Interbull Centre

Activity Report

2015/2016

INTERBULL CENTRE

ACTIVITY REPORT 2015/2016[1]

INTERBULL CENTRE

Department of Animal Breeding and Genetics
Swedish University of Agricultural Sciences - SLU
Ulls Väg 26, PO Box 7023, 750 07 Uppsala, Sweden
Phone: +46(0)18-67 2098
www.interbull.org

SLU
Swedish University of Agricultural Sciences

The Interbull Centre is the operational unit of the ICAR permanent sub-committee Interbull.

ICAR

The Interbull Centre holds the status of European Union Reference Laboratory (EURL) for Zootechnics (Bovine Breeding).

The Interbull Centre is ISO 9001:2008 certified.

ISO 9001
BUREAU VERITAS
Certification
N° SE004561-1

[1] Presented at the 2016 Interbull Meeting, Puerto Varas, Chile, October 2016

INTERBULL CENTRE ACTIVITY REPORT 2015/2016

Contents

INTRODUCTION 3

GOVERNANCE and ORGANISATIONAL STRUCTURE 4

PEOPLE 6

SERVICE and OPERATIONS – International Dairy Breed Evaluations (Interbull) 8

SERVICE and OPERATIONS – International Beef Breed Evaluations (Interbeef) 12

RESEARCH and DEVELOPMENT - Interbull 13

RESEARCH and DEVELOPMENT - Interbeef 16

RESEARCH and DEVELOPMENT - GenoEx 20

RESEARCH and DEVELOPMENT - Infrastructure 21

RESEARCH and DEVELOPMENT - Funding 22

SERVICE CALENDARS 23

TASK FORCES and WORKING GROUPS 24

MEETINGS 25

COMMUNICATIONS and PUBLICATIONS 26

Appendix 1: Interbull Committees and Working Groups 28

INTRODUCTION

The Interbull Centre is a section of the Department of Animal Breeding and Genetics (HGEN) of the Swedish University of Agricultural Sciences (SLU), and acts as the operational unit for Interbull and Interbeef, a permanent subcommittee and a working group of the International Committee for Animal Recording (ICAR), respectively. Additionally, the Interbull Centre holds the status of the European Union Reference Laboratory for Zootechnics (EURLZ).

Starting from January 2016, Interbull Centre has been successfully certified according to the ISO 9001 standards. This achievement has signed the conclusion of a long period of changes at the Centre, regarding both streamlining of operations as well as personnel, which has led the Interbull Centre becoming stronger and more efficient.

After a number of years in which the Interbull Centre was looking to fill vacancies, the team is currently to full strength once again, and in a good position to continue pursuing its goal: providing genetic information services and applied research for improvement of livestock to a worldwide network and fulfilling its mandate as a reference laboratory for the European Union.

This document describes the activities at the Interbull Centre between 12 July 2015 and 31 August 2016, as well as some future activities and work plans.

Toine Roozen,

Interbull Centre Director

GOVERNANCE and ORGANISATIONAL STRUCTURE

The International Bull Evaluation Service ("*Interbull"*) was formed by the European Federation of Animal Science (*EAAP*), the International Dairy Federation (*IDF)* and the International Committee for Animal Recording (*ICAR),* with support of the Food and Agriculture Organization of the United Nations (*FAO*) in 1983. Since 1988 *Interbull* is a permanent sub-committee of ICAR. Interbull is managed by an ICAR appointed **Steering Committee**, supported by two expert groups: the **Scientific Advisory Committee** (SAC) and the **Interbull Technical Committee** (ITC) (see Appendix 1).

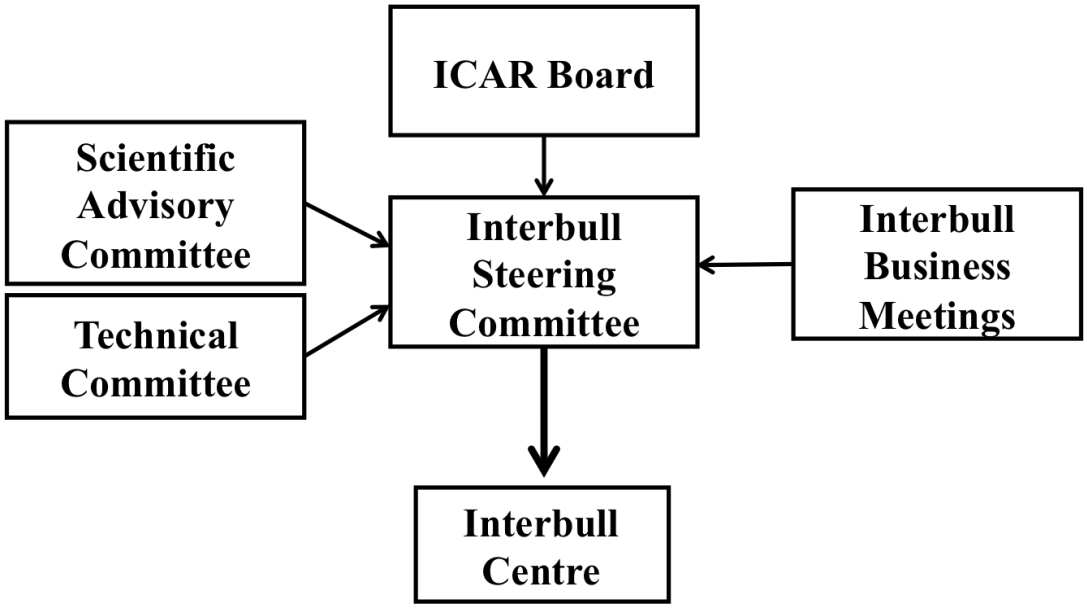

Figure 1: Interbull organisational structure.

Interbull Centre

The Interbull Centre (www.interbull.org/ib/interbullcentremain) is the operational unit of Interbull and provides genetic information services and applied research for improvement of livestock to a worldwide network.

Administratively, the Interbull Centre is a section of the Department of Animal Breeding and Genetics (HGEN) of the Swedish University of Agricultural Sciences (SLU), which has been contracted by ICAR to be the operational unit for Interbull and Interbeef.

As the European Union Reference Laboratory for Zootechnics, the Interbull Centre interacts with the EU member states through the international genetic evaluation services and also provides assistance to the European Commission in issues related to bovine breeding and genetics.

	Multiple Across Country Evaluations (MACE) for progeny tested bulls							Genomic Services				Beef
1995	PROD											
1999	PROD	CONF										
2001	PROD	CONF	UDDER									
2004	PROD	CONF	UDDER	LONG								
2005	PROD	CONF	UDDER	LONG	CALV							
2007	PROD	CONF	UDDER	LONG	CALV	FERT						
2008	PROD	CONF	UDDER	LONG	CALV	FERT	WORK					
2010	PROD	CONF	UDDER	LONG	CALV	FERT	WORK	G-test				
2011	PROD	CONF	UDDER	LONG	CALV	FERT	WORK	G-test	IG			
2014	PROD	CONF	UDDER	LONG	CALV	FERT	WORK	G-test	IG	GMACE		
2015	PROD	CONF	UDDER	LONG	CALV	FERT	WORK	G-test	IG	GMACE		Beef
2016	PROD	CONF	UDDER	LONG	CALV	FERT	WORK	G-test	IG	GMACE	PSE	Beef
PRODuction, CONFormation, UDDER Health, LONGevity, CALVing Trait, FERTility, WORKability, GEBV-Test, IG=InterGenomics, GMACE, GenoEx-PSE, InterBeef												

Figure 2: Development of Interbull Portfolio

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 items.

This report provides details on the full range of services and activities at the Interbull Centre for 2015/2016.

Infrastructure

Interbull Centre utilizes a network of high performance computers, arranged in a cluster system to process data in a parallelized and distributed fashion. The system is built on free and open source software, easy maintenance, and cost-effective hardware solutions, making the system an efficient, versatile and powerful tool for data processing required by services offered by the Interbull Centre. The system currently consists of three servers used for administrative purposes — network/boot server, fileserver and entry point server — as well as 14 data crunching servers, which do the bulk of the data processing. The system is built from years of experience doing parallel processing at the Interbull Centre, is easily scaled up when the demand for more processing power is required and is constantly developed and refined to create an even better environment for data crunching,

Continuous investment in infrastructure improvement has meant that the Interbull Centre has been able to provide an increased number of traits and services within strict deadlines, as exemplified in the tables with statistics on each of the services (MACE, GMACE, InterGenomics and Interbeef).

ISO 9001:2008 Certification

The Interbull Centre's quality management standards for MACE and GMACE services have been SS-EN ISO 9001:2008 certified since January 2016. In line with continuous improvement practices, Interbull Centre staff is working on expanding the certification to additional services, while also upgrading it to the latest (ISO 9001:2015) standard.

PEOPLE

Personnel

The Interbull Centre staff is employed by the Department of Animal Breeding and Genetics (**HGEN**) of the Swedish University of Agricultural Sciences (**SLU**) even though the work plans and budgets for the Centre and the Interbull Secretariat require the approval of the Interbull Steering Committee, the Interbeef Working Group and the European Commission.

The staff employed at the Interbull Centre during the period reported herein consisted of:

- Haifa Benhajali (PhD) – Geneticist (joined Interbull Centre on 09 March 2015)
- Eva Hjerpe (MSc) - Geneticist (01 March 2004)
- Hossein Jorjani[2] (PhD)- Senior Geneticist, Service Manager, Deputy Director (01 November 1998)
- Valentina Palucci (MSc) – Geneticist (07 March 2007)
- Marcus Pedersén – Systems Administrator (23 May 2016)
- Petri Pennanen – Programmer and Systems Administrator (01 May 2014)
- Toine Roozen (MSc, MBA) – Director (08 September 2015)
- Joanna Sendecka (PhD) – Geneticist (15 January 2015)
- Carl Wasserman – Systems Developer and IT Coordinator (01 August 2011).

The following SLU members of staff have part-time responsibilities at Interbull Centre:

- Jonatan Andersson – Programmer (from 10 June 2016 until 30 September 2016)
- Monica Jansson – Interbull Bulletin
- Fernando Lopes-Pinto – Bioinformatician
- Cano Merkan – IT Coordinator / Systems Analyst
- Louise Simann – Administrator (from 15 September 2016)

Staff which left during this period:

- Mohammad Nilforooshan (PhD) – Geneticist (from 1 June 2012 until 16 October 2015)
- Erling Strandberg (PhD) - Interbull Secretary (until 16 November 2015)
- Carin Rask – Administrator (from 1 February 2016 until 30 July 2016)
- Harriet Staffans – Administrator (until 30 April 2016 and from 15 August 2016 until 30 September 2016).

Toine Roozen joined the Interbull Center as Director in September 2015. Marcus Pedersén started in May 2016 as the Systems Administrator at Interbull Centre. We welcome both to the team and wish they enjoy working with us.

We thank Mohammad Nilforooshan and Erling Strandberg for their contributions to the Interbull Centre: Mohammad Nilforooshan left the Interbull Centre in October 2015 to pursue his research career at the University of Otago, New Zealand. Erling Strandberg expressed at the end of 2015 his wish to be relieved from his role as the Interbull Secretary, which was accepted at the Steering

[2] Hossein Jorjani is employed full-time with Interbull Centre, but is on leave of absence for 50% to fulfill his duties as Head of the Department of Animal Breeding and Genetics (HGEN) at the Swedish University of Agricultural Sciences (SLU).

Committee meeting of November 2015. Instead of appointing a new Interbull Secretary, the Interbull Steering Committee has chosen to allocate the majority of the Secretary Role to the Interbull Centre Director, while some of the Interbull Secretary's activities become the responsibility of the Interbull Chair or, where appropriate, SC members.

Training, Courses and Conferences

Staff attended the following courses and conferences during this period:

Training Courses:	**Location**	**Dates**	**Attendee**
Training: ISO 9001 & ISO 14001 News Seminar	Göteborg, Sweden	04 September 2015	Valentina Palucci
Training: "Lead Auditor Quality Management Systems (IRCA-accredited)	Göteborg, Sweden	25-29 April 2016	Valentina Palucci
Short course - Programming and computer algorithms in animal breeding with focus on single-step GBLUP and reality of genomic selection	University of Georgia, Athens, GA, USA	16 May 3 June 2016	Haifa Benhajali
Conferences:	**Location**	**Dates**	**Attendee**
67th Annual meeting of EAAP	Belfast, NI, UK	29 August – 02 September 2016	Toine Roozen and Joanna Sendecka

Consultants

Dr Pete Sullivan (CDN, Canada) works as a part time consultant (25%) on GMACE related issues.

Visitors

Two Swedish high school students, Sebastian Rosengren and Alex Badiee, spent as part of their computer studies two days a week for 10 weeks at the Interbull Centre and were involved in mainly Linux development and administration, i.e. learning and testing how to install, configure and administer Linux systems, and specific Linux applications/services like the Ansible administration system, bundling of network cards and the web2py web framework. They were also helpful with some tasks for the centre like testing the memory of our data crunchers.

Renzo Bonifazi is an Erasmus student from the University of the Study of Perugia, Italy, who worked at the Interbull Centre on genomics projects for a 4-month period (May-September 2016). The purpose of his study was to document and compare methods and results of calculating genomic reliabilities within national genomic evaluations of dairy cattle populations and suggest ways of harmonization. The results of his projects at the Interbull Centre will contribute to his Master Thesis at his University in Perugia.

In October 2015 ICAR CEO Martin Burke (ICAR CEO), Brian Wickham (Coordinator of ICAR Groups) and Reinhard Reents (Interbull Chairman) visited the Interbull Centre, and met with Interbull Centre Director Toine Roozen and Service Manager Hossein Jorjani. The main purpose of the visits was to introduce the ICAR CEO and Interbull Centre Director (both having started in 2015) to each other. In addition, plans for the ICAR and Interbull meetings in Chile, and the continuous cooperation between ICAR, Service-ICAR, Interbull, Interbull Centre and SLU were discussed. The cooperation was considered successful and all parties expressed their wishes to continue and develop the cooperation for the future.

Erik Kutscher, an auditor within *Bureau Veritas Certification Sverige AB*, visited the Interbull Centre on 18 August 2015 and 24 November 2015 to carry out an initial and main audit respectively, leading to the Interbull Centre acquiring the SS-EN ISO 9001:2008 certification on 13 January 2016.

In June 2016 the former Interbull Secretaries Jan Philipsson and Erling Strandberg, and Interbull Chairman Reinhard Reents visited the Interbull Centre and met with Interbull Centre Director Toine Roozen and Service Manager Hossein Jorjani. Main purpose of the visit was to discuss aspects of historic and current governance of the Interbull Centre.

SERVICE and OPERATIONS – International Dairy Breed Evaluations (Interbull)

Validation of National EBVs and GEBVs

One of the most important roles played by Interbull is to test the national genetic evaluation results for consistency before using them as input for the international genetic evaluations. This is part of the Interbull evaluations quality control measures, but also serves as a public recognition that the national data supplied by Interbull Service Users is reliable. The Interbull Centre offered the validation services regularly during the period and Service Users are required to perform validation when:

- the national evaluation model or the genetic parameters change causing the REML sire standard deviation to change more than 5% between previous and current data,
- a population participates for the first time in a specific Interbull evaluation, or
- it has been more than 2 years since the last validation results were submitted to Interbull.

Results of validation tests are confidentially kept between the Interbull Centre and the service user. The fact that a given population participates in the Interbull evaluation for a given trait implies that it has passed validation. The only exception are the results from the GEBV test for production traits, which are made public to comply with determination of the Directorate of Animal Health and Welfare of the European Commission, who has accepted Interbull Centre recommendation to consider genomic evaluations validated by the GEBV test as valid procedures within EU states (official communication).

Methods I, II and III for validation of classic EBVs (based on performance data) follow the official test evaluations calendar. Validation results are submitted over a period of the three weeks after the commencing of the test evaluation and are processed before the end of the test run. The GEBV test results can be submitted by Service Users to the Interbull Centre at any time. Results will be processed as received.

MACE Evaluations

Interbull Centre test evaluation runs were performed in September-October 2015 and January-February 2016. Many changes in national and international evaluations have been introduced during this period, and are all described in the service reports published on the Interbull Centre website at http://www.interbull.org/ib/maceev_archive after each subsequent routine evaluation. Table 1 shows the current number of populations and bulls included in Interbull Centre MACE evaluations and Table 2 shows some additional statistics on Interbull MACE evaluations.

Table 1: Total number of populations per breed-trait group combination in the most recent (April 2016) routine Interbull genetic evaluation service.

Breed Group	Production (3)	Conformation (23)	Udder Health (2)	Longevity (1)	Calving (4)	Female Fertility (5)	Workability (2)	TOTAL (40)	Increment in the period	publishable proofs (production)
Brown Swiss	11	9	10	10	6	9	7	**62**	2	10 332
Guernsey	6	4	6	6	0	6	0	**28**	0	1 104
Holstein	30	24	29	20	16	20	10	**149**	1	143 283
Jersey	11	9	8	9	0	9	5	**51**	0	11 922
Red Dairy Cattle	14	9	13	10	7	11	6	**70**	0	15 218
Simmental	13	0	12	6	0	0	0	**31**	3	30 587
TOTAL	**85**	**55**	**78**	**61**	**29**	**55**	**28**	**391**	6	**212 446**
Increment	0	0	1	1	2	1	1	**6**		5 224

The number of traits by trait group is given in parenthesis.

Number of bulls with published MACE EBVs for production traits is shown in the last column.

Table 2: Size of Interbull Centre operations for MACE.

Multiple Across Country Evaluation (MACE)	**Dec 2013**	**Dec 2014**	**Dec 2015**
Number of countries	34	34	34
Number of evaluation breeds	6	6	6
Number of country-breed-trait combinations[1]	1,789	1,833	1,825
Number of breed-trait evaluations	171	171	171
Number of animals in the pedigree database	21,067,789	23,084,236	24,981,462
Number of submitted national estimated breeding values	8,276,343	11,030,135	11,573,393
Number of qualified national estimated breeding values	5,932,416	6,086,142	6,348,587
Number of calculated international estimated breeding values	251,709,552	265,634,220	270,221,873
Number of distributed international estimated breeding values	98,769,083	102,965,388	103,108,350
Multiple Across Country Evaluation (MACE)	**Sep 2013**	**Sep 2014**	**Sep 2015**
Number of estimated across country genetic correlations[1]	12,999	13,168	12,548
Number of validation tests[2]	146	183	132

[1] Merging of 2 populations in one country during 2015

[2] Subject to natural fluctuations

Routine international genetic evaluations for Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental production traits were computed as scheduled in August 2015, December 2015, April 2016 and August 2016. ARG withdrew from the Interbull Centre evaluation for HOL from December 2015. USA joined the evaluation with SIM in December 2015.

Routine International genetic evaluations for Brown Swiss, Guernsey, Holstein, Jersey and Red Dairy cattle conformation traits were computed according to the same schedule as for production traits. USA added the following breed-trait combinations in April 2016: BSW bde, hde, rtp; JER bde, rtp, rlr; RDC rlr, rtp; GUE rtp.

Udder health traits evaluations for Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental were also computed according to the same schedule as production traits. USA joined the evaluation with SIM in December 2015.

Direct Longevity trait evaluations for Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental were computed according to the same schedule as for production traits. USA joined the evaluation with SIM in December 2015.

Calving traits evaluations for Brown Swiss, Holstein and Red Dairy cattle were computed according to the same schedule as for production traits. FRA joined the evaluation with BSW in December 2015; SVK joined the evaluation with HOL for dce and mce in April 2016.

Female fertility traits evaluations for Brown Swiss, Guernsey, Jersey, Holstein, and Red Dairy Cattle were computed according to the same schedule as for production traits. URY joined the evaluation with HOL (int and cc2) in December 2015 and April 2016, respectively.

International genetic evaluations for workability traits for Brown Swiss, Holstein, Jersey and Red Dairy Cattle were computed according to the same schedule as for production traits. FRA joined the evaluation for BSW (msp) in December 2015.

International Genomic Evaluation of Young Bulls (GMACE)

International genomic evaluation of young bulls (GMACE) is conducted for the time being only for Holstein breed, with 11 countries submitting nationally genomic breeding value estimates (GEBV) for up to 38 traits. Statistics on GMACE evaluations are presented in the table below.

Table 3: Size of the Interbull Centre operations for GMACE.

Genomic Multiple Across Country Evaluation (GMACE)	Dec 2014	Dec 2015
Number of countries	33	33
Number of evaluation breeds	1	1
Number of country-breed-trait combinations	326	339
Number of breed-trait evaluations	38	38
Number of animals in the pedigree database	23,084,236	24,981,462
Number of submitted national estimated breeding values	12,398,617	17,324,351
Number of qualified national estimated breeding values	9,823,735	14,135,403
Number of calculated international estimated breeding values	129,211,446	153,062,674
Number of distributed international estimated breeding values[1]	363,705	322,431

[1] Change of publication rules during 2015

Routine international genomic evaluations for Holstein were computed as scheduled in August 2015, December 2015, April 2016 and August 2016. Test evaluation runs were performed in September-

October 2015 and January-February 2016. Beside EBVs used as input for MACE, also used as input for GMACE, GEBVs from the following countries and traits were used in the latest (April routine) run.

Table 4: Number of traits and the number of countries submitting GEBVs in the April 2016 GMACE routine run, per trait group.

Breed	PROD (3)	CONF (21)	UDER (2)	LONG (1)	CALV (4)	FERT (5)	WORK (2)
HOL	11	11	10	8	7	9	6

Interbull Steering Committee (in its meeting of February 2016) made a decision for clarifications of GMACE publication rules. The details of the rules in their entirety, and a graph to explain the rules, are reproduced in the Interbull Code of Practice (Appendix IX – GMACE Publication Rules). The most notable change is that National Genetic Evaluation Centres will need to write, explain and justify to Interbull Centre why a bull that was previously published should not be published anymore.

Interbull genomic evaluation of the BSW populations (InterGenomics)

Interbull Centre conducts genomic evaluation of the BSW population on behalf of the countries with Brown Swiss dairy cattle ("InterGenomics"). Statistics on InterGenomics evaluations are presented in the following table.

Table 5: Size of the Interbull Centre operations for InterGenomics.

InterGenomics (Genomic evaluation of BSW populations)	Dec 2013	Dec 2014	Dec 2015
Number of countries	7	8	8
Number of country-trait combinations	177	212	219
Number of unique submitted genotypes	13,905	16,599	20,561
Number of genotypes entering imputation & genomic evaluation	13,186	15,808	19,500
Number of distributed international GEBVs	Not previously reported		4,202,064

Customer's Satisfaction Survey

According to the Interbull Centre Quality Management System a customer's satisfaction survey should be sent out every two years to all the National Genetic Evaluation Centres (NGECs) taking part in the international evaluations. Therefore during the month of August 2016 Interbull Centre has sent out its third customer's satisfaction survey to assess the degree of satisfaction of our customers in relation to the quality of our job.

Interbull Code of Practice

The Interbull Code of Practice has been updated, on the basis of decisions by the Steering Committee, notably:

- Chapter 7, Paragraph 7.4.4 Guidelines for assessing the necessity of a test-run: www.interbull.org/ib/cop_chap7;
- Appendix IX – GMACE Publication Rules: www.interbull.org/ib/cop_appendix_ix.

Changes in Interbull Service Users

Responsibility for submission of **New Zealand** data was officially transferred from LIC to DairyNZ as from the April 2016 routine evaluation. This transfer took considerable time from the colleagues from NZL, and the Interbull Centre team during late 2015 and January 2016, but was completed successfully. All LIC commitments were fulfilled prior to the transfer.

The National Center for Disciplinary Research in Physiology and Animal Improvement (CENID F y MA), of the National Institute of Forestry, Agriculture and Livestock Research (INIFAP) in **Mexico** has expressed an interest in joining Interbull Centre services, and Interbull Centre staff is working with INIFAP staff on preparing the necessary files and information for inclusion of production traits for Holstein.

Argentina ceased to use Interbull Centre Services. The last run involving Argentina was August 2015.

SERVICE and OPERATIONS – International Beef Breed Evaluations (Interbeef)

Interbeef is ICAR's Working Group responsible for international standards in beef cattle improvement (www.icar.org/pages/working_groups/wg_interbeef.htm). The Interbeef Working Group is also responsible for providing services of international genetic evaluations of beef traits and breeds, which it completes in collaboration with the Interbull Centre.

In order to maximise effectiveness of the service, Interbeef has adopted a model whereby the research underpinning international evaluations is undertaken by member organisations (these include ICBF (IRL), vit (DEU) and CMCB (CZE)), whilst the Interbull Centre itself computes the routine evaluations. In addition to the routine evaluations, the Interbull Centre also provides all relevant infrastructure to support the Interbeef activities of the research partners (i.e., databases, software and servers), thereby ensuring a smooth and seamless transition between research and operational evaluations.

As part of this work Interbull Centre is also responsible for data integrity and confidentiality including; (i) renumbering of animal identification number, (ii) extraction of pedigree from IDEA, (iii) creation of the pedigree file needed in the project, and (iv) checking performance data used in test and routine evaluations for consistencies between evaluations and files used in the evaluations. For research projects, where no previous data is available, the files are checked for the correctness in the file format and file content.

Table 6: Size of the Interbull Operations for international evaluations of beef breeds Charolais and Limousin.

Interbeef	**Jan 2015**	**Jan 2016**
Number of countries	10	10
Number of evaluation breeds	2	2
Number of country-breed-trait combinations	18	18
Number of animals in the pedigree database	23,927,437	25,389,096
Number of submitted national estimated breeding values	7,210,100	7,472,166
Number of international estimated breeding values[1]	69,569,165	57,996,544
Number of distributed international estimated breeding values	938,179	1,108,658

[1] Change of rules during 2015

Interbeef Code of Practice

To clarify the rules, roles and responsibilities in Interbeef, the Interbeef Code of Practice (similar to the Interbull Code of Practice) has been created. A summary and the purpose of the document were presented in the Interbeef Working Group meeting in Salzburg, March 2016. The Interbeef Code of Practice is expected to be endorsed and implemented during the Interbeef WG meeting in Chile in October 2016.

Status of bull + type of proofs for beef

A request for codes for status of bull was raised in the Interbeef Working Group in 2016. A Working Group with representatives from vit (DEU), INRA (FRA), ICBF (IRL) and Interbull Centre will present a proposal in Chile in October 2016. The proposal is to use the same coding as for dairy with some additional codes for beef. The Working Group also has suggestions for codes for type of proofs for beef following the same principle as for status of bull.

Validation reports

Following a request from the Interbeef member organisations, Interbull Centre has agreed to distribute a log file from one of the Interbull Centre checking programs on outgoing distributed results. The log file will help participating organisations to get a first overview of the result from the evaluation. Interbull Centre has clarified that member organizations still have the responsibility to check the result on the national level. The log file will be distributed with the pre-released results starting in October 2016.

Adjusted weaning weight

ROUTINE AND TEST EVALUATIONS CHA AND LIM

The international genetic evaluations for adjusted weaning weight for CHA and LIM have been well established during 2016. Since autumn 2015 the Nordic countries (Denmark, Finland and Sweden) have been sending data as one population (DFS). The number of participating countries for the international genetic evaluation for CHA and LIM for aww can be found in Table 7.

Table 7: Breeds, participating populations and number of publishable records in the international evaluation for 'adjusted weaning weight' (aww).

Breed	Trait	Populations	Number of publishable records in distribution file	
			1501r	1601r
CHA	aww	6 (IRL, CZE, DFS, FRA, DEU, CHE)	411 119	531 364
LIM	aww	8 (CZE, DFS, ESP, GBR, IRL, FRA, DEU, CHE)	527 060	577 294

RESEARCH and DEVELOPMENT - Interbull

The following is a brief summary of research and development activities conducted at the Interbull Centre or with the involvement of the Interbull Centre staff since July 2015.

Expanding GMACE to other breeds than Holstein

Interbull Centre currently provides MACE services for 6 breeds (HOL, BSW, GUE, JER, RDC and SIM), but GMACE for HOL only. During the month of March 2016, Interbull Centre has initiated an online

survey amongst all National Genetic Evaluation Centres (NGECs) that provide data to the Interbull Centre to assess the interest to expand the current GMACE evaluation to BSW, GUE, JER, RDC and SIM. Responses were received from 11 NGECs. The table below shows for each of the breeds which country showed an interest in GMACE for that breed.

BSW	GUE	JER	RDC	SIM
NLD	---	ITA, ZAF	ZAF	ITA

Expanding InterGenomics

Since "InterGenomics 2.0" was adopted in April 2014, InterGenomics partners have shared information on young bulls and advertised national computation on InterGenomics genotype pools as "InterGenomics". The final step in completing "InterGenomics 2.0" has now been set in motion (and is expected to be completed in 2017) with the implementation and validation of a quality protocol for national computations on InterGenomics genotype pools in order to assure the overall quality of the computations done at national level.

During this reporting period, Interbull Centre has been approached on by two organisations inquiring in the possibilities in implementing 'InterGenomics-like' evaluations for Holstein populations in small countries, and for the Guernsey breed. The English Guernsey Cattle Society, World Guernsey Cattle Federation and the American Guernsey Association have expressed their interest to manage a global Guernsey genomic evaluation in collaboration with Interbull, much like the current InterGenomics structure of the Brown Swiss Breed. Discussions on implementing these services are on-going.

Mendelian sampling trend validation

The working group has continued investigating the results from the pilot study held in February 2014 in order to find plausible explanations for the country-breed-traits combinations failing the Mendelian test validation (about 26% of the data collected in 2014). A further analysis of the results, for protein for example, showed a different trend in variance between bulls vs. cows depending on the way countries applied the heterogeneous variance (HV) correction: countries with HV pre-correction did not seem to show such difference in trend between bulls and cows.

While the working group is conducting further analysis, it also supported Interbull Centre's suggestion to introduce such test together with the three current official conventional validation tests: the final decision of passing/failing would of course not be based on the Mendelian Sampling trend validation alone, but the collection of new results would help building a greater dataset of observation which could help understanding how the data behaves. The working group will present a report during the business meeting in Chile.

Additional conformation traits for BSW

Following the decision from the Steering Committee, during the month of May Interbull Centre has conducted a pilot study to analyse additional BSW conformation traits. Of the nine countries currently participating in the Interbull BSW conformation evaluation, six (CAN, CHE, ITA, USA, DEA and SVN) provided data for the new traits (see Table 8).

After reviewing the pilot run results, a large number of small issues were raised, including some concerns about low to medium correlations attributed to different trait definition among participating countries. It was decided to conduct a test run for such traits during September 2016.

Based on the test run results, the Interbull Technical Committee will make a recommendation to the Steering Committee, which will then decide whether the 11 new traits will be introduced in the December 2016 official evaluation.

Table 8: List of new conformation traits for BSW and summary of what participating countries have provided.

Name of Trait	Trait Code	Participating Countries								
		CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
Overall Frame	ofr	X	X	*NP*	X	*NP*	X	X	X	*NP*
Top Line	tpl	X	X	*NP*	X	*NP*	~~X~~	X	X	*NP*
Overall Rump	oru	X	X	*NP*	X	*NP*	X	X	X	*NP*
Rump Length	rle	--	X	*NP*	X	*NP*	X	X	X	*NP*
Pin Width	pwi	X	--	*NP*	X	*NP*	X	X	X	*NP*
Thurl Position	thp	X	X	*NP*	X	*NP*	X	X	X	*NP*
Hock Quality	hoq	X	X	*NP*	X	*NP*	~~X~~	X	X	*NP*
Fore Udder Length	ful	--	X	*NP*	X	*NP*	~~X~~	X	X	*NP*
Udder Balance	udb	--	X	*NP*	X	*NP*	~~X~~	X	X	*NP*
Teat Direction	tdi	--	X	*NP*	X	*NP*	~~X~~	X	X	*NP*
Teat Thickness	tth	--	X	*NP*	X	*NP*	~~X~~	X	X	*NP*

NP: Not Participating

~~X~~: Initially submitted but later on rejected due to low raw correlations with other countries

--: Not submitted

Table 9: Holstein priors used for post-processing of correlations.

Name of New Trait	Trait Code	Holstein Priors	
		HOL conformation trait name	HOL conformation trait code
Overall Frame	ofr	Overall Conformation Score	Ocs
Top Line	tpl	Stature	Sta
Overall Rump	oru	Rump Angle	Ran
Rump Length	rle	Rump Width	Rwi
Pin Width	pwi	Rump Width	Rwi
Thurl Position	thp	Angularity	Ang
Hock Quality	hoq	Rear Leg Set	Rls
Fore Udder Length	ful	Fore Udder Attachment	Fua
Udder Balance	udb	Udder Support	Usu
Teat Direction	tdi	Front Teat Placement	ftp
Teat Thickness	tth	Front Teat Length	ftl

MACE robust to bias in trends; 'Robust MACE'

Since 2013, research collaboration between INRA, Institute de l'Elevage and Interbull Centre has been studying the impact on international breeding values of using a MACE model robust to bias in trends of national genetic evaluations. In December 2015, the Interbull Centre took over the responsibility of carrying out the necessary runs and summarizing the results. A working group has been formed in order to oversee the general design of the studies and results, including the type of models to be compared, and the parameters to be considered for comparison of models. Recent results showed that Robust Mace is over correcting the bias for some traits and not for others. The early assumption about phantom groups' solutions being less stable with Robust Mace was not confirmed so the working group is now investigating the origin of this over-correction.

GMACE reliabilities for MAS

Following enquiries after the December 2015 GMACE run, Pete Sullivan (CDN, Canada) has been investigating a potential upward bias in GMACE reliabilities for MAS. A report with recommended changes to GMACE methodology has been submitted to the Interbull Technical Committee.

RESEARCH and DEVELOPMENT - Interbeef

Pilot run Simmental beef

During 2016 the Interbull Centre has performed a pilot evaluation Adjusted Weaning Weight (aww) for Beef Simmental. The results were distributed for review to member organisations in June 2016 and will be discussed in Chile October 2016. The number of participating populations can be found in Table 10.

Table 10: Participating populations and number of publishable records in the distribution file in the international test evaluation for BSM (Beef SiMmental).

Breed	Trait	Populations	Number of publishable records in distribution file
BSM*	aww	4 (DEU, DFS, CHE, IRL)	182 321

* Note that for operational purposes Simmental cattle is indicated with "BSM" in Interbeef evaluations as opposed to "SIM" (in Interbull evaluations)

Pilot run crossbred animals

A pilot evaluation with crossbreed animals included in the aww evaluation for CHA and LIM was performed at Interbull Centre in 2016. In the evaluation, crossbred animals were included only for IRL and the same data as in the January 2016 evaluation was used for the other participating populations. The results were distributed for review to IRL in April 2016 and will be discussed during the October meeting in Chile 2016. The participating populations can be found in Table 11.

Table 11: Breeds of evaluation, participating populations and the number of publishable records in the distribution file in the pilot run for Crossbred animals.

Breed	Trait	Populations	Number of publishable records in distribution file
CHA	aww	6 (IRL, CZE, DFS, FRA, DEU, CHE)	823 068
LIM	aww	8 (CZE, DFS, ESP, GBR, IRL, FRA, DEU, CHE)	765 116

Note: IRL was the only country participating with crossbred data.

Maternal publication rules

Interbull Centre applied a suggestion for maternal publication rules from FRA on data from the Interbeef January routine run 2015. On 6 November 2015, the results were sent to FRA. The results were analysed and presented at the Interbeef Technical meeting in Salzburg 2016, and FRA will conduct further investigations.

Calving traits

The research project for CHA and LIM calving traits is performed by CMCB, CZE. Results for CHA and LIM calving ease were presented during the Interbeef technical meeting in Salzburg, March 2016. In

the presented results, data from Denmark, Finland and Sweden were included as three populations. During the meeting it was decided to continue the research with birth weight and that the Nordic countries should send data as one population (DFS) for all calving traits. New data for birth weight from the Nordic countries and IRL were sent to CZE on 12 July 2016 and new data from DFS and calving ease was sent on 20 July 2016.

Table 12: Breeds and populations participating in the research project for the calving traits 'birth weight' (bwt), 'calving ease' (cae) and 'stillbirth' (stb).

Breed	Trait	Populations
CHA	bwt	5 (CHE, CZE, DFS, FRA, IRL)
	cae	5 (CHE, CZE, DFS, FRA, IRL)
	stb	3 (CHE, IRL, DFS)
LIM	bwt	6 (CHE, CZE, DFS, FRA, GBR, IRL)
	cae	6 (CHE, CZE, DFS, FRA, GBR, IRL)
	stb	3 (CHE, IRL, DFS)

Female fertility

The research project for CHA and LIM fertility traits is performed by vit (DEU) and started in 2015. Data edits and parameter estimation have been presented in the Technical meeting in Salzburg 2016.

Table 13: Breeds and populations participating in the research project for the female fertility traits 'age at first calving' (afc), 'calving interval' (cai) and 'number of calvings' (nca).

Breed	Trait	Populations
CHA	afc	4 (DFS, IRL, DEU, CHE)
	cai	4 (DFS, IRL, DEU, CHE)
	Nca	3 (FRA, DEU, CHE)
LIM	afc	5 (DFS, GBR, IRL, DEU, CHE)
	cai	5 (DFS, GBR, IRL, DEU, CHE)
	nca	4 (GBR, FRA, DEU, CHE)

Project management tool for Interbeef projects

To increase the transparency and rate of progress in Interbeef projects it has been decided to carry out a pilot study using 'Redmine[3]' as a project management tool for Interbeef projects. The female fertility project, performed by vit (DEU), will be used in this study. The time schedule for the female fertility research project will be visible in Redmine from October 2016.

[3] 'Redmine' (www.redmine.org) is a free and open source, web-based project management and issue-tracking tool implemented at the Interbull Centre (and a number of Interbull Service Users, including vit). It allows users to manage multiple projects and associated subprojects.

Reference contact list for Interbeef

The reference contact list for countries participating in the Interbeef international evaluations has been updated and is available on the ICAR website:
http://www.icar.org/wp-content/uploads/2015/12/Interbeef-Contact-persons-for-countries-participating-in-Interbeef.pdf.

Growing the ICAR/Interbeef Membership

Following the very successful workshop in Salzburg, Austria in March 2016, a small group were established to examine opportunities for growing the number of countries availing of the ICAR/Interbeef service. One area of particular interest was those countries that do not have a national genetic evaluation system of their own, but would consider sending phenotypes directly to the Interbull Centre or alternatively through an existing Interbeef member (as is the case currently with a number of European countries and France in relation to the Limousin breed). The feedback from this working group will be presented back to the WG at the meeting in Puerto Varas, Chile In October 2016.

RESEARCH and DEVELOPMENT – Internal Projects

Impact study on change of rG post-processing rules

A new set of rules for post-processing of genetic correlations was approved by ITC/SC during 2015, and implemented in the September 2015 test-run. The purpose of this impact study was to ensure that the implemented changes have the desire effects.

Following a request by ITC, and in order to increase the utilization of connectedness between the countries and improve the stability of rG estimation, Interbull Centre decided to introduce a new set of rules, i.e. new correlation windows for all the traits, and increase in the number of link provider countries. New windows were calculated based on per-breed averages' 25th and 95th percentiles of countries having at least 50 common bulls. Three new link provider countries were selected for having the highest link to the USA population, and the remaining countries.

During September 2015 test run, the new set of rules was implemented, and the resulting correlations used in MACE evaluations.

For the purpose of comparison of the old and the new set of rules, the estimated correlations from January 2015 (1501t) were compared with the correlations estimated based on data from September 2015 and the old set of rules (1509x), and the new set of rules (1509t). Therefore, the comparison of the three runs can be used to assess the impact of different changes as described below:

- Comparison of 1501t and 1509x: The effect of changes due to the new data;
- Comparison of 1509x and 1509t: The effect of changes in the set of rules;
- Comparison of 1501t and 1509t: The effect of changes in both data and set of rules.

Table 14 – Impact of change of data and set of rules on the genetic correlations. Average changes in values of correlations between two runs, based on all correlations. Average ± SE

rG type	changes caused by new data	changes caused by new settings	changes caused by both data and settings
ESTIMATED	0.005 ± 0.0004	-0.0008 ± 0.0002	0.0041 ± 0.0004
WINDOWED	0.0012 ± 0.0002	0.0177 ± 0.0006	0.0191 ± 0.0005
POST-PROCESSED	-0.0014 ± 0.0001	0.0009 ± 0.0001	-0.0005 ± 0.0002

Table 15 – Percentage of correlations that changed between runs. Data on average values for breed-trait combinations.

rG type	*changes caused by new data*		*changes caused by new settings*		*changes caused by both data and settings*	
	% increased	*% decreased*	*% increased*	*% decreased*	*% increased*	*% decreased*
ESTIMATED	*52*	*42*	*5*	*9*	*51*	*44*
WINDOWED	*44*	*45*	*75*	*20*	*78*	*20*
POST-PROCESSED	*53*	*35*	*67*	*19*	*74*	*25*

RESEARCH and DEVELOPMENT - GenoEx

During the reporting period, the International **Geno**type **Ex**change Platform "GenoEx" has been developed at the Interbull Centre, with financial support from Interbull, SLU and ICAR. The services to be provided through this platform are differentiated into three categories: **P**arentage **S**NP **E**xchange (GenoEx-PSE), **G**enotype **D**ata **E**xchange (GenoEx-GDE) and **C**ustomised **G**enotype **R**epository (GenoEx-CGR).

GenoEx-PSE

GenoEx-PSE will be available to ICAR members (including Interbull Service Users). During the current reporting period, the infrastructure necessary for international cooperation based on SNP data is being established at the Interbull Centre, with a focus on the implementation of GenoEx-PSE. GenoEx-PSE will be launched during the ICAR – Interbull meetings in October 2016.

The implementation is taking place under the guidance of the ICAR-appointed GenoEx-PSE Implementation Task Force, responsible for proposals of GenoEx-PSE policies and business rules, and the GENOEX-PSE Expert Group, addressing specific scientific and technical issues.

GenoEx-GDE

During the current reporting period, enquiries about, and requests for, prompt implementation of GenoEx-GDE have been received from current Interbull Service Users for application to InterGenomics and Interbeef.

RESEARCH and DEVELOPMENT - Infrastructure

IDEA: AnimInfo

The module AnimInfo was introduced in the January routine run 2016. AnimInfo is a module in the Interbull Centre Data Exchange Area (IDEA) website which allows member organisations to report additional information connected to existing animals in the pedigree module and to use IDEA as an exchange area for information. Examples on type of additional information are coat colour, crossbreed information, herdbook number, eartag number, genetic defects, if an animal is genotyped or not etc.

The system was developed to allow different security levels for the information which means that for some of the information only the authorized organization may view and upload, for other information it is possible for some or all organisations to view and/or upload.

New type of information can easily be added to AnimInfo and the used XML file format allows easy future development of the module. The type of additional information that will be reported in IDEA AnimInfo will be decided by member organisations in collaboration with Interbull Centre. Member organisations are encouraged to send requests on new additional information types to Interbull Centre.

The first type of additional information to be uploaded in AnimInfo was CROSSBREED information, percentage red Holstein genes in Simmental dairy. This information was previously sent to ITBC via flat files. To make the transfer from flat files to XML file format easy, a convert program was made available in IDEA/software together with instructions on how to use the program. Interbull Centre has also created two webpages for basic information on XML (https://en.wikipedia.org/wiki/XML and https://wiki.interbull.org/public/XMLdigest) and a manual on how to use the module (https://wiki.interbull.org/public/IDEA_animinfo_manual?&rev=114).

IDEA: parallel uploading

While there has always been a two weeks' uploading time for conventional data, due to technical reasons the uploading time for genomic data via IDEA's ebv module was limited to one week. Following several requests for increasing the time available for uploading genomic data, the time allocated for uploading of (g)ebvs has changed; from April 2016 it is possible to upload conventional and genomic data at the same time. As a result, the overall time for NGECs to upload genomic data has been extended from one to three weeks' period (i.e. 2 weeks for uploading of conventional & genomic data before conventional data deadline + 1 week for uploading of genomic data before genomic data deadline). During the April 2016 routine run no organisations have used this parallel uploading functionality while in August 2016 just one organisation did so.

The parallel uploading simply allows extending the uploading time for genomic data but does not change or replace any technical dependency between conventional and genomic data. The need for the information contained in the parameter files to be the same between conventional and genomic data is, therefore, still maintained. Hence **new (when available) conventional data must always be uploaded first** followed by the new genomic data. If no new conventional data is provided by the time a new genomic data is uploaded, the system will assume that the information already present in

the previous parameter file are the valid ones and will double check the new genomic parameter values against it.

A new module "Additional GMACE info" for the AnimInfo database

The two GMACE input files, file formats 733 and 734, are currently handled as flat files that are directly used in the GMACE evaluation process. The purpose of this project is to store the information content of these two files in a database module in order to increase (and automate) the quality control, and also improve the integration of the information in the GMACE evaluation process.

A conversion program for changing the file format from ASCII flat file to XML format is underway. The conversion program will be made available to the national genetic evaluation centers so that they can upload the data to the database.

RESEARCH and DEVELOPMENT - Funding

In addition to funds raised from service fees, research and development activities at the Interbull Centre are financed by grants from the Swedish University of Agricultural Sciences (SLU), the European Union, and the World Guernsey Cattle Federation (WGCF). Co-funding for the development of GenoEx-PSE services has also been granted by ICAR.

Contributions of the above organisations to the development of Interbull Centre services are gratefully acknowledged. Contributions made to R&D activities from participating organisations leading to improved or expanded Interbull Centre services are also much acknowledged.

During the reporting period, Interbull Centre has also accepted invitations to join the following externally funded project consortia. If successful this will provide additional funding:

Project Acronym: "GenTore"
Project title: *Genomic management tools to optimise resilience and efficiency*
Project Duration: 60 Months.
Funding source: European Commission; Horizon2020, Research and Innovation action
Funding status: GenTore has passed stage 1 and was invited to submit a proposal for Stage 2. The stage 2 proposal was submitted in September 2016. Decision on funding is expected by February 2017, with the successful project due to start by May 2017.

Project Acronym: "MethaBreed"
Project title: *Implementation of comprehensive phenotyping and breeding strategies across North-West Europe for the reduction of enteric methane emissions from dairy cattle.*
Project Duration: 42 Months.
Funding source: European Union; European Regional Development Fund; Interreg North-West Europe
Funding status: MethaBreed has passed stage 1 and has been invited to submit a proposal for Stage 2 by 23 December 2016 or 30 June 2017 at the latest.

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.

Service Calendar – Interbull (Dairy)

During the period comprehended by this report, routine evaluations for production, conformation, udder health, longevity, calving, female fertility and workability traits were scheduled with the following release dates:

2015 August 11
December 1
2016 April 5
August 9

Test evaluation runs for production, conformation, udder health, longevity, calving, female fertility and workability traits took place as follows:

2015 September
2016 January
September

Routine evaluations for production, conformation, udder health, longevity, calving, female fertility and workability traits are scheduled with the following release dates (for further details see the Interbull Centre website on www.interbull.org/ib/servicecalendar:

2016 December 06
2017 April 04
August 08
December 05

The 2017 test evaluation runs for production, conformation, udder health, longevity, calving, female fertility and workability traits are scheduled with the following release dates:

2017 February 13 (MACE & InterGenomics)
February 21 (GMACE)
October 03 (MACE & InterGenomics)
October 10 (GMACE)

Service Calendar – Interbeef (Beef)

Members of the Interbeef Working Group and the Interbull Centre have agreed on 2 routine evaluations per year. During the Interbeef Working Group meeting in Salzburg 2016 it was furthermore decided to continue to have only one test evaluation per year (in spring). However, in order to facilitate expansion of Interbeef international evaluations, a second test run, during the autumn, may be performed. This second test run will only take place if a new country wants to join the Interbeef international evaluations.

During the period comprehended by this report, routine evaluations for animal weaning weight were carried out for CHA and LIM with the following release dates:

2015 August 11
December 1
2016 April 5
August 9

Test evaluation runs for animal weaning weight (aww) took place as follows:

2015	September	(Test run with joined data from the nordic countries for CHA/LIM aww)
2016	April	(Test run with crossbred IRL data for CHA/LIM aww)
2016	June	(Test run for aww Simmental Beef (BSM)l

In addition to the above dates, the following release dates for beef have been agreed for 2016-2017:

2016	November 07
2017	March 22
	November 06

Test evaluation run for animal weaning weight (aww) is scheduled to take place as follows:

2017 June

TASK FORCES and WORKING GROUPS

During the reporting period, Interbull Centre staff was involved in the following Task Forces and Working Groups.

Interbull-ICAR Operations Task Force (IB-ICAR TF)

Toine Roozen is the secretary of the Interbull-ICAR Operations Task Force. This Task Force held two face-to-face meetings (3 February 2016, Verona); 26 May 2016, Amsterdam), and 4 conference calls (December 2015, March 2016, April 2016, September 2016) during this reporting period, and will report on its findings during the ICAR – Interbull meetings in Puerto Varas, Chile in October 2016.

GenoEx-PSE Business Rules Task Force (GenoEx-PSE BRTF)

Hossein Jorjani was the convener of the ICAR/Interbull appointed GenoEx-PSE BRTF. This Task Force worked during fall 2014 and spring 2015 to prepare such business rules that can be flexible and capable of adjusting to industry needs. Following endorsement of the Business rules by the ICAR Board, this group received a new mandate and became the GenoEx-PSE Implementation Task Force.

GenoEx-PSE Implementation Task Force (GenoEx-PSE ITF)

The GenoEx-PSE ITF is chaired by Toine Roozen. This Task Force, working towards the implementation and launch of GenoEx-PSE in October 2016, held 8 conference calls during this reporting period (25/11/2015, 25/01/2016, 11/12/2016, 17/03/2016, 04/05/2016, 03/06/2016, 18/07/2016, 12/08/2016).

GenoEx-PSE Expert Group (GenoEx-PSE EG)

Hossein Jorjani is the secretary of the GenoEx-PSE EG, which provides expert advice to the GenoEx-PSE ITF. The Expert Group has had regular (at least once a month) Skype meetings.

Interbeef Working Group

Eva Hjerpe has monthly conference calls with members of ICAR's Interbeef Working Group. Other members of staff have attended these calls as and when required. Interbull Centre was represented at the Interbeef meeting in Salzburg on 8 and 9 March 2016 by Toine Roozen, Hossein Jorjani, Eva Hjerpe and Haifa Benhajali.

Parentage Recording Working Group

Hossein Jorjani is a member of ICAR's Parentage Recording Working Group.

Mendelian Sampling Working Group

Hossein Jorjani and Valentina Palucci are members of the Mendelian Sampling Working Group. The working group has had three Skype meetings, in March, June and August 2016.

MEETINGS

Annual Meetings

The SC agreed to organise the Interbull Annual Meetings jointly with ICAR in even years (2016, 2018, etc.), while alternating the odd years between EAAP (2017 in Estonia, 2021 in Switzerland) and ADSA (2019, 2023). The Interbull Annual Meetings are scheduled to take place as follows:

2016: The Joint ICAR-Interbull Meeting will take place in Puerto Varas, Chile from 24 to 28 October

2017: The 2017 Interbull meeting will precede the 2017 EAAP meeting (Estonia, August 2017)

2018: The Joint ICAR-Interbull Meeting will precede WCGALP

2019: The 2019 Interbull Annual Meeting will be organised in collaboration with ADSA (June 2019)

2020: The venue of the joint ICAR-Interbull Meeting has yet to be confirmed

2021: The 2021 Interbull Annual Meeting will precede the 2021 EAAP meeting (Switzerland).

Updated information on future Annual Meetings and other meetings that may be of interest to the Interbull Community can be found on: http://www.interbull.org/ib/ibc_future_events

Interbull Strategic Planning Workshop

The Interbull Steering Committee, accompanied by representatives of the Interbull Scientific Advisory Committee (SAC) and the ICAR Board, met in Verona on 4 and 5 February 2016, to perform a new round of strategic planning, since previous plans were carried out in January 2009 and 2013. All members of the above mentioned groups responded to a preparatory questionnaire in January 2016, which had two main objectives: review the previous strategic plan from January 2013 and to bring all participants into a common understanding about the main issues to be addressed. The results from the questionnaire were instrumental in establishing the background for the plan and saved considerable discussion time from the participants.

The workshop turned out to be very comprehensive and yielded a structured framework to guide Interbull for the short-term (2-year) activities. Andrew Cromie acted as facilitator and his contribution was greatly appreciated.

Results from the Workshop and further strategic planning activities are used by the Interbull Steering Committee to put 'strategy into action'. A summary of the strategic plan will be distributed to the wider Interbull community.

Interbeef Meeting

Interbull Centre staff attended and presented at the Interbeef meeting in Salzburg on 8 and 9 March 2016: Toine Roozen, Hossein Jorjani, Eva Hjerpe and Haifa Benhajali.

Technical Workshops

Interbull Technical Workshops are generally held 2 years out of three. In 2015/2016, no Interbull Technical Workshop was organised. An Interbull Technical Workshop will be organised early February 2017 in Central Europe. Further details will be made available in due course.

Other meetings

In years that the Interbull meetings are not co-organised with ADSA resp. EAAP, we may organise joint sessions with EAAP resp. ADSA. A joint session was organised at the 67th Annual Meeting of EAAP in Belfast (29 August – 2 September 2016) on the subject of "The use of genetics and genomics to improve disease and welfare traits in cattle", and a joint session is foreseen at the ADSA meeting (Pittsburgh, PA, USA; 25-28 June 2017).

COMMUNICATIONS and PUBLICATIONS

Interbull Bulletin

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. During the period comprehended by this report one issue of the Interbull Bulletin has been published (No 49) with the proceedings of the 2015 Interbull Annual Meetings in Orlando, Florida, USA.
https://journal.interbull.org/index.php/ib/issue/archive

Interbull Web Site

To further improve the navigation of the Interbull web site (www.interbull.org), Interbull Centre staff conducted a usability test on the Interbull web site on 1 April 2016. Three people were chosen from SLU's Department of Animal Breeding and Genetics; each of them with a different level of knowledge of Interbull and its activities, and were asked to browse the web site and find information and/or documents related to different tasks they were given.
Watching them performing such tasks and observing their struggles from time to time, made it possible for us to identify the major limitations and possible ways to handle them:

A. All the testers had difficulties noticing the different kinds of links on the left side menu (link with/without arrow). They all discovered the "arrow" menu by chance but once discovered none thought of clicking on the link itself again;
   - Proposed change: The content of the submenu should be displayed also when hovering over the main menu link, not only when hovering over the arrow.
B. None of the tester noticed the "site map";
   - Proposed change: Move the "site map" below the "search" functionality. Make the "search" functionality more visible by displaying it in bold and capital letters plus adding a white background to it.
C. All our tester, regardless from their level of knowledge of our activity, had difficulties understanding the meaning of some acronyms used in the webpage (i.e. GE, GENO);
   - Proposed change: Avoid use of acronyms in the links (i.e. prefer Genetic Evaluation Forms rather than GE).

We have planned to introduce the above-mentioned changes by the end of October 2016.

LinkedIn

A company profile was created on LinkedIn in order to reach a wider audience for the vacancy of System Administrator at the Interbull Centre. The profile continues to exist, and Interbull Centre staff members have linked their individual profiles to the company profile.

Publications of Interbull Centre staff as authors or co-authors

July 2015 – July 2016

Eken Asp, H., Fikse, F., Nilsson, K. & **Strandberg**, E. 2015. Breed differences in everyday behaviour of dogs. *Applied Animal Behaviour Science169,* 69-77.

Gaspa, G., **Jorjani, H**., Dimauro, C., Cellesi, M., Ajmone-Marsan, P., Stella, A. & Macciotta, N.P.P. 2015. Multiple-breed genomic evaluation by principal component analysis in small size populations. *Animal 9:5,* 738-749. doi:10.1017/S1751731114002973

Ismael, A., **Strandberg**, E., Kargo, M., Fogh, A. & Løvendahl, P. 2015. Estrus traits derived from activity measurements are heritable and closely related to the time from calving to first insemination. *Journal of Dairy Science 98:5,* 3470–3477. http://dx.doi.org/ 10.3168/jds.2014-8940

*Ismael, A., **Strandberg**, E., Berglund, B. & Lövendahl, P. 2015. Season affects expression and heritability of in-line recorded estrus traits in Danish Holstein. 66th Annual Meeting of the EAAP,* Warsaw, Poland, August 31 – September 4, 2015. *Book of Abstracts 21, Session 20,* p. 215.

Kantanen, J., Løvendahl, P., **Strandberg**, S., Eythorsdottir, E., Li, M-H., Kettunen-Praebel, A., Berg, P. & Meuwissen, T. 2015. Utilization of farm animal genetic resources in a changing agro-ecological environment in the Nordic countries. *Frontiers in Genetics 6, Article no 52,* 9 p. doi: 10.3389/fgene.2015.00052

Loberg, A., **Dürr**, J.W., Fikse, W.F., **Jorjani, H**. & Crooks, L. 2015. Estimates of genetic variance and variance of predicted genetic merits using pedigree or genomic relationship matrices in six Brown Swiss cattle populations for different traits. *Journal of Animal Breeding and Genetics132:5,* 376-385.

Nicolazzi, E.L., Caprera, A., Nazzicari, N., Cozzi, P., Strozzi, F., Lawley, C., Pirani, A., Soans, C., Brew, F., **Jorjani**, H., Evans, G., Simpson, B., Tosser-Klopp, G., Brauning, R., Williams, J.L. & Stella, A. 2015. SNPchiMp v.3: integrating and standardizing single nucleotide polymorphism data for livestock species. *BMC Genomics 16:283*. DOI 10.1186/s12864-015-1497-1.

Rewe, T.O., Peixoto, M.G.C.D., Cardoso, V.L., Vercesi Filho, A.E., El Faro, L. & **Strandberg**, E. 2015. Gir for the *Giriama*: The case for Zebu dairying in the tropics - a Review. *Livestock Research for Rural Development. Volume 27:8, Article #150.* Retrieved February 12, 2016; Published August 2015, from http://www.lrrd.org/lrrd27/8/rewe27150.html

***Strandberg**, E., Roth, A. & Emanuelson, U. 2015.* Herd factors affecting longevity in Swedish dairy cattle. *66th Annual Meeting of the EAAP,* Warsaw, Poland, August 31 – September 4, 2015. *Book of Abstracts 21, Session 53,* p. 520.

Tenghe, A.M.M., Bouwman, A.C., Berglund, B., **Strandberg**, E, Blom, J.Y. & Veerkamp, R.F. 2015. Estimating genetic parameters for fertility in dairy cows from in-line milk progesterone profiles. *Journal of Dairy Science 98:8,* 5763–5773. http://dx.doi.org/10.3168/jds.2014-8732

*Tenghe, A.M.M., Bouwman, A.C., Berglund, B., **Strandberg**, E. & Veerkamp, R.F. 2015. Unravelling the genetic background for endocrine fertility traits in dairy cows. 66th Annual Meeting of the EAAP,* Warsaw, Poland, August 31 – September 4, 2015. *Book of Abstracts 21, Session 25,* p. 276.

*Tenghe, A.M.M., Bouwman, A.C., Berglund, B., **Strandberg**, E. & Veerkamp, R.F. 2015. Unravelling the genetic background for endocrine fertility traits in dairy cows. Versailles, France: PROLIFIC 2nd annual consortium meeting, 2015-01-14.* Powerpoint presentation (professional). http://library.wur.nl/WebQuery/wurpubs/486985#

Wallenbeck, A., Rydhmer, L., Röcklinsberg, H., Ljung, M., **Strandberg**, E. & Ahlman, T. 2015. Preferences for pig breeding goals among organic and conventional farmers in Sweden. *Organic Agriculture 1-12.* ORGA-D-15-00025R2. DOI 10.1007/s13165-015-0125-3.

*Wang, S., Leroy, G., Malm, S., Lewis, S., **Strandberg**, E. & Fikse, W.F. 2015. Gene flows and dog breeding practices in France, Sweden and UK. 66th Annual Meeting of the EAAP,* Warsaw, Poland, August 31 – September 4, 2015. *Book of Abstracts 21, Session 20,* p. 224.

Velie, B.D., Shrestha, M., Stinckens, A., **Wasserman, C.,** Blott, S., Ducro, B., Buys, N. & Lindgren, G. 2015. Horsegene Database: An efficient and secure way to store and share phenotypes and genotypes between researchers. *11th Dorothy Russell Havemeyer Foundation International Equine Genome Mapping Workshop,* July 22-25, 2015, Hannover, Germany, p. 115-116.

*Enrique Sánchez-Molano, Dimitrios Tsiokos, Dimitrios Chatziplis, **Hossein Jorjani**, Lorenzo Degano, Clara Diaz, Attilio Rossoni, Hermann Schwarzenbacher, Franz Seefried, Luis Varona, Daniele Vicario, Ezequiel L Nicolazzi, Georgios Banos (2016) A practical approach to detect ancestral haplotypes in livestock populations. BMC genetics 2016; 17: 91.* http://dx.doi.org/10.1186/s12863-016-0405-2

Appendix 1: Interbull Committees and Working Groups

Interbull is managed by an ICAR-appointed **Steering Committee**, consisting of 9 members from different countries. The objectives for the Steering Committee are to set strategy, priorities, work plans and budget for Interbull Centre.

Since 2003 the Steering Committee is supported by two expert groups: the **Scientific Advisory Committee** (SAC) and the **Interbull Technical Committee** (ITC). The objective of the SAC is to propose methodological developments that are needed to ensure the strategic direction, scientific soundness, and long-term progress of the Interbull Centre services. The objective of the ITC is to identify and review technical issues that may be essential for providing a high quality service to countries participating in the international genetic evaluations.

Interbull Steering Committee Composition and term times.

Name	Representing	Member since:	End of term
Reinhard Reents (Chair)	Germany, Austria and Switzerland	May 2000 Chair since June 2006	2019
Sophie Mattalia	France and Wallonia	June 2006	2018
Brian Van Doormaal	America's	1996	2017
Marj Faust	America's	2009	2017
Daniel Abernethy	Oceania	2013	2017
Gert Pedersen Aamand	Nordic Countries - Chair of the Interbull Technical Committee	2004	2019
Marco Winters	UK, Ireland and The Netherlands	July 2015	2019
Enrico Santus	Italy, Spain and Portugal	1996	2016
Marija Klopčič	Eastern Europe	2013	2017

For contact details see www.interbull.org/ib/steeringcommittee

Interbull Technical Committee

The objective of the Interbull Technical Committee (ITC) is to identify and review technical issues that may be essential for providing a high quality service to countries participating in the international genetic evaluations. This objective is achieved via the consideration of new or improved methods that increase the efficiency and accuracy of the evaluation service, while safeguarding the transparency of the services and its acceptability by Interbull Centre Service Users and additional stakeholders.

The ITC comprises of genetic evaluation specialists from Interbull Centre Service Users who:

- Test questions posed by the Interbull Community
- Test new proposal, identifying and solving issues the Interbull Centre and/or Interbull Service Users may run into when implementing new protocols.

Members of the Interbull Technical Committee

Gert Pedersen Aamand (Chair)	Zengting Liu
Hossein Jorjani	Raphael Mrode
Gerrit Kistemaker	Esa Mäntysaari
Tom Lawlor	Gerben de Jong
Paul VanRaden	Peter Sullivan

For contact details see http://www.interbull.org/ib/technicalcommittee

Scientific Advisory Committee

The objective of the scientific advisory committee is to propose methodological developments that are needed to ensure the strategic direction, scientific soundness, and long-term progress of the Interbull Centre services, and to act as a resource body to the Interbull technical committee and steering committee on scientific issues.

Members of the Interbull Scientific Advisory Committee

Vincent Ducrocq (SAC member since 2003, Chair since 2013)
Daniel Gianola (2010)
Mike Goddard (2003)
Ignacy Misztal (2013)

For contact details see www.interbull.org/ib/scientificadvisorycommittee

Interbeef Working Group

Interbeef is ICAR's Working Group responsible for international standards in beef cattle improvement. The Interbeef Working Group is also responsible for providing services of international genetic evaluations of beef traits and breeds, which it completes in collaboration with the Interbull Centre. For further details see: http://www.icar.org/index.php/technical-bodies/working-groups/interbeef-working-group/

Members of the Interbull Technical Committee

Andrew Cromie (Chairman)	Mauro Fioretti
Robert Banks	Anders Fogh
Pavel Bucek	Laurent Griffon
Kirsty Moore	Friedrich Reinhardt
Clara Diaz	Japie Van de Westhuizen