INTERBULL BUSINESS FUNDING MODELS TASK FORCE

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Assessment of Interbull Fee Structure for MACE Services

Following the Interbull Business Meeting held in Montreal, Canada in June 2022, the main 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. The key elements of those discussions and resulting recommendations are summarized below.

I. Current MACE Fee Structure

The basic structure for calculating each country's annual fee for participating in Interbull's MACE services has not significantly changed since it was introduced more than 25 years ago. Table 1 presents the current fee structure applied for MACE for production traits.

Table 1: Calculation of Interbull Service Fees (Euro) for MACE – Production Traits

Basic Fee		4 325
Variable Fee (per 1,000 milk recorded cows)	≤ 100	53.05
	100 to 300	20.23
	300 to 1,000	7.57
	1,000 to 2,400	5.09
	> 2,400	0.28

MACE fees for other trait groups are subsequently calculated as a direct function of each country's MACE fee for production traits, as presented in Table 2. The associated fee for an additional trait group is applied upon inclusion of any one breed to encourage participation for as many breeds as possible within each trait group. Summing the percentages across all trait groups totals 108%, meaning that the calculation of a country's fee for MACE Production could represent less than half of its total fees for all MACE services. The fees for GEBV Validation are also calculated as a function of the MACE Production fee at a rate of 15%.

Table 2: Calculation of Other MACE-Related Service Fees Relative to Production Fee

Conformation	Udder Health	Longevity	Calving	Female Fertility	Workability	Clinical Mastitis	GEBV Validation
30%	15%	15%	15%	20%	5%	8%	15%

II. Challenges of the Current MACE Fee Structure

The key underlying data metric used for the current fee structure for MACE services is the number of milk recorded cows in each country (or group of countries in specific cases). While the use of this data metric has served well since the introduction of MACE evaluations 25 years ago, the following challenges have been experienced in recent years:

- Difficulty obtaining timely data for "No. of Milk Recorded Cows" by country via the ICAR annual survey
- Variable accuracy of the statistic provided by each country depending on its ability to calculate an exact count, especially when many milk recording organizations exist at the national level
- In some countries, the total number of milk recorded cows includes breeds not included in the MACE services provided by Interbull.
- Decreasing trend in the number of milk recorded cows in many countries participating in MACE while Interbull Centre costs continue to increase year over year

III. Assessment of a Proposed Alternative Fee Structure

Proposed Data Metric

Based on various discussions during the 2021 and 2022 Interbull Business Meetings, the proposed new metric assessed by the BFMTF is directly related to the number of daughters of the sires included in the calculation of MACE evaluations for production traits.

Advantages and Challenges

The main advantages of the proposed new data metric for calculating MACE service fees include:

- Very objective and exact statistic that can be validated by all MACE service users
- Can be calculated internally by Interbull Centre staff and updated annually rather than collected via the current ICAR annual survey related to milk recorded cows
- Is directly related to the data contributing to genetic evaluations at the national level and the international MACE evaluations for production traits
- Accounts for animals that may be milk recorded at the national level but are of a breed for which MACE services are not provided by Interbull

One challenge to be addressed by using this proposed new data metric for establishing MACE fees is that the data would not be immediately available for new countries joining the MACE services. A second challenge that could affect results from using the new proposed metric is that some countries may be (a) truncating the oldest sires from inclusion in MACE production services and/or (b) truncating older data from inclusion in national evaluations for production traits, which may increasingly occur as countries migrate to single-step evaluation systems.

Data Analysis

To assess using the proposed new data metric, the BFMTF used MACE files for production traits distributed by Interbull to participating countries. These files include the count of daughters for Milk, Fat and Protein for each sire in the outgoing MACE evaluation files. The analysis focused only on daughter counts for Milk since it is generally the highest of the three trait counts and the count for Milk will more likely be the best in the future if component sensor data is not broadly used/included by national genetic evaluation units. To conduct the assessment analysis, a single data file was created to combine all sires included in MACE evaluations for all breeds, specifically Holstein, Red Dairy Cattle, Jersey, Brown Swiss, Guernsey and Simmental. This file was used to calculate total daughter and sire counts within each country/population included for MACE Production services, with the option of defining

the earliest birth year of sires included in the total counts by country. Based on all sires included in MACE production, the total data file across all countries and all breeds included over 138M daughters of more than 235,000 different sires.

Through analysis of the above data, the BFMTF was able to fine-tune the originally proposed concept of using daughter counts contributing to MACE as well as its application within the MACE fee structure for production traits. The following key results stemmed from this analysis:

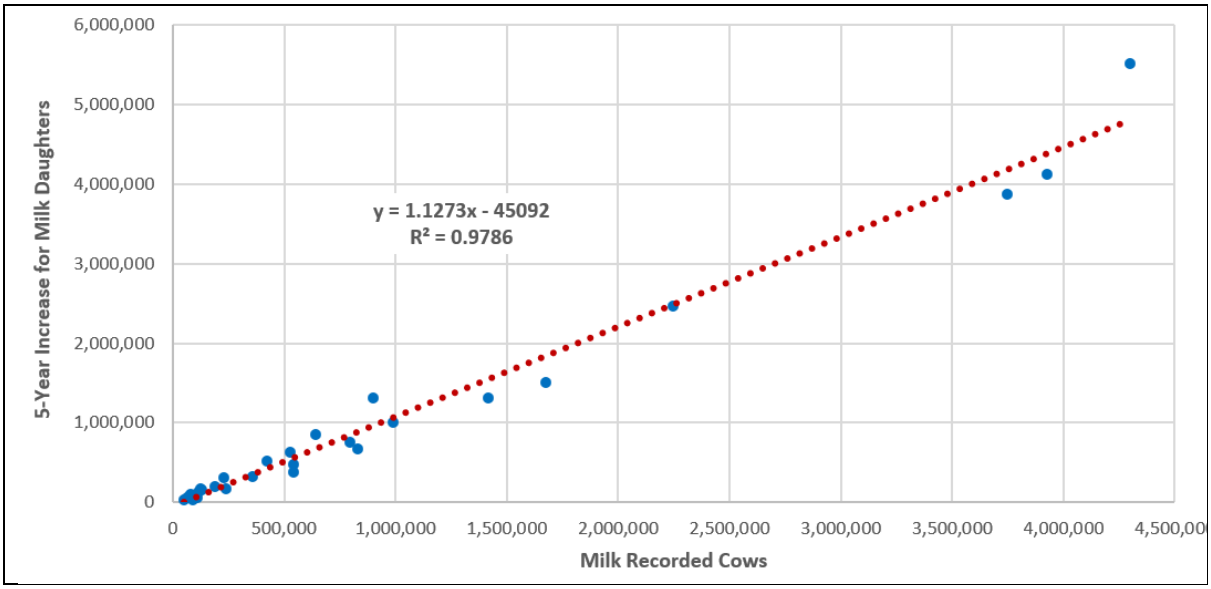
1. The current MACE fee structure includes a Basic Fee and a Variable Fee as presented in Table 1. The current Basic Fee is 4325 Euro for each country but this is applied multiple times for organizations participating in MACE that submit "national" evaluations that include data from multiple countries. The MACE participating country/population of DFS is one example, for which the Basic Fee is applied three times since data from Denmark, Finland and Sweden is included. While not the focus of the analysis conducted, the BFMTF also discussed and reviewed options for modifying the Basic Fee level and its application.

2. The Variable Fee is calculated using five rate categories that are applied based on ranges in the number of milk recorded cows (Table 1) and then summed across the five rate categories to derive the total. While the BFMTF explored options for modifying this long-standing structure applied to MACE services, as well as other Interbull services, it was determined that it was still appropriate and equitable.

3. A minimum birth year should be applied to define which sires are included in the analysis. This criterion is needed since not all countries continue to include all sires born since 1986 with a national evaluation. That said, the BFMTF also established that a maximum number of sire birth years is desired to reflect the inclusion of daughters from all qualifying sires regardless of their age. For the final analysis conducted by the BFMTF, as presented in this report, the minimum sire birth year of 2002 was used, which represents a sire birth year cut-off of 20 years (since the analysis was initiated in 2022).

4. Any use of daughter counts as the underlying metric for MACE service fees should be based on the **increase in daughter counts** over a pre-defined number of years. This can be applied at the Interbull Centre by calculating the daughter counts contributing to MACE for Milk Yield within each country for two different MACE runs that are the pre-defined number of years apart and then calculating the total increase in daughter count across all breeds for each country. The BFMTF applied various interval lengths for calculating the increase in daughter counts as the basis for the MACE fee structure. In the end, it was determined that a 5-year interval, which was August 2017 to August 2022 for this current analysis, was the ideal interval compared to anything longer or shorter. As shown in Figure 1, using a 5-year interval yields a linear regression slope slightly higher than 1.0 when using the number of milk recorded cows to predict the new metric of "5-Year Increase in Milk Daughters" for each of the 30 countries/populations included in MACE for production traits. The advantage of having this regression slope as close as possible to 1.0 is that it then facilitates the application of the existing fee structure and the general fee levels with each of the five rate levels. Figure 1 also shows that the current and proposed new metric are generally very similar for most countries currently participating in MACE. With an R-square close to .98, there is an excellent general relationship between these two metrics, so most participating countries should expect to see a relatively small impact on the level of Variable Fee applied if the new metric was approved and implemented.

Figure 1: Relationship Between the No. of Milk Recorded Cows and 5-Year Increase in Daughters for Milk Yield MACE Evaluations



The new metric of "5-Year Increase in Milk Daughters" was applied across all 30 countries/populations currently participating in MACE. The structure for the Variable Fee was applied exactly as described in Table 1 based on "No. of Milk Recorded Cows". Each country was allocated to one of five groups depending on the maximum level of the fee structure that it reached using the new metric, as shown in Table 3. Considering the impact on each of the five groups of countries, the group of smallest countries (N=7) has an average 21% decrease in the Variable Fee with the new metric and the difference in the total Variable Fee from these countries is 6768 Euro, when compared to their 2022 fee for MACE Production services. For the other four country groups, the average increase ranges from 0% (Group 4) to 6% (Group 2) and the sum of the increased Variable Fee ranges from 2929 Euro for Group 4 (N=4) to 4196 Euro for Group 3 (N=9).

Table 3: Summary of Using 5-Year Increase in Milk Daughters for MACE Production Fee

Fee Category	1	2	3	4	5
Maximum Fee (Euro)	53.05	20.23	7.57	5.09	0.28
Countries Included	SVN,HRV,BEL, PRT,SVK,ZAF, URY	HUN,ISR, KOR,LTU, LVA,EST	CAN,POL,IRL, JPN,CHE,ESP, AUS,CZE,NOR	NLD,DFS, ITA,GBR	USA,DEU, NZL,FRA
Average % Change in Variable Fee	-21%	11%	5%	6%	5%
Total Variable Fee Change (Euro)	-6768	3146	4196	2929	3802
Average % Change in Total Fee	-11%	6%	3%	-4%	1%
Sum of Total Fee Change (Euro)	-6768	3146	4196	-4631	862

Table 3 also includes the impact on the Total Fee per country that would result with no change in the level of the Basic Fee but applying a 10% increase in the Basic Fee for each additional organization at the national level, beyond one, that submits data for inclusion in MACE services, which may vary by breed and/or trait group in some countries. Specifically, this revised application of the Basic Fee multiplier was applied for United States with two data

providers, as well as for Italy and Germany/Austria each with three data providing organizations. Based on this strategy for applying the Basic Fee, the combined impact on the Total Fee after using the new metric varies from -11% for Group 1 to 6% for Group 2. Across all participating countries, the impact on the Variable Fee is 7305 Euro (+2.4%) and -3195 Euro (-0.7%) on the total Interbull revenue for MACE Production services.

As part of the BFMTF review of the MACE fee structure, consideration was given to the approach of calculating a specific fee for each breed in each country/population and then summing the amounts across all breeds to derive the total MACE fee to be invoiced. While the proposed new metric of "5-Year Increase in Milk Daughters" would facilitate such a fee structure by breed, the impact would be very significant of most, if not all, participating organizations. Currently, 7 of the 30 participating organizations involve a total population size across all breeds that are relatively small (i.e.: less than 100,000) so that only the first tier of the MACE fee structure gets applied. On the other end of the scale, 8 organizations reach the fourth tier and half of those have a population size across all breeds exceeding 2.4 million. If a within breed fee structure was applied, then the tier 1 level of fee, which is by far the highest, would be applied to many more animals, basically the first 100,000 of each breed. Outside of the impact on total fees paid, a key objective of the current fee structure that pools all breeds is to encourage the maximum participation of countries for all breeds.

IV. Recommendations for Revised MACE Fee Structure

Based on the analysis conducted, the BFMTF proposes the following recommendations for approval by the Interbull Steering Committee for presentation at the Interbull Business Meeting scheduled for August 2023.

Variable Fee

1. 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"
2. Maintain the current MACE fee structure categories and associated rate level for each.
3. The Steering Committee may continue to apply an annual percentage increase to the fee rates used within the MACE fee structure, including the Basic Fee, to cover budgeted increases in operational costs.
4. For any new country joining MACE services for production traits, the annual fee for the initial years shall be determined based on the No. of Milk Recorded Cows or another appropriate metric to be developed, until the country has participated long enough for the fee to be calculated using the "5-Year Increase in Milk Daughters".
5. For countries that move to an updated national genetic evaluation system that involves truncating or otherwise reducing the phenotypic data and cows included, the Interbull Centre shall assess the "5-Year Increase in Milk Daughters" using national evaluations submitted for the GEBV Trend Validation Test, which is 4 years prior to the current run" and estimate the expected 5-year increase in milk daughters.

Basic Fee

1. Revise the Basic Fee calculation by country from the current basis of "No. of Countries" to "No. of Data Providing Organizations". This recommendation stems from the fact that Interbull Centre staff invest more time in processing files received from multiple data providers from a country rather than a single organization and more effort is also required in terms of communications.
2. For a country with more than one data provider for MACE services, the Basic Fee would be calculated using a 10% multiplier (4325 Euro x 10% = 433) that is added for each additional data providing organization.

It should be noted that the total fee (Basic + Variable fees) for MACE production services is used by the Interbull Centre to calculate the subsequent fees for the remaining trait groups of Conformation, Udder Health, Longevity, Calving, Female Fertility and Workability (as well as the 8% level used for determining the fee for Clinical Mastitis for SNP training purposes).
Therefore, removing the current Basic Fee multiplier of "No. of Countries" will quite negatively impact Interbull Centre and not just impact the MACE
Therefore, removing the current Basic Fee multiplier of "No. of Countries" will have a negative impact on Interbull Centre revenue, and not just the impact on the MACE fees for production.
On the other hand, implementing a new Basic Fee multiplier of 10% based on "No. of Data Providing Organizations" will replace some of the lost revenue for the Interbull Centre and more accurately reflect the additional work required at the Interbull Centre.

V. Approval and Implementation Plan

The Interbull Steering Committee has indicated its support, in principle, of this BFMTF report and associated recommendations for sharing with the countries currently participating in MACE services. This report is being distributed in advance of the Interbull Business Meetings to be held on August 26-27, 2023 during the Interbull meetings scheduled in Lyon, France. Discussion of the proposed new metric of "5-Year Increase in Milk Daughters" and the specific recommendations related to each of the Variable Fee and the Basic Fee shall be part of the Business Meeting. Following the discussion of this proposal at the 2023 Interbull Business Meeting, the Interbull SC will make a decision regarding the timing of possible implementation in 2024 or 2025.