The implementation of the Cow’s Own Worth (COW) decision support tool for spring calving dairy herds in Ireland.

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Summary

The Cow’s Own Worth (COW) is a new decision support tool expected to become available to milk recorded spring calving herds in Ireland in late 2017. The COW was designed to aid farmers in making informed culling and retention decisions on dairy females within herd. The COW operates by ranking each dairy female on her expected profit for the remainder of her lifetime, taking cognisance of both additive and non-additive genetic merit, permanent environmental effects, and current states of the animal including the most recent calving date and cow parity. The objective of this study was to trial the COW from a theoretical model state to an instantaneous live application available to commercial dairy herds from the Irish Cattle Breeding Federation’s (ICBF) on-line COW profile screens. A survey was also carried out to gauge farmer’s impression and interest in utilising the COW.

The framework of the COW consisted of the profit accruing from 1) the current lactation, 2) future lactations, and 3) net replacement cost differential. The COW was generated from estimated performance values (EPV; sum of additive genetic merit, non-additive genetic merit and permanent environmental effects) of traits, their respective net margin values, and transition probability matrices for month of calving, survival, and somatic cell count; the transition matrices were to account for predicted change in a cow’s state in the future. Commercial herds were invited to trial the COW profile in September 2017 and participate in a survey.

There were 88 survey responses and findings were overwhelmingly positive, with 98% of farmers (combined strongly agree and agree) indicating that they would use the COW profile to aid in their management decisions. Furthermore, 64% of participants strongly agreed that their milk recording information had more value because the COW was exclusively only available to milk recording herds. A high proportion of participants stated that they would be more inclined to record additional information such as their fertility and health events in order to improve the accuracy of their herds COW rank prior to making culling decisions.

Bridging the gap between theory and application, the COW is a unique opportunity to equip dairy farmers with the necessary information to make informed management decisions for their herd. Farmers will be able to more confidently select culling candidates and retain the most profitable cows. The COW offers future prospects to improve herd profitability by adding value to existing services such as milk recording and genotyping of dairy females. In order to maximise the efficiency of the COW, farmers need to fully engage in on-farm data recording for example inseminations, pregnancy diagnosis, and health (e.g. mastitis and
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Introduction

Accurate identification of dairy cows with the greatest future profit potential has a substantial impact on the herd profitability and efficiency. Culling cows that are no longer profitable is a necessary task in order to maximise herd productivity. Choosing the optimal strategy to identify culling candidates however is not trivial and has been discussed extensively, with dairy producers generally relying on their own intuition for making culling decisions.

Dairy producers make significant investments in data recording (e.g. milk recording, pregnancy diagnosis and genotyping) but collating all these data sources into one value per animal is key to aid decision making. A decision support tool was developed to aid producers in making informed decisions on dairy females for culling and retention. The Cow’s Own Worth (COW) combines multiple sources of information to identify the expected profit potential for the remainder of every dairy female’s life. The COW generates a value for every cow within a herd and ranks cows using additive genetic merit (estimated breeding values), non-additive genetic merit, permanent environment effects and current states of the cow (i.e., lactation number, calving date, and predicted calving date from available inseminations or pregnancy diagnosis). Farmers can quickly identify under-performing females to cull, thereby retaining only the most profitable females. Other benefits of this management tool are the reductions in time, effort and resources farmers spend on culling and retention decisions while getting more value from their data recording strategies.

The Irish Cattle Breeding Federation (ICBF) operates a centralised database for all cattle herds in Ireland for the provision of running the national genetic evaluations and providing cattle breeding services. Information from multiple sources is routinely collected for every animal, including information from calf registrations, milk recording, pregnancy diagnosis, abattoirs, animal health laboratories etc. An opportunity exists to provide dairy producers with a means to rank cows on expected profitability, using the abundant data from the database, with minimal farm-specific data entry from the user. The information on each dairy female is readily available from the database and the potential to integrate necessary information to inform culling decisions can be used to generate a COW value for each cow in the herd. The COW was developed and validated by Teagasc Moorepark (Irish dairy research centre) and results indicated the validity and usefulness of this management tool (Kelleher et al., 2015). The objective of this study was to trial the on-line live COW profile on commercial herds using the ICBF’s database. Results from this trial will be used to improve the COW profile prior to the commercial launch of this service to dairy farmers in Ireland.

Materials and Methods

Model

The framework of the COW consisted of the profit accruing from 1) the current lactation, 2) future lactations, and 3) net replacement cost differential. Full details of the formulation of the COW have been previously described by Kelleher et al. (2015). The COW was generated from estimated performance values (EPV; sum of additive genetic merit, non-additive genetic merit and permanent environmental effects) of traits, their respective net margin values (obtained from the Moorepark Dairy Systems Model (MDSM; Shalloo et al., 2004)), and
transition probability matrices for month of calving, survival, and somatic cell count; the transition matrices were to account for predicted change in a cow’s state in the future.

**Live COW profile trial**

The COW was initially developed and validated (as previously described by Kelleher et al. 2015) using SAS. To generate an instantaneous, on-line COW profile, the COW model was migrated to run through ICBFs database. The new on-line COW profile screen was created and dairy females were ranked on their expected profit potential within herd using the most up-to-date information instantly. Farmers were invited to trial the on-line live screens where requirements were met; 1) spring-calving herd, 2) currently milk recording, 3) recording fertility events (i.e. inseminations, natural serves and/or pregnancy diagnosis). Herd owners were informed of the theory of how the COW operates in detail, were given a COW information flyer and conducted a survey. The survey assessed the user’s opinions on the accuracy of the live COW profile on their dairy herd.

**Results and Discussion**

A total of 88 farmers conducted the survey after examining their herd on the on-line COW profile. Results were overwhelmingly positive, with 63% and 35% of farmers strongly agreeing and agreeing, respectively, that they would use the COW profile to aid in their management decisions (Figure 1). Furthermore, all participants agreed to strongly agree that their milk recording information had more value because the COW was exclusively only available to milk recording herds. A high proportion of participants stated that they would be more inclined to record additional information such as their fertility (e.g. inseminations and pregnancy diagnosis) and health (e.g. mastitis and lameness) events in order to improve the accuracy of their herds COW rank and therefore make better informed decisions in terms of retention and culling their dairy females. Farmers were also invited to provide open response feedback and results indicated an urgency to provide the COW application to coincide with culling decisions at the end of lactation. As a consequence, the demand for this service has justified the investment of resources to develop an on-line COW application for farmers with adequate levels of herd recording.

Farmers from the wider industry who have invested in recording services such as milk recording, inseminations, pregnancy diagnosis services, genotyping for example, will have access to an on-line live COW for their herd. In this way, the COW profile promotes additional and accurate recording in order to rank cows more accurately as well as rewarding those that invest in data recording services. Using the COW, the farmer can quickly identify under-performing spring calving females to cull thereby retaining only the most profitable females while getting more value from their data recording strategies.

An added advantage to the COW profile is that certain constraints have been applied prior to running the live COW profile. Depending on the time of the year, particular prompts are displayed to encourage timely data recording (e.g. insemination details prior to the end of the lactation) that influence the integrity and accuracy of the COW rankings. Herd owners lacking fertility or health information at specified times of the year will not have access to the COW profile screen until the information has been submitted to the database. To this end, the COW profile provides an excellent incentive for dairy producers to record traits that currently lack routine collection that can be subsequently used for genetic evaluations.

Furthermore, we expect to see similar opportunities and gains in split-calving dairy herds, but with the complication that it will present additional challenges both in terms of
technical difficulty (i.e. economic values derived from different optimal calving dates, carryover cows moving between calving seasons etc.) and industry uptake (due to the low levels of fertility and health recording as well as a significant proportion of herds that do not milk record). Nevertheless, it is anticipated that the implementation of the COW profile this year will drive demand from the industry.

Conclusions

The COW is a new management tool to rank dairy females for culling decisions that is expected to be available to dairy farmers for the first time in 2017. COW integrates multiple sources of available data, and critically, is complementary to the EBI (Ireland’s national breeding index) which identifies the most suitable females for breeding replacements. The COW offers future prospects to improve herd profitability by adding value to existing services such as milk recording and genotyping of dairy females. In order to maximise the efficiency of the COW, farmers need to fully engage in on-farm data recording for example inseminations, pregnancy diagnosis, and health (e.g. mastitis and lameness) events. In this way, the COW profile promotes additional and accurate recording of data in order to rank cows more effectively. An added advantage of the COW profile is that it will help provide more data on which ICBF can utilise to provide more accurate genetic evaluations. This will greatly aid where routine collection of data is lacking, for instance health and management traits.

**Figure 1.** Responses to survey (n=88) from live trial of COW conducted by ICBF in 2017.

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