Your herd. Your asset. Your future.

NATIONAL BREEDING OBJECTIVE – INTERIM REPORT

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What is a National Breeding Objective?

The National Breeding Objective (NBO) aims to deliver herds that the Australian dairy industry needs for the future.

While Australian Breeding Values (ABVs) express a bull or cow’s genetic potential for a single trait such as fertility or protein kilograms, most farmers want to improve more than one trait in their herd.

From an Australia-wide perspective, the NBO aims to support genetic selection pressure for an agreed group of desirable traits, providing direction for both bull and cow breeding across the country. Australia’s current national breeding objective is to increase net farm profit. Over time, the NBO must evolve in response to new knowledge and the demands of dairy businesses.

To translate a National Breeding Objective into a practical breeding tool, an index is developed that applies weights to individual ABVs which best match the objective. The index is used to rank bulls, cows and herds so that superior genetics can be identified and used in breeding programs. As the Objective evolves, so does the index.

REVIEWING THE NATIONAL BREEDING OBJECTIVE

The Australian Dairy Herd Improvement Scheme (ADHIS) has a policy to review the NBO and the index formulated to meet this objective (currently the Australian Profit Ranking - APR) on a regular basis.

The last NBO review took place in 2010. Key outcomes from this review were to increase the emphasis on survival (longevity), fertility and mastitis.

ADHIS commenced the current review in late 2013. The purpose of the review is:

a) to ensure the NBO which is aimed at driving on-farm profit still remains relevant, and
b) to develop an index (or indexes) based on strong scientific principles which are in line with farmer preferences and meet the agreed NBO.

In planning for the current review greater focus was placed on obtaining direct input from farmers and the wider herd improvement industry to support the standard scientific review of economic inputs and genetic parameters used in the construction of an updated index.
This discussion paper provides an overview of the review to date including the NBO survey results together with the Task Force’s recommended indexes based on feedback received. This report is the basis for further consultation through the winter months with a decision announced towards the end of 2014.

Direct Farmer Feedback

There have been two large scale activities to hear directly from farmers. The information was gathered from Australia’s Longest Farmwalk and the National Breeding Objective Survey. Both have had a direct impact on developing potential future indexes by better understanding the priority farmers place on traits and the breeding preferences of groups of farmers.

Australia’s Longest Farmwalk

What was it? A series of 26 events on 46 farms in every dairy region. In total, the process involved around 900 participants.

What did we hear?

Australia’s Longest Farmwalk provided an opportunity to share observations about our cows and generate ideas about how herds could be improved to meet our future needs. Farmwalk discussions varied widely depending on the region and the views of participants but here are some of the main points:

- Profit remains the main focus for genetic improvement.
- Fertility is a high priority.
- Farmers want a robust functional cow that can survive and thrive in the herd under a variety of conditions.
- Cows that are resilient and flexible to respond to changing dairy environments are desirable (at least in pasture based systems).
- Some traits have an ‘ideal’ zone. Too much milk or too little milk are undesirable. Teats that were too short or too long are undesirable. Extreme overall conditions.
- Some farms have an ‘ideal’ zone. Too much milk or too little milk are undesirable. Teats that were too short or too long are undesirable. Extreme overall type and poor overall type are undesirable.
- Our breeding priorities can be different – even if we farm next door to each other. For example some aim to maximise milk solids per kilogram of cow live weight or breeding an easy-care animal while others focus on structural soundness through type.
- Farmers are keenly interested in better understanding the Australian index.

National Breeding Objective Survey

What was it? On behalf of the NBO Task Force, ADHIS conducted a large scale on-line survey of breeding trait preferences through March and April 2014. The survey collected information about farm demographics, attitudes and behaviours about genetic decisions from 551 farmers and 15 service providers. A novel survey technique known as 1000minds™ was used to determine trait preferences.

What did we hear?

The results provided meaningful insights into trait preferences as well as attitudes and behaviours related to genetic choices. Participants were broadly representative of the Australian industry in terms of region, breed, calving pattern, feed system and herd size.

Agreement on the National Breeding Objective

The current NBO is to increase net farm profit. Throughout the consultation process there has been no suggestion that this should be changed. When asked for their level of agreement/disagreement with the current expression of the NBO, 59% of farmers agreed or strongly agreed that the Australian Profit Ranking is the best way to rank bulls for profit in Australia. However, there is scope to improve how traits are weighted as only 40% agreed or strongly agreed that the APR weights traits according to their needs.

Through the survey, the range of traits and the relative importance of these traits differed from those applied in the Australian Profit Ranking. As a result the index needs to evolve to ensure it is relevant and accurate for the dairy industry. The two areas where accuracy and relevance can be improved are the inclusion of traits in the NBO (such as conformation) and the value each trait contributes to net farm profit.

Trait Preferences

The survey revealed some very interesting results that provide a solid foundation from which to evolve the National Breeding Objective. Highlights from the survey include:

- There is a continuum of breeding preferences rather than distinct and separate groups of farmers.
- Differences in preferences are only moderately linked to production system drivers such as calving pattern and feeding system. Stronger differences in preferences are observed between farmers that register cows with a breed society and those that don’t.
- Improved udders and type were important to a broad section of farmers, regardless of the proportion of the herd registered with a breed society.
- Mastitis, Longevity and Fertility were ranked the top three traits across survey participants as illustrated.

Differences between Demographic Groups

There are differences between groups of farmers with respect to trait preferences, views on genetics and criteria used to purchase semen. The differences can be used to tailor indexes (or custom indexes) towards groups of farmers with different breeding needs. This information is also helpful in developing tools and activities to support the use of indexes and ABBVs.

The following table summarises some of the most interesting and statistically significant differences observed in the survey.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Mastitis</th>
<th>Longevity</th>
<th>Fertility</th>
<th>Udders</th>
<th>Lameness</th>
<th>Protein</th>
<th>Type</th>
<th>Feed Efficiency</th>
<th>Calving Difficulty</th>
<th>Temperament</th>
<th>Milking Speed</th>
<th>Late Lactation Yield</th>
<th>Live Weight</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
Table 1: Differences in breeding preferences between farmers grouped by demographic group

<table>
<thead>
<tr>
<th>Difference observed in participant views of genetics</th>
<th>Differences observed in the criteria used to make genetic purchasing decisions</th>
<th>Breeding traits that were ranked noticeably higher in preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed\nComparing herds with more than 75% Jerseys compared to herds with more than 75% Holstein.</td>
<td>Herds with more than 75% Jersey put more weighting on type and milking speed and less on mastitis and fertility compared to Holsteins.</td>
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</tr>
<tr>
<td>Calving pattern\nComparing seasonal, split and year-round</td>
<td>Seasonal herds had a stronger preference for fertility and lower liveweight. Split calving herds ranked fertility higher than year-round herds.</td>
<td>No meaningful differences.</td>
</tr>
<tr>
<td>Feeding system\nComparing unregistered herds.</td>
<td>No meaningful differences.</td>
<td>No meaningful differences.</td>
</tr>
<tr>
<td>Breed society registration\nComparing herds with &gt;two thirds registered cows with herds that don’t register cows.</td>
<td>Type ABVs and pedigree were more important while price is less important amongst registered herds.</td>
<td>No meaningful differences.</td>
</tr>
<tr>
<td>Region\nComparing regions.</td>
<td>Lameness was more favourably ranked in Subtropical dairy region, Southwest Victoria and Tasmania.</td>
<td>No meaningful differences.</td>
</tr>
<tr>
<td>Milk payment system\nComparing herds paid on a per litre basis.</td>
<td>Calving difficulty more favourably ranked and a lower preference for late lactation yield amongst herds paid on a per litre basis.</td>
<td>Customer appearance and type.</td>
</tr>
<tr>
<td>Herd size\nAs herd size increases.</td>
<td>Herd size increases there is more agreement with APR &amp; ABVs in unregistered herds.</td>
<td>Herd size increases there is more agreement with APR &amp; ABVs in unregistered herds.</td>
</tr>
<tr>
<td>Age of farmer\nAs farmer age increases.</td>
<td>As farmer age increases, there is more reliance on advice from farmers/ advisers and cost of semen becomes more important.</td>
<td>As farmer age increases, there is more emphasis on type and milking speed and less emphasis on fertility and lameness.</td>
</tr>
<tr>
<td>Service Providers\nNot collected for service providers.</td>
<td>Service providers placed more emphasis on temperament and less on temperament than farmers.</td>
<td>Service providers placed more emphasis on temperament and less on temperament than farmers.</td>
</tr>
</tbody>
</table>

Cluster analysis

The purpose of cluster analysis is to look for similarities in breeding trait preferences. In general, there is a continuum of trait preferences rather than farmers forming distinct and different groupings. However, based on the top 7 traits of each respondent, researchers found three reasonably distinct clusters that can be loosely described as production focused, type focused and functionality focused. A similar number of farmers fall into each cluster. The clusters are not aligned to calving pattern or feeding system. For example, a farmer that calves seasonally could be found in any of the three cluster groups.

It is important to note that some trait preferences were similar across all clusters. For example, all clusters listed mastitis and fertility in their top four traits. Some of the differences in traits and attributes between clusters were:

- **Production group** – stronger preference for production and longevity. This group has proportionately more Jerseys, are less likely to register cows and are younger in age.
- **Functionality group** – stronger preference for mastitis and fertility. This group has proportionately more Holsteins, are more likely to register cows and have more full-time staff.
- **Type group** – stronger preference for longevity, mastitis and udders. This group has more Holsteins, even more staff than the functionality group and bigger herds. This group gave higher scores to daughter appearance and udders. This group have more Holsteins, even more staff than the functionality group and bigger herds.

Figure 2: Three broad clusters of trait preferences were observed with mastitis and fertility being common top traits in each

Due to the level of similarity in trait rankings across all farmers and the uniform desire to increase fertility, survival and conformation (particularly mammary system) an updated index can be developed focused on achieving these outcomes. This index would for the most part meet the needs of the majority of farmers. However the cluster analysis also shows differences in groups of farmers. These differences align to those seeking greater focus on type and those seeking greater focus on fertility/functionality. These philosophies were considered in the specific development of customised indexes presented later in the report.

Development of Economic Values

Our National Breeding Objective has focused on profit for many years but the balance between generating increased returns from more production and lowering the cost of production has shifted over time. Feedback from the Farmwalk suggests that profit is still the dominant focus and direction for breeding cows in Australia.

However, the range of traits and the relative importance of these traits differ from those applied in the Australian Profit Ranking. This suggests there is a need to reassess the economic values for traits. To analyse the profit from each unit of genetic improvement, the research team has developed a bio-economic model from which the values of each trait are generated. The model repeatedly answers the same question ‘all things being equal, how much additional profit will this herd generate by increasing one unit of a particular trait?’. Clearly, a good understanding of economics, management practices and biology of the cow are all required for this model. The model used information collected from farmers, a range of industry, government and herd recording sources, scientific literature, farmers, milk processors, professionals working in the areas of statistics, genetics, nutrition, fertility, mastitis, stock sales and farm performance analysis.

Index recommendations

Direct farmer input and a review of economic trends of different farming systems were used to develop several profit-focused and desired gains indexes for sector-wide discussion. On the whole, the indexes:

- Increase the rate of improvement for cell count.
- Increase the rate of improvement for fertility in the primary index.
- Increase the rate of improvement for survival.
- Slow the rate of improvement for production.
- Show more progress in type traits, including overall type, mammary system, udder depth.
- Increase the rate of improvement for milking speed, likeability and temperament.
In addition to these changes, custom indexes have been developed which change emphasis on either type or functionality.

Correlations are high between indexes, although significant re-ranking of top bulls, cows and herds is expected.

In total 13 indexes with multiple variations have been evaluated by the NBO Industry Task Force. The Task Force reviewed the assumptions, economic values, impact on production, management and type traits and expected industry acceptance of each index. From the initial field of 13 indexes, three are recommended to industry. Each of the recommended indexes is presented below so that their relevance can be compared.

Table 2 describes the focus of each index recommendation compared to the current APR and to each other.

<table>
<thead>
<tr>
<th>INDEX</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (APR)</td>
<td>Current APR. Included for comparison purposes only.</td>
</tr>
<tr>
<td>Balanced Primary</td>
<td>This is an economic index that aligns directly to the top priorities outlined from the NBO survey. It achieves net profit through a balance of functionality, type and production. Compared to the current APR, this index has a stronger focus on fertility, cell count, survival, udders and overall type as supported by farmer feedback and as such this index would align to the vast majority of Australian farmers.</td>
</tr>
<tr>
<td>Type</td>
<td>This specifically designed index has the strongest focus on overall type, mammary system, udder depth and foreudder attachment. Gains in liveweight, stature and angularity will be faster and gains in fertility will be slower.</td>
</tr>
<tr>
<td>Functionality</td>
<td>This specifically designed index has the strongest focus on fertility, cell count and survival. Gains in production and type will be slower than in other indexes.</td>
</tr>
</tbody>
</table>

Figure 3: Percent emphasis on trait groups in 3 index proposals compared to current APR

Compare the emphasis placed on trait groups in each index compared to the APR. For example, the emphasis on cell count in all proposed indexes’ is greater than the APR.

Figure 4: Response to selection over 10 years for recommended indexes in trait standard deviation units

This table is useful to compare the amount and direction of progress when used to breed cows. Traits could improve, remain stable or decline.

Summary of the Impact from Recommended Indexes

The most important consideration when comparing indexes is the outcome that is expected based on the Australian population of cows and the AI bulls used to produce the herd’s next generation. The change in traits that is expected based on genetic selection for each index over ten years is illustrated in Figure 4.

NBO Task Force Recommendation

The NBO Taskforce recommends that:

1. The current APR is replaced by the new Balanced Index outlined in this report. This index aligns directly to farmer preferences as outlined in both the Farmwalks and the NBO survey including maximising profit from selection.
2. Two additional indexes are released to align to the specific breeding philosophies. These indexes are:
   a. Type Index – specifically designed for farmers who seek greater focus on conformation traits.
   b. Functional Index – specifically designed for farmers seeking emphasis on fertility and survival.

The Taskforce encourages farmers to review this recommendation which provides overall direction for the Australian herd whilst supporting YOUR CHOICE.
Have your voice heard

Farmers and service providers are asked to carefully consider the index proposals and their application within Australian dairy herds. In particular, which index or indexes are most relevant to your herd or the herds of your clients?

Scan this QR code with your smart phone or go to www.adhis.com.au to provide your feedback on the relevance of each index proposal to your herd and the herds of your clients. If you prefer to talk to a real person, call 03 8621 4240 to be surveyed over the phone.
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