GenTORE

Genomic management Tools to Optimise Resilience and Efficiency

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H2020 - Research and Innovation Action

D5.1
Dairy female ranking tool prototype developed.

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Workpackage concerned: WP5

Concerned workpackage leader: Donagh Berry

Lead Beneficiary: TEAGASC

Dissemination level:

    X PU: Public (must be available on the website)

    ☐ **CO:** Confidential, only for members of the consortium (including the Commission Services)

    ☐ **CI:** Classified, as referred to in Commission Decision 2001/844/EC

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1. Summary

The objective of this deliverable was to develop an index to rank dairy females on expected lifetime profitability within the mature herd. The index for such was already developed for Ireland prior to GenTORE but has been extensively modified since as well as disseminated to stakeholders (with accompanying demonstrations on how to use); it has been presented at two Irish open days attended by >10,000 farmers each. Surveys of end-users have proven very positive but also identified areas which were subsequently improved. The index has been developed for several UK dairy herds and is currently being developed for French dairy herds. COVID is having a big impact on the developments in France for a number of reasons including the reliance on non-GenTORE members to develop further the necessary data for inclusion in the index.

2. Introduction

Most decision support tools in cattle are breeding-based with limited tools to identify which animals should be culled. This is especially true for easy-to-use tools that can run on-the-fly-off a database. Animal performance, however, is a function of both the animal's DNA and the environment and management the animal is exposed to. The growing number and quality of available data sources in agriculture provide opportunities to develop value-creating tools to aid decision making on-farm. While such decision support tools can be used within herd, they should also be applicable across herds. The objective here therefore was to develop a value-creating decision support tool that aids in the identification of dairy females for culling; the tool was modular based so that it was sufficiently flexible to fit with the data sources available for the respective countries of use.

3. Approach

Ireland

All data used in this deliverable originated from the Irish Cattle Breeding Federation (ICBF) national database; this included raw phenotypic data but also the outputs from the national genetic evaluations operated by the ICBF as well as the associated pedigree data. While the index was already just in existence prior to GenTORE, it is continually being refined. Refinements during GenTORE include :

- Test-day model estimated replace 305-day yield model.
- Newly developed national genetic evaluations for dairy cow calving difficulty replacing old model which was based on dairy and beef combined; non-additive genetic effects also updated
- Survey of users (83 respondents)

- Based on feedback from users, a stricter penalty was applied to both SCC and fertility

- Operational improvements with regard to;
    - dry-off dates recording gives a penalty per day if dry-off occurs early,
    - rules around minimum level of fertility and health recording in order to gain access to the profile,
    - relaxed rules for new entrants to encourage them to record more data and use profile
    - early pregnancy scans being used to determine "ON HEAT", in-calf or empty to rerank cows (Autumn scans were always used but some herds scan early in the season and the farmers wanted that data being used in COW).

National fertility genetic evaluations are currently being developed ; once, developed they will be integrated into the latest versin of the COW

France

The plan for deployment in France was developed at a 3-day meeting in Teagasc prior to COVID. The opportunity of implementing a COW index for dairy breeds in France was investigated. Using the Irish COW model, data in France are available for the milk traits, milking speed, temperament, udder heath, calving ease, longevity and calf mortality; no lameness data are available and carcass data are available only for the Montbeliarde. The lack of data for some animal features, however is not an issue because of the modular framework for the index. However, in France, genetic evaluations for particularly important traits (e.g. longevity) are based on complex genetic model including survival analysis based on sire-maternal grandsire models and estimates of genetic merit are thus not available for females. Therefore, combined EBV issuing from multi-traits evaluations models including predictors of longevity had to be used. The economic values (i.e., how the traits are weighted in the culling index) were updated in 2021 by the Institut de l'Elevage. Transitions matrices were then computed for the probability of survival, SCS and month of calving. It appeared that due to different breeding practices between France and Ireland, month of calving had no impact in France whatever the breed or the region studied, while the seasonality of the calving period (which depends on fertility) are essential factors in the Irish COW index. It suggests that breeders rely less on grazing in France than in Ireland. Then, we studied the possibility to include a region effect instead of a month effect with the hypothesis of a breeding system linked to the environment. Again, transitions matrices were very similar when comparing oceanic region (Brittany) and mountainous region (Auvergne). In conclusion, it appeared that culling in France is mainly linked to parity with an high replacement rate and on average less than three lactation per cow. Combined strategies including genotyping and use of sexed semen allowed the breeders to better select their heifers meaning that now most of them focus on short generation interval to improve genetic level of the herd. This study showed that communication is needed to claim for a more reliable system and a reasoned choice for culling. Rethinking of a new culling index

adapted to French breeding conditions has to be engaged in the near future with the collaboration with milk recording organizations and breeding associations.

4. Results

A video describing the COW was posted on the YouTube GenTORE channel https://www.youtube.com/watch?v=jrbvfLMSwYQ. The COW index has also been discussed at farmer discussion groups in Ireland since the start of GenTORE; it has been presented at two Moorepark Open days which were attended by >10,000 farmers each (https://www.teagasc.ie/media/website/publications/2019/Moorepark19-Irish-Dairying-booklet.pdf ; https://www.teagasc.ie/media/website/publications/2017/Teagasc-Moorepark2017-Booklet.pdf

https://www.teagasc.ie/media/website/publications/2019/Decision-support-tools-1.pdf

). The use of COW is also lectured annually to undergraduates in Dairy Science as well as professional farm mangers; demonstrations on it use are also given. How it is visualised by Irish farmers on their web-service interface once logged into their farm account is below. The data underpinning this all originates from the national database and is live; therefore as data becomes available either farmer inputted or from sensors, the ranking of cows is updated.

Of the survey undertaken on 83 Irish dairy herds for feedback on the COW, 98% said they would like the COW to be generated for their herd from now on; furthermore, 95% recommend the national extension of the COW to all dairy milk recording herds. Other comments included "*I have been waiting for this support tool*"

and "*live ranking of cows essential*". There were other comments about improving the appearance of the COW. In 2020, 34% of eligible Irish dairy farmers (total of 17,000 dairy farmers) accessed their COW profile.

In France, transition matrices for survival were calculated as per the Irish COW model. Unlike in Ireland, there was little impact of month of calving in the transition matrices but this was expected based on discussion among the project team during the planning phase.

5. Conclusions

The developed index which now operates, on-the-fly, directly of the Irish national database is well used by Irish farmers. Survey results substiantiate farmer appreciation of the tool. Considerable interest has been expressed from other non-GenTORE partners (e.g., LIC in New Zealand and Lactanet in Canada) to develop the tool albeit COVID didn't allow for an organised sabatical to occur between New Zealand and Ireland.