Performance Recording for Small Herds

One of the most common questions asked by seedstock breeders is "What size herd do you need to obtain effective results from BREEDPLAN?" Whilst there is no minimum herd size requirement for herds wishing to participate in BREEDPLAN, the nature of the BREEDPLAN analysis means that there are a number of additional considerations that small herds need to make to ensure the performance information that they record for their animals can be analysed effectively by BREEDPLAN.

There are two main concepts that all herds, regardless of size, need to understand if they going to obtain effective results from BREEDPLAN. These concepts are contemporary group formation and the creation of genetic linkage. Small herds in particular should look to implement management strategies which maximise the size of their contemporary groups and create genetic linkage both within the herd and with other herds in the breed.

Contemporary Group Formation

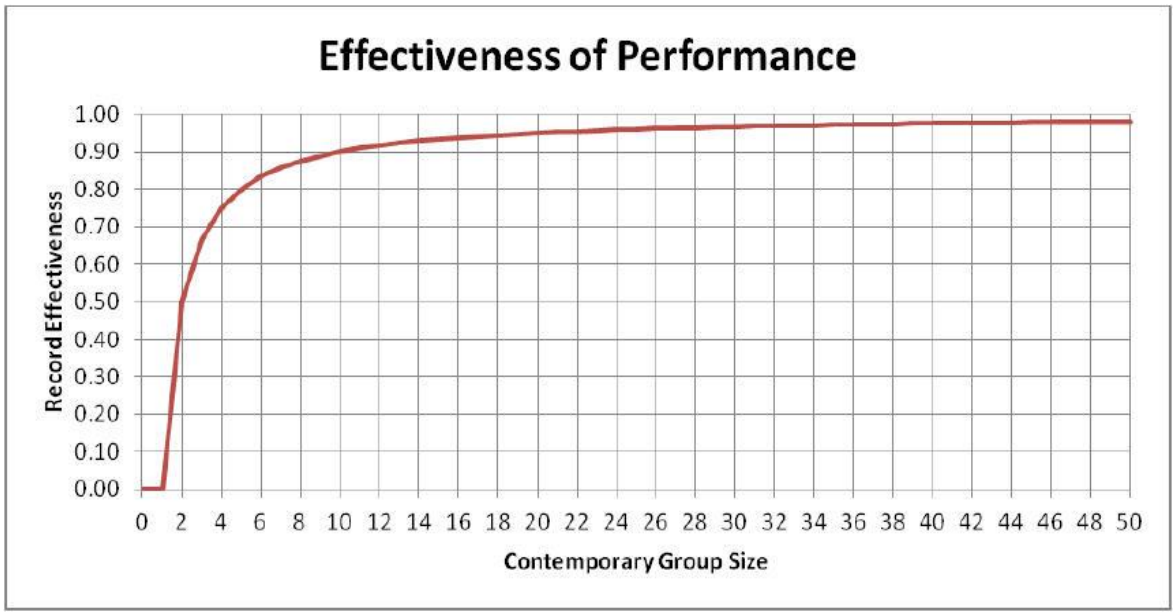
Although the BREEDPLAN analysis is underpinned by a very sophisticated analytical model, the basic mechanism by which it works is to directly compare the performance of an animal with the performance of other "similar" animals within the same contemporary group. Put simply a contemporary group can be described as animals from the same herd, of a similar age and run under the same conditions i.e. animals that have had the same opportunity to perform.

For most performance traits, calves will be analysed in the same contemporary group if they:

- Were bred in the same herd
- Are of the same sex
- Are of the same birth number (i.e. twins are not compared to single calves)
- Are of the same birth status (i.e. ET calves are not compared to AI/natural calves)
- Were born in the same calving year
- Were born within 45 days (for birth and 200 day weight traits) or 60 days (for 400 & 600 day weight, scrotal and scanning traits) of each other
- Have been weighed on the same day (& have the same weighing history)
- Have been run under the same conditions (breeder allocated management group)

Therefore small herds must try and ensure there are at least two animals that meet the above criteria if their performance records are to be analysed effectively by BREEDPLAN. When there is only one animal represented in a contemporary group, there are no other "similar" animals to which its performance can be directly compared and thus the performance submitted for it will not be used in the BREEDPLAN analysis, rendering it ineffective.

The effectiveness of an individual animal's performance record increases as more animals are represented within each contemporary group. The effect of the contemporary group size on the effectiveness of the performance is illustrated in the graph on the following page. The general aim for all herds should be to maximise contemporary group size where possible.



Graph 1. Effectiveness of Performance relative to Contemporary Group Size

Understanding Genetic Linkage

Genetic linkage gives the BREEDPLAN analysis the ability to compare the performance of animals from different contemporary groups. This is particularly important for animals running under different conditions in different herds, but also relates to animals in different contemporary groups within a herd. For example, animals born in the same herd but in different years. For BREEDPLAN to compare animals from different contemporary groups, each contemporary group must have some performance recorded progeny from common animals (typically common sires) so that the performance recorded animals in each group are genetically linked.

As a simple example of genetic linkage, consider the scenario below where 3 different mobs of calves (either on the same property or different properties) are compared. There are environmental differences between the groups – Contemporary Group 1 (CG1) has relatively poor nutrition, Contemporary Group 3 (CG3) is average and Contemporary Group 2 (CG2) is relatively good. All of the progeny in each group are by different sires (Nifty, Lofty & Curly), with a common link sire (Admiral) existing in each contemporary group. This link sire makes it possible to compare the progeny of the different sires represented in each group.

When compared to the link sire Admiral, Curly in contemporary group 3 can be considered to have the highest genetic value for 400 day weight performance, followed by Nifty in group 1, followed by Lofty in group 2. Graphically, these differences are shown in Figure 2. For the purpose of this exercise, we will assume all sires are joined to cows of equal genetic merit, although in practice, BREEDPLAN accounts for any genetic differences that exist between the dams.

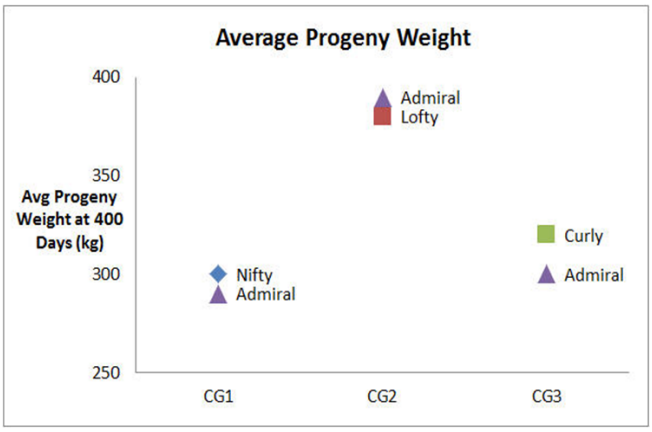


Figure 1. Average progeny weight difference at 400 days of age

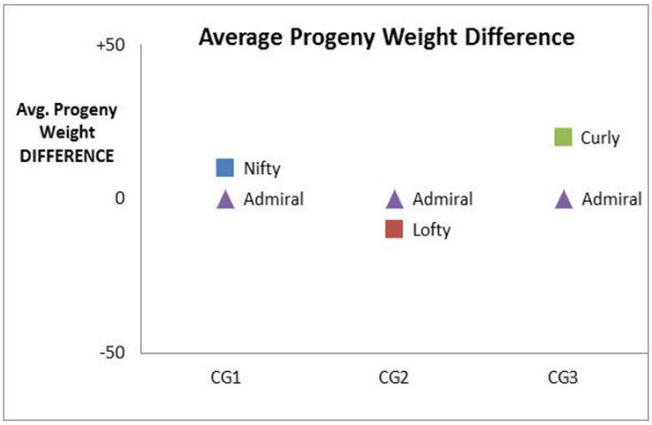


Figure 2. Average progeny weight difference at 400 days of age of the sires Nifty, Lofty and Curly compared to the link sire Admiral

Management Strategies for Small Herds

Understanding the concepts of contemporary group formation and genetic linkage, it becomes obvious that small herds, if not managed with these concepts in mind, may struggle to maximise the effectiveness of their performance recording. Because of their low animal numbers, small herds tend to have high numbers of single animal contemporary groups, and may struggle to create genetic linkage, thereby reducing the effectiveness of their performance recording. There is however a variety of management strategies small herds can implement to increase the effectiveness of their performance recording.

Creating Effective Contemporary Groups

There are a number of ways breeders can manage their herd to create effective contemporary groups.

1. *Restricted calving periods* – as calves are generally only included in the same contemporary group if they are born within 45 or 60 days of one another, it is recommended that herds aim to have a restricted calving period. A calving period of 6 to 8 weeks is ideal.
2. *Run all calves under the same management conditions* – where possible all calves should be run under the same management conditions. Where calves are to be split into different groups e.g. male calves into steers and bulls, weigh the whole group before it is split.
3. *Record performance for all animals on the same day* – as BREEDPLAN only directly compares the performance of animals that has been recorded on the same day, it is important to record the performance for all animals within a contemporary group on the same day e.g. weighing all heifers on the same day.
4. *Inclusion of commercial/unregistered animals* - many breeders have a small stud herd run in conjunction with commercial animals. If you have a commercial herd of similar breed content to your stud animals, it may also be possible to record these animals with your relevant Breed Society. This will allow a greater number of animals to be included in the same contemporary group.
5. *Associated Herds* – In the situation where two herds run their animals together on the same property, BREEDPLAN can associate the two memberships to allow the performance of calves in both herds to be directly compared together.
6. *Use more than one sire – The* BREEDPLAN analysis will be more effective if at least 2 sires are represented in each contemporary group as the performance of the progeny is going to contribute to the calculation of the EBVs of their sire. Where AI programs are used they should be timed so that AI sired calves are born at the same time as calves sired by natural joinings.
7. *Supply recipient dam details* – Herds that use embryo transfer need to identify the breed and age of the recipient dams of ET calves. If the breed of recipient dams is not supplied ET calves are split into single animal contemporary groups and therefore their performance is not effective. To maximise the analysis of ET calves by BREEDPLAN, it is preferable if the recipient dams used are all of the same breed.

Creating Genetic Linkage

There are a number of ways breeders can manage their herd to create effective genetic linkage.

1. *Use a range of sires* – common sires link contemporary groups within a herd, across herds and across years. In order to create genetic linkage across herds, it is recommended that where possible sires bred or used by other herds who are performance recording with BREEDPLAN, be used alongside home bred sires where possible.
2. *Use sires across years* – do not replace all sires in the herd from one year to the next so that across year comparisons can be made.
3. *Mix cows after joining* – mixing cows that have been single sire joined, particularly AI females, after joining will create contemporary groups with more than one sire represented.

Further Information

This article only touches on the basic concepts of the BREEDPLAN analysis. Recently SBTS & TBTS ran a webinar for small herds , titled "Small Herds – Obtaining Effective Results from BREEDPLAN". This webinar is available for viewing on the SBTS and TBTS websites and expands on the concept of how BREEDPLAN works, contemporary group formation and genetic linkage. Additional information is also available from the tip sheets section of the BREEDPLAN website (http://breedplan.une.edu.au).