Subject: The Impact of Genomic Selection on Herdbook Associations.

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Introduction

WHFF Council, at its February 2011 meeting, received a paper on the likely effects of genomics on the future activities of Holstein Herdbook Associations. The Secretary General was requested to produce a paper for Council to consider, with the objective of informing WHFF members of the likely challenges and potential opportunities for their organisations.

In this paper 'genomics' is treated as another way of collecting data and discusses the opportunities this may offer. However the structure of individual herdbook organisations holds the key to the strategic direction of the business and the services it can develop. It is therefore impossible for WHFF to give a universal recommendation and as such different structures of herdbooks are examined and possible strategies outlined for each structure.

WHFF membership divides into 5 business structures:-

i. Traditional Herdbook Associations.
ii. Herdbook Associations with Milk Recording. (DHI)
iii. Breeding Organisation with Herdbook and AI.
iv. Breeding Associations with Evaluation Centre.
v. Fully integrated Breeding Company.

i. Traditional Herdbook Associations

Traditional Herdbook Associations are those which continue to focus primarily on registration, classification and showing. They are not involved directly in any milk recording or AI business. Because they are narrowly focused, this structure has the most challenges resulting from the development of genomics. Traditional Herdbook Associations will be directly affected by the overall changes to the cattle breeding industry in general, and to pedigree/purebred animals in particular.

Traditional herdbook organisations are disappearing, as many are integrated into national data centres, AI and milk recording organisations. The main challenge to those

independent organisations is loss of income. Historically finance was generated from registration and parentage recording, supplemented by other herdbook activities such as classification. In many ways it was regarded as authenticated/validated parentage. However, genomics will fulfil this requirement, but with far more accuracy. The dilemma for farmers will be registration cost versus genomic test cost on individual animals. More importantly, will 'lesser' genetics continue to be regarded as valuable enough to pay for a registration, when its details are potentially recorded on national databases or milk recording agencies?

Herdbooks still have advantages in the culture of pedigree/pure bred breeding, as many breeders still aspire to develop strong female families with distinct bloodlines, usually linked to the farmers prefix, their unique marketing brand. This culture is historical and firmly based within the current generation of breeders; however in the future a younger generation of breeders or larger farms with the main goal to produce milk may not be convinced of its relevance. The question is will the genomic testing of animals discover a more reliable path of predicting quality as compared to simple pedigree, as perceived by the traditional breeder? If this is established then Herdbook Associations will need to discover other sources of income in order to maintain the 'cultural activities' associated with membership and financed through registration income. Otherwise there will be a downward spiral of activity inevitably leading to a terminal decline in traditional herdbook activities.

Herdbook Associations have established a reputation of honest independence in relation to the inspection and evaluation of animals. This aspect of the business should be developed and used in the promotion and application of new services. Becoming a 'partner' in your members herd/breeding management decision making process is a positive goal that should be aimed for. However, it must be remembered that this type of activity will place the organisation in direct competition with AI and independent milk recording companies.

Type Classification has always been a key service within this sector and is used by breeders as a valuable management and marketing tool, in addition to the information on sire breeding patterns and mating programs. It is predicted that progeny test inspections will decrease, which will reduce income from the AI sector. The spectre of this change might force a radical change of inspection applications, with the farmer/customer selecting the type of classification he requires for individual animals: Official final class classification, progeny linear, functional breeding or some other derivative to meet their particular requirements.

Considerations and Potential Actions

- Type classification –
    - Review service options as genomics could reduce the demand for classification for management.
        - At call service – not regional or by "tour".
        - Classifiers could be used to help farmers develop breeding objectives – not advise on specific bulls - but advice to be based on breeding values.
        - Possibility to score new traits – Health and Welfare?
- Introduce Genotyping service, parentage verification.
- Competition by private companies is a reality!
- Can members' cultural and business interest be protected and how?
- Will all genomic information be published; if so is this a challenge?
- Change business structure and evolve to become an overall service provider in cattle breeding and/or management information.
- The position of purebreds in the industry may change as the number of herdbook animals might decrease but their importance may rise.

ii. Herdbook Associations and Milk Recording

These herdbooks are in a stronger strategic position as there is a natural synergy between the two operations, which naturally link performance data collection, government mandated ear tag registration requirement and pedigree. This linkage enables the use of data across both management and breeding programs. In addition the organisation has all the benefits of a Herdbook Association, but much lower collection costs. The fact that currently milk samples are transported from farm and that there is already association staff visiting the farm naturally lends itself to collecting DNA samples and building strong direct facing links with the farmer, with one set of combined data flow - single entry, multi use.

The challenge to these organisations will be the advancement of on farm data collection through inline and at line testing. Linked to the web and cloud computing these organisations are well placed to offer a complete range of services aimed at farm management, and pedigree breeding at least cost. Although the growth of inline and at line testing is a challenge to herdbooks, it is also an opportunity to couple these new technologies with genomics to provide a more complete service to their members.

Considerations and Potential Actions

- Performance recording will be essential to enable genomics to be continually evaluated and refined.
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        - Classifiers could be used to help farmers develop breeding objectives – not advise on specific bulls - but advice to be based on breeding values.
        - Possibility to score new traits – Health and Welfare?
- Milk Recording
    - Milk recording fitting in with the farmer. *(frequency of service)*
    - Independent Health and Welfare recording. Will Milk factories require this?
    - In parlour auto recording - how does this data move off farm into industry systems?
        - Work with parlour manufactures for data transfer.
- Genotyping service, parentage verification.
- Ear-tag registration to government mandated database.
- Consider becoming an overall service provider in cattle breeding and/or management information.
- Option of cloud computing to assist the farmer with performance recording, pedigree, genomics and management information.

iii. Breeding Organisation with Herdbook and AI

Building on the integration theme, these organisations gain in the fact that in addition to controlling information flow, there is the opportunity to build a fully integrated relationship with the farmer in the recording, management and breeding of his herd. The fact that AI is part of the business offers savings in all areas of the operation and the business is ideally placed to offer a full service to the farmer/customer, with the advantage of constant face to face contact. Genomics is an ideal fit into this business plan and this type of organisation should have established a genotyping service as well. To the farmer this offers a 'One Stop Shop' and to the organisation the financial efficiency of an integrated customer base on a partnership approach.

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    - In parlour auto recording - how does this data move off farm into industry systems?
        - Work with parlour manufactures for data transfer.
- Genotyping service, parentage verification.
- Ear-tag registration to government mandated database.
- Consider becoming an overall service provider in cattle breeding and/or management information.
- Option of cloud computing to assist the farmer with performance recording, pedigree, genomics and management information.
- Offer a full breeding and management advice service.
- Create progeny testing opportunities.
- Establish a 'One Stop Shop' approach to the farmer to become his business partner.

iv. Breeding Associations with Evaluation Centre

The situation has greater advantages to the Breeding Association than the farmer. The farmer is looking for management and breeding information, which this scenario does not offer. The limitations on personal contact are a negative aspect of the business. The fact that all parentage information may be obtained through other sources, such as web registration, milk recording and calving data, places these organisations at a disadvantage as the farmer is required to double enter information. These organisations need to integrate with on-farm services and become associated or linked with a genomic testing company to remain competitive.

Considerations and Potential Actions

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        - At call service – not regional or by "tour".
        - Classifiers could be used to help farmers develop breeding objectives – not advise on specific bulls - but advice to be based on breeding values.
        - Possibility to score new traits – Health and Welfare?
- Genotyping service as well as the traditional parentage verification.
- Consider integration with on farm data collectors: Milk recording and/or parlour manufacturers.
- Have herd-books access to all genomic information available? Is information shared between organisations?
- Consider increasing ties with other parts of the industry to become an overall provider of advice in the cattle breeding and/or management information.
- The position of purebreds in the industry may change as the number of herdbook animals might decrease but their importance may rise.

v. Fully Integrated Breeding Company

This structure is the optimum solution to deliver a comprehensive range of services at least cost as it benefits from economy of scale and efficiency of integration. Registration costs are minimised and the integration of services provides seamless links across all services. Genomics is of greater benefit to this structure as it offers the opportunity to reduce costs and maximise use of information in all parts of the business from identification of the best bloodlines, sire selection, progeny testing through to semen sales, using information collected in other sectors of the business. To the farmer the cost for services should be lower, but there is an underlying risk of a monopolistic regime, which could take away choice from the end user and place control with a single entity, thus reducing competition. These integrated structures are in the strongest position to develop and expand.

Considerations and Potential Actions

- All previous options are available to the organisation as they are in more control of their destiny since they combine herdbook, milk recording, evaluation and AI services under one roof.