Recording of health and fertility to reduce costs

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Abstract

To maintain sustainability of farm profit farmers need to optimise the balance between maximum production and minimising costs of production. Reduced dairy herd profitability is associated with health and fertility costs, which are also the leading causes of involuntary culling. Recently advances have been made with the use of farmer recorded data for use in genetic evaluations to improve the functionality of the dairy cow. In the early 2000's UK farmer recorded data related to fertility were assessed for their suitability for use in genetic evaluations which led to the inclusion of the Fertility Index in UK genetic evaluations in August 2006. Following this, records on calving ease were analysed and since 2010 calving ease proofs have been available on sires in the UK. In the past, direct measures for health traits have been excluded in genetic evaluations due to insufficient records and uncertainty in quality and completeness, but the levels of recording year on year have been increasing (e.g. mastitis and lameness), thus future genetic evaluations seem feasible. The improvement of animal health (by genetic or management means) should in turn lead to simultaneous improvement of reproductive performance and consequently, longevity. Of course there is a cost associated with recording but it is becoming a requirement of some milk sale contracts, particularly by retailers whose interest is to differentiate on product quality. The information from recording can help farmers make better management decisions and is a good benchmarking tool, as you can't manage what you don't measure. As important to recording is to review the results regularly, because this is when a herdsperson might be alerted to a problem before it becomes too serious, and to be able to investigate and rectify the root cause. Farmers in the UK have recorded sufficient good quality data to enable the provision of mastitis evaluations that will be incorporated into UK overall index in 2012.

Recent Changes in UK Breeding Goals

Increased milk production has been extremely successful through genetic selection together with improvements in nutrition and management. Including functional traits, which directly influence the costs of production, such as health and fertility, have become increasingly more important in breeding goals. However, their inclusion and their accuracy are dependent upon a good quantity of quality data, which in past years were insufficient or lacking completely. The importance of dairy cow fertility can be seen in recent years by its contribution to genetic evaluations worldwide; with 18 participating countries in the international genetic evaluation for daughter fertility (Interbull, 2012). An antagonistic association exists between milk production and fertility (Royal et al 2000), thus after many years successfully increasing milk yield the well-documented decline in fertility and its subsequent knock-on effect on longevity became a major concern worldwide (Lucy, 2001). In the early 2000's producer recorded insemination data were assessed for their suitability for use in genetic evaluations (Kadarmideen and Coffey, 2001). Genetic variation and heritability were sufficient for defined fertility traits which led to the inclusion of the Fertility Index in UK genetic evaluations in August 2006. The multivariate analysis of Wall *et al.*, (2003) involved six

traits, which were a combination of direct and correlated traits pertaining to first lactation cows, and of these, non-return rate at 56d and calving interval are used in the current UK Fertility Index. The access to bull proofs on daughter fertility has led to increased recording of fertility traits and tentative trends suggest a levelling out in the rate of decline in fertility.

Many countries around the world have been routinely publishing calving ease proofs for a number of years, with 13 countries contributing to Interbull. Calving difficulty results in economic loss to the dairy industry due to its physiological effects on both dam and calf. McGuirk et al (2007) estimated that a slightly difficult calving cost approximately £110, whereas a seriously difficult calving cost £350-£400. Voluntarily farmer-recorded calving ease data were analysed as part of a feasibility study in 2007 and calving ease proofs have now been available on sires in the UK from 2010.

The Present – Inclusion of Health Traits

Mastitis is an expensive disease of dairy cattle, with an estimated cost of £300 million (including subclinical mastitis) in the UK (Hillerton and Berry, 2005). Udder health has been incorporated into the national dairy breeding goal by the inclusion of indicator traits, somatic cell count (SCC, lactation average) and udder type traits, as index traits in its national profit index £PLI. SCC records are easily available in very large numbers making it an ideal phenotype for genetic evaluations. The correlation between SCC and mastitis is reasonable but not unity implying there is even more benefit from using direct mastitis records. A lack of a national recording system for mastitis in the UK has impeded its use in genetic improvement of udder health. However, voluntarily recorded health events by farmers as part of their milk recording and herd management show promise for their use in future genetic evaluations as fertility records did a decade ago.

Recording of Health Events and their analysis

Health events recorded by farmers are made available by milk recording organisations in the UK. Health data consists of the health event code (e.g. mastitis) and the health event / treatment date for the affected animal. In these analyses mastitis events were considered that took place from 0 to 305 days from calving. Mastitis was defined as either a binary (affected/not affected) or count trait (0, 1, 2, 3, 4+ cases). Based on recommendations of Kelton et al. (1998), a mastitis case was considered to be a new mastitis episode when there had been no other mastitis events recorded during the preceding eight days. However, there are limitations to the data as the quarter affected is not known. Analyses comprised affected animals and their contemporaries of the same herd, year, and season of calving. Thus, herds not recording health events were not included in analyses.

The incidence of mastitis, defined as whether a cow was affected by mastitis at least once during the lactation, increased from 14% in lactation 1 to 26% in lactation 3. The heritability of mastitis analysed as a repeated trait across the first three lactations was 0.04 as a binary trait and 0.05 as a count trait and was genetically correlated with SCC (~0.68) and udder composite (0.28). The genetic trend of mastitis tracks closely that of SCC (Figure 1). Predicted transmitting abilities (PTA's) were increasing in both traits in the undesired direction (i.e. daughters prone to higher SCC/mastitis) but in more recent years (since the introduction of SCC in evaluations) this has stabilised and it appears that PTA's are now decreasing. Genetic correlations between mastitis and fertility traits were favourable, which indicates that selection against mastitis should simultaneously improve fertility. Further, a

random regression model was developed for the joint genetic evaluation of mastitis and SCC to harness the information from individual test day SCC to improve the accuracy of the genetic evaluations for udder health compared to the current model. It is planned that mastitis evaluations will be incorporated into UK overall index in 2012.

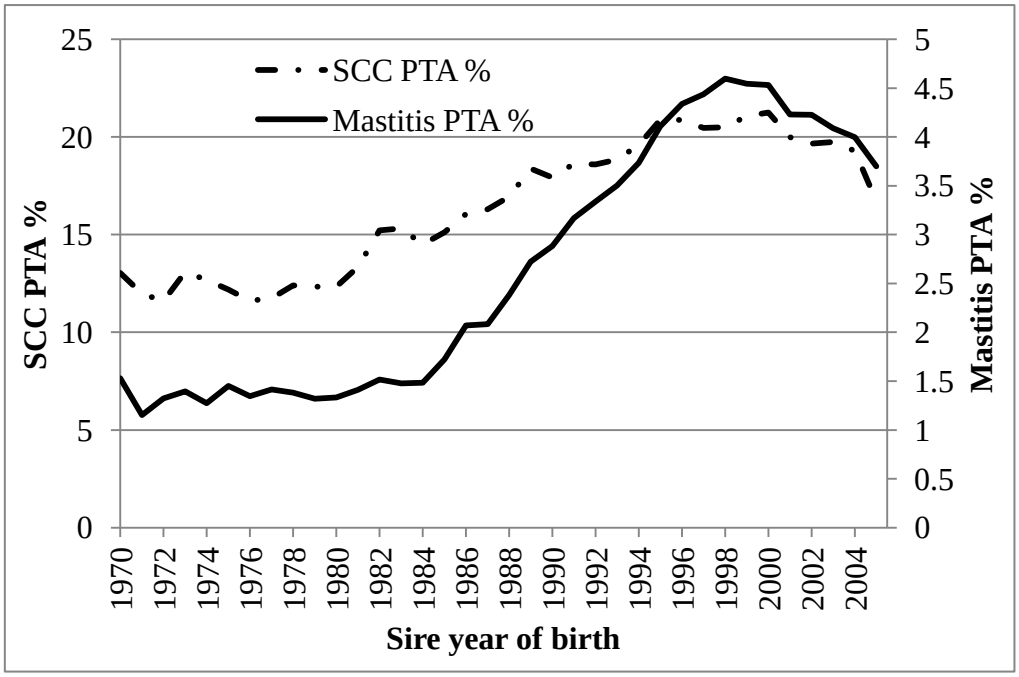

Figure 1 Mean Mastitis and SCC PTA of sires born in years 1970 to 2005 (reliabilities for mastitis and SCC at least 30 %).

The health data at present may have its limitations and maybe expected to be poor as recording is optional. However, incidence levels and genetic parameter estimates were found to be in line with other studies. At this stage the data and analyses might be regarded as simple, yet it is a step in the right direction. In the same way when the fertility index was introduced, the evaluation of mastitis as a direct trait and the availability of bull proofs should emphasise the importance and lead to greater effort in the recording of mastitis, so that greater amounts of quality data is obtained in the future. In a few years, with a greater quantity of quality data, it might then be time to re-investigate the mastitis data and make improvements on the current analyses, if required.

The Future

Alike to mastitis, lameness is also a major cost to the dairy industry and also has a negative effect on production, reproductive performance and longevity. Current indicator traits are included in £PLI for lameness but a direct trait would also benefit accuracy and genetic gain. Alike to mastitis, lameness is also voluntarily recorded by farmers and could be analysed in a similar way as mastitis. Preliminary work has shown that lameness is less recorded than mastitis, and it has been suggested that mastitis that has an immediate and visible cost is higher on the agenda than lameness, with regard to recording. Other sources of data exist which may be advantageous, such as hoof trimming records and locomotion scoring.

Over time genetic evaluations and traits evolve due to the uptake of new technologies, improved methods of analysis, availability of data, and computers that are able to cope with larger amounts of data and at faster speeds. For instance, many countries have moved from

305d lactation to the test day model for production traits and somatic cell count. Now that more data is available it is time to make improvements to the Fertility Index. The Fertility index combines direct and correlated traits pertaining to first lactation, however fertility is a problem in later parities, if not more so, which often leads to culling of cows before they reach their full lactation potential. It would be expected that the addition of data from later lactations would improve the accuracy of genetic evaluations compared to using solely lactation one. Maiden heifer fertility is also a potential trait if sufficient records were available, which is not yet evaluated in the UK. Half of those countries that submit female fertility traits to Interbull also include submission of traits related to maiden heifer fertility.

Broadening breeding goals to achieve a more robust cow, a sustainable industry, and strengthened consumer confidence requires sufficient quality data for the inclusion of functional traits into the index. The recent advances by inclusion of fertility and calving ease traits would not be possible without the recording of events done by farmers. Inclusion of direct traits, such as mastitis and lameness, should improve the accuracy and increase the genetic gain to reduce disease incidence. As well as reducing the costs of disease, selection against mastitis and lameness should in turn improve fertility and longevity, therefore reducing the number of replacements required (reducing costs) and more cows reaching their full lactation potential (improving income). The information from recording can help farmers make better management decisions, such as pinpointing causes of fertility or health problems, to be more aware of the costs and focus efforts on improvement of fertility and health, which in turn can lead to increased profitability.

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