS – INTERBEEF

Interbeef routine evaluations were performed, as scheduled, for Aberdeen Angus (AAN), Charolais (CHA), Hereford (HER), Limousin (LIM) and Simmental (SIM) in January and October 2023, and included 14 countries.

Following an extensive R&D phase, the first official evaluation for beef carcass traits was performed in October 2023 with Ireland and United Kingdom as participants.

The carcass evaluation is offered for three breeds; Charolais, Limousin and Simmental; and covers three traits: carcass weight, carcass conformation and carcass fat. The distribution of Interbeef results across breeds, trait groups and countries in 2023 is reported in Table 5.1.



Table 5.1: Distribution of Interbeef evaluation across breeds, traits groups and countries in 2023

	Adjusted Weaning Weight					Calving					Carcass		
	AAN	CHA	HER	LIM	SIM	AAN	CHA	HER	LIM	SIM	CHA	LIM	SIM
Australia		✓		✓									
Czech Republic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
DFS*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Estonia	✓	✓	✓	✓		✓	✓	✓	✓				
France		✓		✓			✓		✓				
Germany	✓	✓	✓	✓	✓								
Great Britain				✓					✓		✓	✓	✓
Ireland	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Italy		✓		✓									
Latvia		✓		✓									
Slovenia		✓		✓			✓		✓				
Switzerland*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			

+ DFS: Denmark, Finland and Sweden

x Switzerland: January only

Statistics on the Interbeef evaluations of the beef breeds Aberdeen Angus, Charolais, Hereford, Limousin, and Simmental are presented in Table 5.2.

Table 5.2: Size of the Interbull Centre operations for Interbeef

Interbeef	Oct 2020	Oct 2021	Oct 2022	Oct 2023
Countries	11	13	12	13
Evaluation breeds	5	5	5	5
Country-breed-trait combinations	64	86	94	112
Animals in the pedigree database	38 205 169	46 144 424	48 064 957	50 627 805
Submitted phenotype records	43 435 328	45 636 686	50 616 474	57 228 077
International estimated breeding values*	330 541 516	396 706 011	493 903 871	478 511 245
Publishable international estimated breeding values*	7 696 416	8 808 232	9 803 556	9 708 703

* Direct + maternal EBVs are counted as one.

Interbeef breeding values are estimated using MiX99 Software. Reliabilities are calculated using the MT-EDC5 package. Variance components for Adjusted Weaning Weight (aww) and carcass traits Carcass Weight (cwe), Carcass Conformation (cco) and Carcass Fat (cfa) are estimated by ICBF (Ireland) using the DMU package, while variance components for the calving traits Birth Weight (bwt) and Calving Ease (cae) are estimated by CMBC (Czech Republic) using the BLUPF90 package.

5.1. Changes in participation

In 2023 Switzerland participated only in Interbeef's Routine Evaluation in January - adjusted weaning weight and calving traits for all breeds (Aberdeen Angus, Charolais, Hereford, Limousin and Simmental).

Tyr, the national breeding- and interest organisation for Norwegian beef producers successfully passed its first Interbeef Test Evaluation in October 2023, and will participate in its first Routine Evaluation in January 2024 - adjusted weaning weight for all breeds.

6. DATA EXCHANGE SERVICES

The Interbull Centre provides three levels of genetic and genomic data exchange:

1. Parentage SNP Data
2. (Large) Genotype Data
3. Genetic Traits Information

The service for exchange of genetic traits was extended also to BSW breed starting from December 2023. The service, therefore, now comprises of sharing genetic traits information for Holstein and Brown Swiss breeds. The exchange of Parentage SNP data and (large) genotype data is possible for any beef and dairy breed.

Participation for each of these services (December 2023) is provided in Table 6.1.

Table 6.1: Subscription to the genetic and genomic data exchange services (December 2023)

Country	Organisation	Parentage SNP	Genotypes	Genetic Traits
Australia	DataGene			✓
Belgium	Service Public de Wallonie			✓
Canada	Lactanet		✓	✓
DFS ⁺	SEGES/NAV	✓		✓
France	GenEval		✓	
Germany	Vit	✓		✓
	LFL		✓	
Great Britain	AHDB			✓
Ireland	ICBF	✓	✓	
Israel	ICBA		✓	
Italy	ANAPRI	✓		
	ANARB		✓	✓
	ANAFIBJ	✓		
Japan	LIA	✓		
Netherlands	CRV	✓		✓
Norway	GENO	✓		
Poland	NRIAP	✓		
Slovenia	AIS	✓	✓	
South Korea	NIAS		✓	
Switzerland	Qualitas		✓	✓

+ DFS: Denmark, Finland, Sweden

6.1. Parentage SNP Exchange

The International Genotype Exchange Platform (“GenoEx”) is a platform for exchanging genotypes in a standardised way. On 1 June 2018, GenoEx-PSE (Parentage SNP Exchange) was the first service to be launched on the Interbull Centre’s International Genotype Exchange Platform.



Data Exchanged	Service/Database	Purpose	Key Benefits include
Parentage SNP	GenoEx-PSE	Facilitate and streamline parentage analysis activities carried out by organisations that are responsible and/or active in parentage integrity.	AI bull owners have more accurate identities of daughters in semen importing countries. Available for any breed (dairy & beef)

Table 6.2: Available genotypes of Parentage SNP data to GenoEx-PSE. Data is sorted by Number of Organisations and Total number of genotypes (December 2023).

Breed	Genotypes of Females	Genotypes of Males	Total no. of genotypes	No. of organisations supplying genotypes
Holstein	10 483	32 314	42 797	7
Red Dairy Cattle	54	53 924	53 978	4
Simmental		892	892	3
Jersey		680	680	3
Meuse Rhine Yssel		180	180	3
Holstein, Red and White	48	75	123	3
Brown Swiss	5 677	846	6 523	2
Charolais		344	344	2
Belgian Blue		277	277	2
Angus		262	262	2
Limousin		247	247	2
Hereford	1	117	118	2
Dutch Frisian		80	80	2
Blonde d'Aquitaine		56	56	2
Salers		56	56	2
Parthenaise		42	42	2
Piedmont		33	33	2
Wagyu		28	28	2
Dexter		15	15	2
Highland Cattle		4	4	2
Dairy Shorthorn		84	84	1
Uckermärker		51	51	1
British Frisian		50	50	1
Aubrac		46	46	1
Montbeliard		45	45	1
Normandy		11	11	1
Kerry		4	4	1
Pinzgau		4	4	1
Galloway		3	3	1
Romagnola		3	3	1
Rouge des Pres		2	2	1
Belgium Red & White		1	1	1
Crossbreed		1	1	1
Gelbvieh		2	2	1
Glan Donnersberg		1	1	1
Murray-Grey		1	1	1
Total	16 263	90 781	107 044	

The main purpose of GenoEx-PSE is to provide a service for exchanging standardised sets of SNPs for genotyped animals **to facilitate and streamline parentage analysis activities** carried out by organisations that are responsible and/or active in parentage integrity.

ICAR certification for DNA data interpretation Centres (§8.1) is an important prerequisite for participation in the PSE service. Further details are available on the GenoEx website¹².

Extension of the GenoEx-PSE service with inclusion of **Parentage Discovery** is planned for early 2024. Organisations interested in accessing this extended service are encouraged to apply for ICAR certification for parentage discovery – in addition to ICAR certification for parentage verification.

6.2. Genotype Data Exchange

Within the International Genotype Exchange Platform (GenoEx), the Genomic Data Exchange database (GenoEx-GDE) provides an easy way for exchanging large genotype datasets, facilitating building reference populations, decreasing costs by avoiding re-genotyping the same individuals and

¹² [GenoEx.org](https://www.genorex.org)

encouraging development of genomic evaluations. GenoEx-GDE was launched in August 2020, and is currently used routinely to provide genotypes for the InterGenomics-Brown Swiss and InterGenomics-Holstein services.

Data Exchanged	Service/Database	Purpose	Key Benefits include
Genotypes	GenoEx-GDE	Facilitate and streamline (large) genotype data exchange, through standardised procedures and file formats, allowing definition of specific sharing permission.	Countries with national genomic evaluations are able to exchange national and foreign (males' and females') genotypes through a safe, secure and streamlined process.

Table 6.3: Number of genotypes uploaded to GenoEx-GDE

Breed	Genotypes uploaded in 2023		Total number of genotypes		
	Sex	Female	Male	Female	Male
Brown Swiss		504	4 599	16 908	57 952
Holstein		2 715	7557	33 511	19 823
Other breeds*			100	67	138

* "Other breeds" includes Belgian Blue; Charolais; Hereford; Holstein, Red and White; Jersey; Limousin; Montbeliard and Simmental

6.3. Exchange of Information on Genetic Traits

The "Exchange of Information on Genetic Traits" is in place for sharing animal-specific information on genetic traits in the Holstein and Brown Swiss breeds (see Table 6.4). Besides allowing access to a wider set of information and assuring a smoother and more timely exchange of genetic information (including recessive traits) among participating countries, the service also facilitates effectively reducing the amount of conflicting information among participating countries.

Data Exchanged	Service/Database	Purpose	Key Benefits include
Genetic Traits	IDEA-AnimInfo	Sharing of updated information regarding recessive traits. Identify AI bulls which are carriers of important traits.	Genetic Trait information on animals tested in other countries becomes available to all participating organisations.

During 2023, Interbull Centre worked with the InterGenomics-BSW community to test sharing of relevant genetic traits for the Brown Swiss breed. During this process, a set of traits and their relative codes have been defined and the procedure of sharing such information tested thoroughly. As a result, the "AnimInfo" module on the Interbull Data Exchange Area ("IDEA") has been updated, and the service to exchange information on genetic traits has been expanded to include both Holstein (since 2019) and Brown Swiss (December 2023).

Interbull Centre also continues to collaborate with the ICAR "Breed Associations" and "Interbeef" Working Groups to expand the service to other dairy and beef cattle breeds.

Table 6.4: Participation (with data) in the exchange of genetic traits (December 2023).

Country*	Organisation	Breed	Number of records uploaded
The Netherlands and Flanders	Cooperative CRV	HOL	103 149
Germany	VIT	HOL	436 256
Great Britain	AHDB	HOL	77 573
Italy	ANARB	BSW	46 031
Switzerland	QUALITAS	BSW	104 974
Total			767 983

*Other countries as reported in table 6.1 have not contributed with data, yet.

7. EUROPEAN UNION REFERENCE CENTRE – Zootechnics

The European Commission's decision to designate the Interbull Centre as the European Union Reference Centre for the “*scientific and technical contribution to the harmonisation and improvement of the methods of performance testing and genetic evaluation of purebred breeding animals of the bovine species*” (“EURC-Zootechnics”) was published in the *Official Journal of the European Union* Issue L204/78, 5.8.2017¹³ in 2017. The current duties as the EURC are carried out under the EURC Grant for 2023-2024.



7.1. Performance Recording, Evaluation & Publication Database

For many years, Interbull and Interbeef Service Users and National Genetic Evaluations Centres have been acquainted with Forms “GE”, “GENO” and “BEEF” to describe their national systems for performance recording and genetic & genomic evaluation. The Performance Recording, Evaluation and Publication (“PREP”) Database was launched in March 2022 to replace these forms and facilitate greater transparency of information on performance recording and evaluation – on a wider range of traits and breeds. Through the PREP Database, breed societies and third parties designated by breed societies

The PREP database:

- Facilitates greater transparency of the information performance recording and evaluation;
- Enables the collection of additional information - on a wide range of breeds and traits;
- Harmonises and standardises the collection of information on recording and evaluation of traits.

(NGEC’s) can give information in a standardised way. The PREP database has shown to be especially valuable in better comparing and ultimately harmonising performance testing and genetic evaluation methods, and assists in identifying traits of common interest to the global cattle breeding industry (see §2.6) from a wide range of traits and breeds.

At the end of 2023, the PREP database provides harmonised information regarding the internationally evaluated trait groups “Production”, “Conformation”, “Fertility” and “Calving” for dairy cattle, and all traits included in the Interbeef evaluations: “Adjusted Weaning Weight”, “Calving” and “Carcass”. During 2024, PREP will be equipped with the remaining internationally evaluated traits - Udder Health, Longevity, Workability - and enable reporting on genomic evaluations.

Aided by the standardisation of information to create dedicated electronic forms in the PREP database, the work on providing a set of recommended guidelines for recording, editing and evaluating fertility traits in dairy cattle has started in 2023. It is expected that such recommendations will be distributed to the dairy community in 2024, and that this will result in an update of the ICAR Guidelines¹⁴ (“Section 09 – Dairy Cattle Genetic Evaluation”¹⁵).

In 2023 the PREP database was equipped with new features to increase its usability, such as *access to content for non-registered users*, improved search/filter functionality to provide overviews of the available information, and the possibility to download the result of the query in different formats (pdf/xml/json/csv).

¹³ https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.204.01.0078.01.ENG&toc=OJ:L:2017:204:FULL

¹⁴ <https://www.icar.org/index.php/icar-recording-guidelines/>

¹⁵ <https://www.icar.org/Guidelines/09-Dairy-Cattle-Genetic-Evaluation.pdf>

7.2. Validation

Validation of national EBVs and GEBVs is one of the top priorities to ensure reliable National and International, genetic and genomic evaluations. Conventional Validation tests provide reassurance to the National Genetic Evaluation Centres, cattle organisations and farmers that the bias in their statistical models applied for a given breed/trait are within a tolerated threshold of 2%. This provides an assurance that their statistical models applied are sound and fit their data well, avoiding any under/over estimation of their animals' genetic worth. In 2023 the Interbull Centre provided a total of 622 validation tests to National Genetic Evaluation Centres.

Providing further assistance to European Competence Authorities and in line with the current European Animal Breeding Regulations, Interbull Centre offers the possibility to Breeding Associations and their third parties (including Genetic Evaluation Centres) to assess the correctness of their genetic evaluation models (in matter of level of bias detected) by offering the **EURC Validation service**. This service is offered to Breed Associations and their third parties, even if a breed or country is not included in international genetic evaluations at the Interbull Centre.

8. SUPPORT SERVICES to ICAR

In addition to the genetic and genomic evaluations for dairy and beef, the Interbull Centre provides the following technical support to ICAR.

8.1. ICAR Certification of DNA Data Interpretation Centres

The Interbull Centre handles the technical component for the ICAR certification of DNA Data Interpretation Centres since 2018 by distributing and assessing the necessary test files and results. The test files are created by a programme, 'Cuckoo', that has been developed by Lactanet, Canada. Since the inception of the service, 70 tests have been assessed by the Interbull Centre. At the end of 2023, twenty-four (24) organisations were ICAR Certified DNA Data Interpretation Centres. Many of these organisations have been re-certified when the two-year validity of their certification expired. Visit the ICAR website for the full list of ICAR Certified DNA Data Interpretation Centres¹⁶ and to get further information on how to become an ICAR Certified DNA Data Interpretation Centre¹⁷.

8.2. ICAR Certificate of Quality

The Interbull Centre provides ICAR with information on international genetic and genomic evaluations for the ICAR Certificate of Quality. During 2023, information was provided for eight (8) Interbull Service Users:

- Association Wallonne des Éleveurs (AWE), Belgium
- Czech Moravian Breeders Company (CMBC), Czech Republic
- Coöperatie Koninklijke CRV u.a. (CRV), The Netherlands
- Irish Cattle Breeding Federation (ICBF), Ireland
- Agricultural Data Centre (LDC), Latvia
- National Genetic Evaluation Centre for Denmark (SEGES), Denmark
- Scotland's Rural College (SRUC), United Kingdom
- Växa Sverige, Sweden



THE GLOBAL STANDARD FOR LIVESTOCK DATA

¹⁶ <https://www.icar.org/index.php/certifications/dna-certifications/certification-and-accreditation-of-dna-genetic-laboratories/two-new-dna-based-services/dna-data-interpretation-centres/icar-accreditation-of-dna-interpretation-centres/>

¹⁷ <https://www.icar.org/index.php/certifications/dna-certifications/certification-and-accreditation-of-dna-genetic-laboratories/two-new-dna-based-services/dna-data-interpretation-centres/>

9. INTERBULL CENTRE INFRASTRUCTURE

The Interbull Centre has an efficient, effective, versatile, scalable, and powerful computing infrastructure. It consists of customer facing software services and databases for the exchange of data and information: *Interbull Data Exchange Area* (“IDEA”), *International Genotype Exchange Platform* (“GenoEx”) and *Performance Recording, Evaluation and Publication Database* (“PREP”), as well as a cluster system with attached clustered file storage that is used for high-performance data analysis and tools for system monitoring, operational system management, backups, communication, and project management.

Software costs are kept manageable by using many well-vetted Open Source components, while the performance and ease of maintenance of the system has been honed by years of experience doing large-scale data analysis at the Interbull Centre.

9.1. System Maintenance and Developments 2023

The Interbull Centre continues to invest in infrastructure improvement in order to continue to provide an increasing number of services efficiently. During 2023, routine updates and upgrades were carried out to make sure that servers remain up-to-date with the latest versions of operating systems and software. Servers were migrated away from the old Operating System (CentOS) and replaced with the latest versions of Debian to make sure that the Interbull Centre continues to maintain required updates of systems.

Interbull Centre encourages its users to also update their software regularly and ensure that they comply with the minimum version requirements to minimise issues in data exchange with Interbull Centre.

The Interbull Discussion Forum (<https://forum.interbull.org>) has been converted and merged to a different platform due to decreasing development in the old system. PREPdb (<https://prep.interbull.org>) has seen some great improvements (see §7.1), and GenoEx (<https://genoex.org>) has been further improved: it has been moved to the latest database management system (Postgresql), ported to the newly installed operating system (Debian), and bugs have been fixed.

10. RESEARCH & DEVELOPMENT – Dairy

The following is a summary of research and development activities conducted at the Interbull Centre or with the involvement of Interbull Centre staff in 2023.

10.1. SNP Mace; International SNP Evaluations

During 2023, plans were made to carry out the next stage of the SNP Mace project – to address outstanding technical questions. Although these plans have not yet been implemented, the Interbull SC would like to see these carried out during 2024.

10.2. Genomic Reliabilities (“GREL”) WG

In 2023, the Genomic Reliability Working Group investigated computational time of the Interbull GREL method. Due to the increased practice of cow genotyping leading to reference populations of millions of genotypes, challenges of calculating genomic reliability within the time frame of routine evaluations occurs. A possible solution was proposed: to use a constant for the EDC gain for the routine evaluations, re-calculating the constant when larger changes are done to the evaluation model. The GREL WG, started in 2023, also reviewed the Interbull recommendations for calculation of genomic reliability, with the aim to present updated recommendations in 2024.

10.3. Genomic Pre-selection (“GPS”) and Future MACE WG

The Future MACE Working Group has defined and tested the effects of different models to best fit genomic preselection in the MACE model. When dealing with GPS effects, the WG realised that two main scenarios needed to be taken in consideration to properly account for such effects for all types of bulls:

- Bulls pre-selected and proven in country of birth and then also proven in another country.
- Bulls sold, pre-selected and proven in country 2, without being selected or proven in country of birth.

The model derived from these considerations resulted in the following approach:

- pre-selection countries were limited, in order to have a minimum population’s size:
- pre-selection effects were assumed to be zero or very negligible for countries with a very small population size.

Application of this approach would still result in the majority of participating countries to be included in the analysis. The new model allows an estimation of the genomic pre-selection effect that appeared to be more internationally based compared to the other models tested. The incidence of pre-selection effect on imported bulls would then get multiplied by the regression from the selecting to the proven country’s scale.

The new model looks promising and preliminary results have been shared during the 2023 Interbull Technical Workshop in Rome, as well as the 2023 Interbull Business Meeting in Lyon. The WG continues fine-tuning the model for a possible implementation at the earliest opportunity.

10.4. Validation WG

The Validation Working Group has fine-tuned the enhanced GEBV-test software already presented during the 2023 Interbull Technical Workshop in Rome, and the 2023 Interbull Annual Meeting in Lyon. It is expected that the new software will be made available to all Interbull users during the first half of 2024 - so that users can adapt to the new requirements of the software in matter of input files - and be officially introduced in August 2024.

10.5. Reviewing MACE proof code WG

In 2023, the ITC initiated a new working group to review the codes currently used by countries to define the different type of proofs provided for MACE evaluations (i.e. based on first crop sampling daughters; based on first and second crop daughters, etc.). The relevance of these codes is now being assessed, as such codes have not been reviewed since early MACE evaluations, while more recently most countries have moved towards genomic selection. The aim of the Working Group is thus to review the current codes, provide clearer guidance to countries on how to use them and propose any changes that could be relevant in the current breeding scenario. A report with recommendations is expected in 2024.

11. RESEARCH & DEVELOPMENT – Beef



11.1. Interbeef Female Fertility traits WG

During 2023, a first attempt to estimate breeding values with a simple model was conducted and results shared with the participating countries. Although the results were found to be satisfactory there was the necessity to further develop both the models and parameters to be used. Issues raised during the Interbeef Technical Committee meetings have been addressed.

11.2. Validation of national and international beef models WG

This Validation Working Group has focused on adapting Interbull Method II – as used for dairy – to assess evaluations of beef cattle. Less intensive use of artificial insemination in the beef cattle industry than in the dairy industry results in fewer offspring per bull and smaller contemporary groups available compared to dairy. For this reason, the criteria for choosing bulls to be included in the validation test needs to be revised. Different scenarios have been tested using data from Ireland, Italy and Interbeef Evaluations, and the most promising ones have been retained to check the test sensitivity.

A report with the results obtained so far will be presented to the Interbeef WG and scientific advisors in 2024.

11.3. Interbeef Genomic Task Force

Within the Interbeef Genomic Task Force framework, Interbull Centre, in association with Wageningen Livestock Research (WLR), has prepared and presented to the Interbeef WG, development plans for the Genomic Evaluation and linked services. Activities were carried out to receive feedback from the Interbeef community and enrich the discussions. Although a final decision on the approach to follow has not yet been reached, these discussions have led to 1) a new R&D project with WLR, supported by ICAR, Ireland, Great Britain and Italy, titled "*Towards multi-breed multi-trait beef cattle international genomic evaluations for novel traits and small populations*", and 2) the installation of an 'Interbeef Convenor Group' by the ICAR Board to address the future of Interbeef.

11.4. Interbeef Variance Components Estimation WG

The Interbeef Variance Component Estimation (VCE) WG was reactivated in 2023. One of the most important activities of the VCE WG during the year was to find objective parameters to help decide on the need for new variance component estimations whenever no changes to the data from participating countries were made for a prolonged period of time.

The estimation of VC in the framework of an International Evaluation is very costly in terms of computer resources and time. The need to have objective parameters for decision-making on a total or partial re-estimation of these components is crucial to keep the parameters up to date while at the same time avoiding unnecessary use of resources. The WG has already identified critical points to include in the decision-making protocols. It has also conducted tests to measure genetic connectivity between populations, which can be included in the procedures. The WG expects to submit a report with recommendations to the Interbeef WG in 2024.

12. MEETINGS, COMMUNICATIONS and PUBLICATIONS

12.1. 2023 Interbull Annual Meeting

The 2023 Interbull Annual Meeting was held from 26-28 August 2023 in conjunction with the 74th EAAP Annual Meeting in Lyon, France. During the Business Meeting the Interbull activities were presented by the Interbull Chair, members of Interbull Committees, Task Forces and Working Groups, and Interbull Centre staff, covering Interbull Governance, Interbull Centre's finances, services, R&D and operations (Dairy, Beef and SNP services)

The Interbull Open Meetings addressed “*New traits in genetic and genomic evaluation systems*”, “*Experiences at national level with single-step evaluations*”, “*New methods, validation, harmonisation, dairy cross-breeding and beef evaluations*”.

The EAAP-Interbull joint session “*Up side and down side of “genomic selection”*” provided the participants with the latest updates on these relevant topics.

On the Interbull website you will find the public materials for the Business Meeting¹⁸, and presentations of the Open Meetings¹⁹. The proceedings of the Open Meetings have been published in Interbull Bulletin No. 59²⁰. Some interesting pictures from the 2023 Interbull Annual Meeting are also available on the Interbull Hall of Fame.

12.2. 2024 Interbull Annual Meeting

The 2024 Interbull Annual Meeting will be organised in conjunction with the 47th ICAR Conference in Bled, Slovenia.

12.3. Interbull Webinars

A series of webinars was held during 2023. Webinars have been recorded and the video is available within the IDEA/Help tab for the convenience of all current and future IDEA users.

- **IDEA pedigree module** and all its functionalities, 27 April 2023, 46 participants
- **AnimInfo module**, 26 July 2023, 34 participants
- **Dairy proofs module** (for dairy users), 27 September 2023, 26 participants
- **Beef performance module** (for beef users), 26 October 2023, 14 participants.

12.4. Interbull Bulletin and Websites

The **Interbull Bulletin** contains the state-of-the-art in genetic evaluation methods, as well as the most recent information on national and international implementations. Two issues were published in 2023. The Proceedings of the 2023 Interbull Technical Workshop were published in *Interbull Bulletin* No. 58 in June 2023. The Proceedings of the 2023 Interbull Meeting were published in *Interbull Bulletin* No. 59 in December 2023. These issue as well as all historic issues can be accessed through the online *Interbull Bulletin*²¹.

The **Interbull**²² website has been updated with the latest information, including the 2023 Interbull Centre Activity and Finance Reports, and the 2024 Annual Operating Plan²³.

¹⁸ https://interbull.org/ib/2023_bm_lyon

¹⁹ https://interbull.org/ib/2022_scientific_programme (only presentations for which permission to publish has been received)

²⁰ <https://journal.interbull.org/>

²¹ <https://journal.interbull.org/>

²² <https://interbull.org/>

²³ <http://interbull.org/ib/itbcreports>

The latest information on **Interbeef** is shared with ICAR so relevant Interbeef pages on the ICAR website²⁴ can be updated.

Pictures of Interbull events remain available in the “**Hall of Fame**”²⁵.

12.5. Publications by Interbull Centre staff

Haugaard, K., Sendeck, J., Macedo, F., Nicolazzi, E., de Jong, G., Roozen, T., Palucci, V. (2023) Interbull Technical Workshop 2023 Overview of the New Traits Session, *Interbull Bulletin 58*, 1-6

Palucci, V. (2023) Performance Recording, Evaluation and Publication information: **PREP** il nuovo database di Interbull Centre, *Bianconero Journal*, May-June 2023

Palucci, V., Haugaard, K., Macedo, F. (2023) Interbull new services: Current and Future, *Interbull Bulletin 59*, 158-163

Macedo, F. (2023) International beef evaluation for Carcass traits, *Interbull Bulletin 59*, 197-201

Nazari Ghadikolaei, A; Fikse, F.; Eriksson, Susanne (2023) Single-step GBLUP for growth and carcass traits in Nordic beef cattle, *Annual meeting of the European Association for Animal Production*, Vol: 29, 801-80, DOI: 10.3920/978-90-8686-936-7

Hazas, S., Palucci, V., Haugaard, K., Nazari, A. (2023) - Cos'e' Interbull?, *Bianconero Journal*, November-December 2023.

²⁴ <https://www.icar.org/index.php/technical-bodies/working-groups/interbeef-working-group/>

²⁵ <http://interbull30years.blogspot.se/>

Appendix 1: Interbull and Interbeef Committee, Working Group and Task Force Compositions.

Interbull Centre personnel are represented in various Committees, Task Forces and Working Groups. Full membership for these groups as on 31 December 2023 is provided below.

Within brackets are members of the Interbull Centre team who regularly attend the meetings of the group, even if not official group members.

ICAR's Sub-Committees and Working Groups:

- **Interbull Steering Committee:**
Matthew Shaffer (Chair), Brian Van Doormaal (Vice-Chair), Gerben de Jong, Marija Klopčič, Sophie Mattalia, Gert Pedersen Aamand, Daniele Vicario, Ezequiel Nicolazzi, Urs Schnyder (**Toine Roozen, Simone Hazas**).
- **ICAR ID Sub-committee:**
Kevin Evers (Chair), Kaivo Ilves, Folkert Vonken, **Valentina Palucci**, Othon Reynoso Campos, Sebastian Duroy, Paul Laronde, Salvador Ronda, Pedro Vieira, Andie Dimitriadou.
- **ICAR DNA WG:**
Romy Morrin-O'Donnell (Chair), Brian Van Doormaal, André Eggen, Suzanne Harding, Dariusz Kamola, Matthew McClure, Nilesh Nayee, Ezequiel Nicolazzi, **Katrine Haugaard**, Jiansheng Qiu, Clotilde Patry, Johan De Meulemeester.
- **Interbeef WG:**
Andrew Cromie (Chair), Steve Miller, Gert Pedersen Aamand, Mike Coffey, Mauro Fioretti, Laurent Griffon, Til Masthof, Svenja Strasser, Mart Uba, Mojca Voljc, Japie van der Westhuizen (**Fernando Macedo, Toine Roozen, Katrine Haugaard, Valentina Palucci, Anahit Nazari**).
- **Beef Genetic Traits WG:**
Suzanne Harding (chair), Jennifer McClure, Matthew McClure, Catalin Rotar, Steven Skinner, Alena Svitakova, Kevin Byskov, Pauline Michot (**Valentina Palucci**).

Interbull Steering Committee Working Groups and Task Forces:

- **Interbull Technical Committee:**
Gerben de Jong (Chair), Tom Lawlor, Paul VanRaden, Zengting Liu, Raphael Mrode, Andres Lagarra, Jan-Thijs van Kaam, Peter Sullivan, **Valentina Palucci (Katrine Haugaard, Fernando Macedo, Anahit Nazari)**.
- **EU Reference Centre WG:**
Sophie Mattalia (Chair), Marija Klopčič, **Toine Roozen, Valentina Palucci**.
- **Business Funding Models Task Force:**
Brian Van Doormaal (Chair), Laurent Journaux, Urs Schnyder, Gert Pedersen Aamand, Gerben de Jong, **Toine Roozen**.
- **InterGenomic-Holstein WG:**
Marija Klopčič (Chair), Sophie Mattalia, Brian Van Doormaal, **Toine Roozen, Katrine Haugaard**.
- **New Traits Pipeline WG:**
Gerben de Jong, Ezequiel Nicolazzi, **Toine Roozen, Valentina Palucci (Anahit Nazari)**.

Interbull Technical Committee's Working Groups:

- **Genomic Reliability (GREL) WG:**

Zengting Liu (Chair), Mario Calus, Martin Lidauer, Vincent Ducrocq, Paul VanRaden, Jeremie Vandenplas, Herwin Eding, **Katrine Haugaard**.

- **Genomic Pre-selection (GPS) & Future MACE WG:**

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- **Validation WG:**

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- **SNPMace WG** (dormant in 2023):

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- **Reviewing MACE proof codes WG** (new in 2023):

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- **Interbeef VCE WG** (dormant in 2023):

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- **Interbeef Female Fertility WG:**

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