



Comparing AI boar selection strategies

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Selection of AI boars

In Australia, estimated breeding values (EBVs) from BLUP genetic evaluations have been available for pigs since 1989. As a selection tool, EBVs have been shown to be a more accurate predictor of genetic merit than phenotypic performance only. However, in Australia semen from boars selected on phenotypic performance alone is still available and was also used by pig breeders participating in the National Pig Improvement Program (NPIP).

Since AI boars had progeny recorded in multiple herds it was possible to obtain across herd EBVs from the NPIP for both BLUP selected and non-BLUP selected individual boars. This allowed a comparison of the mean EBVs of the two boar groups for average daily gain and backfat, which are an estimate of the mean genetic merit for these two boar groups. The boars from the BLUP selected group had full pedigree known, however, the parentage of the non-BLUP selected group was unknown. The possibility exists that some of the non-BLUP selected boars were from BLUP selected sires. It was hypothesised that AI boars selected using EBVs have superior genetic merit than AI boars selected using phenotypic information only.

Data limits

The NPIP data used in this study were limited to Large White boars with progeny born between 1995 and 2006. Prior to 1995 there were insufficient boars in the BLUP selected group and post 2006 there were insufficient boars in the non-BLUP selected group. In addition, there were insufficient number of boars from the non-BLUP selected group in 1997 and 2002 and these years were removed from the analyses. Sires with less than 20 offspring were excluded from this study and only herds with progeny from both boar groups in the same year were used.

Five boar subgroups based upon the birth year of their progeny were created. Boars can be represented in more than one year group. The number of boars in the combined year groups ranged from 20 to 48 and there were between 2,990 and 10,482 progeny per year group (Table 1). Estimated breeding values for the BLUP selected sires were derived using all information available in the across herd genetic evaluations of the NPIP while EBVs for the non-BLUP selected sires were derived from the performance of their offspring only. However, given the large number of progeny per AI boar, all EBVs were highly accurate with average accuracies of 0.93 or 0.90 for average daily gain (ADG) and 0.97 or 0.94 for backfat (BF) in the BLUP or non-BLUP selected boar group.

Table 1. Number of boars and offspring by BLUP group status from 1995 to 2006.

	1995-1996	1998-1999	2000-2001	2003-2004	2005-2006
Non-BLUP selected boars	11	9	5	11	6
BLUP selected boars	14	26	15	37	21
Non-BLUP selected offspring	1029	1609	842	1145	677
BLUP selected offspring	1961	5799	2207	9337	2331

EBV trends

In 1995-1996, the two boar groups were initially similar in regard to their mean EBVs for growth rate (Figure 1) and backfat (Figure 2). As years progressed the mean EBVs in the BLUP selected boar groups improved continuously for both traits. In contrast, no improvement was achieved by the non-BLUP boar groups in mean EBVs for average daily gain since 1998-1999 and in mean EBV for backfat since 1995-1996. By 2005-2006 the BLUP selected boars had attained an advantage of approximately 30 g/d in mean EBV for growth and -1.5 mm in mean backfat EBVs over the non-BLUP selected boar group. Half of this superiority is expected to be passed on to the progeny of the BLUP selected boar group.

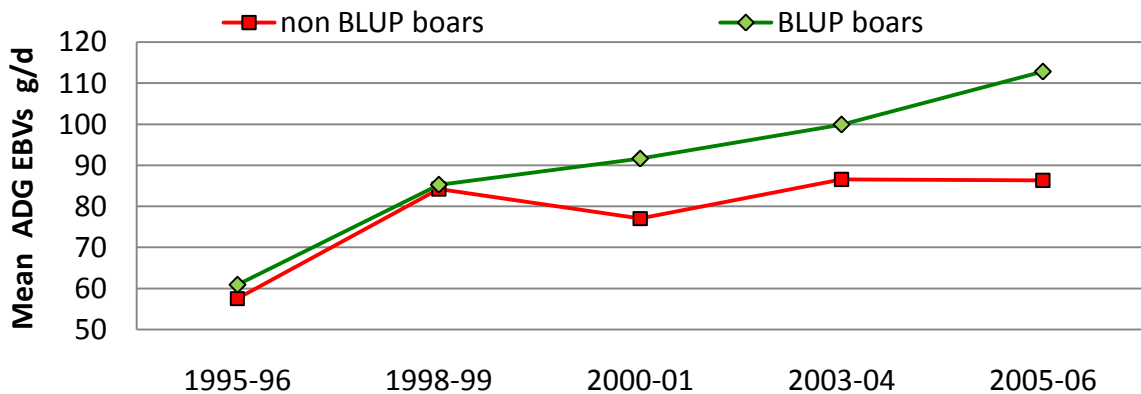


Figure 1. Mean average daily gain EBV trends

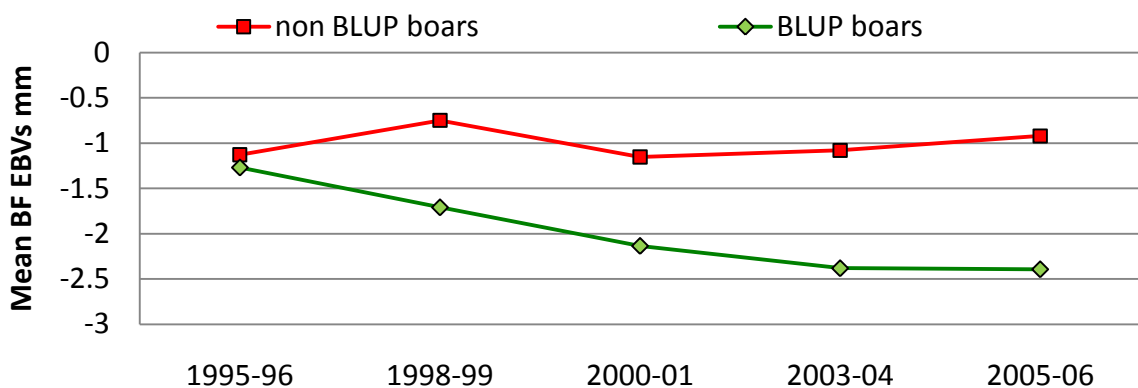


Figure 2. Mean backfat EBV trends

Variation between boars

There was considerable variation between boars for both growth rate (Figure 3) and backfat (Figure 4) EBVs. The variation in EBVs between boars within a group was larger than the differences in EBVs between boar groups. However, the best individual boars for each trait were selected based on EBVs since the late 1990s and the mean EBVs of the BLUP selected boars have been superior to the EBVs of the best individual non-BLUP selected boars since 2003-2004 in backfat and since 2005-2006 in growth rate.

Profitability of pork production is affected by a number of traits. The larger range of EBVs in the BLUP boar groups indicates that breeders were taking a wider range of traits into account in addition to growth rate and backfat to target individual herd and market requirements.

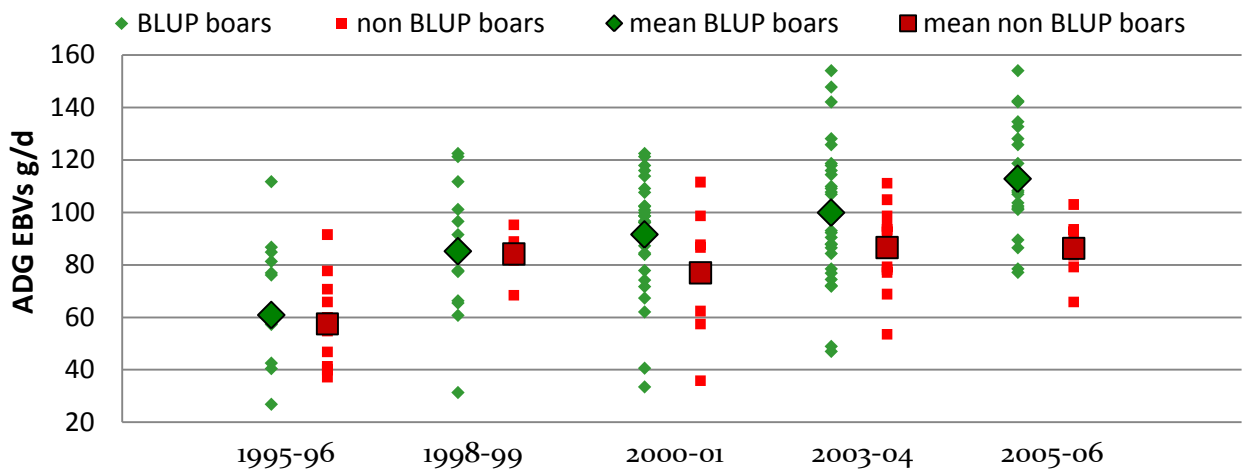


Figure 3. Variation between boars for average daily gain EBVs

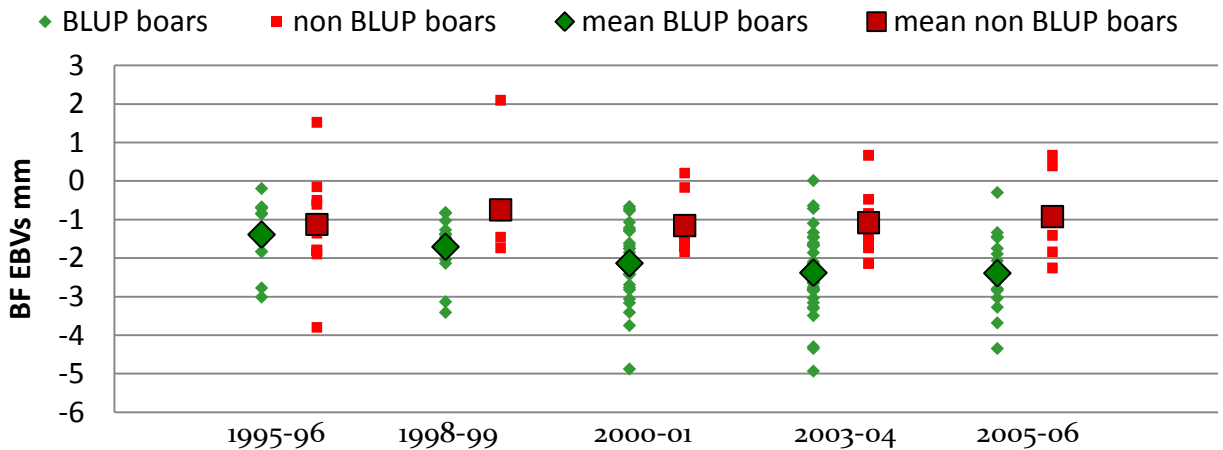


Figure 4. Variation between boars for backfat EBVs

Combining EBVs for growth rate and backfat in the \$Index

Selection indices, also called \$Index, are used to choose animals based upon their combined genetic merit in a number of economically important traits. The preferred sires in most systems would be those achieving a combination of high growth rate and low backfat EBVs, which are shown for AI sires from both selection groups in Figure 5. Many more BLUP selected sires than non-BLUP selected boars were in the preferred region with high average daily gain and low backfat EBVs in the 2003-2004 as well as the 2005-2006 data set.

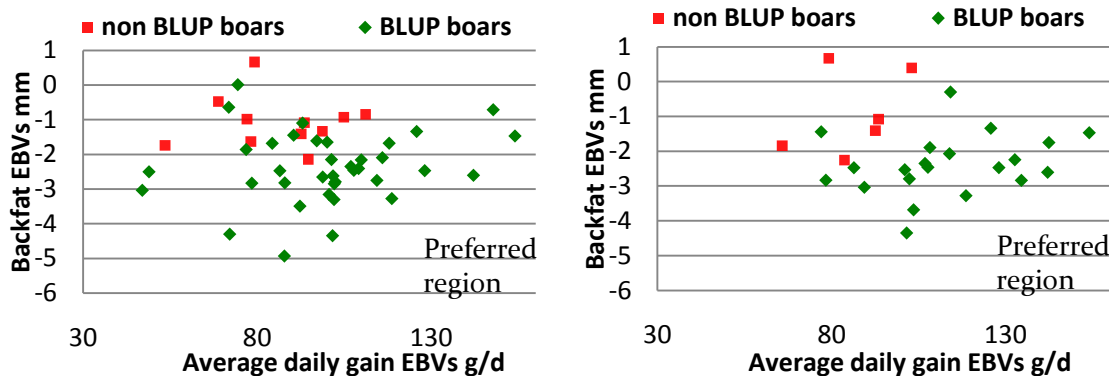


Figure 5. Growth rate versus backfat EBVs for a) 2003-2004 and b) 2005-2006

Index comparison

The mean \$Index (\$/litter) was derived for the two boar groups as the mean average daily gain EBV of each boar group times \$1.00 plus the mean backfat EBV of each group times minus \$20.00. Please note, differences in feed efficiency or sow performance could not be considered in this simple \$Index since no information was available for further traits. The comparison of the mean \$Index for each group (Figure 7) shows that there was a minor superiority of \$6 per litter for the BLUP selected boars in the 1995-1996 boar groups. However, by 2005-2006 this superiority had markedly increased to \$56 per litter.

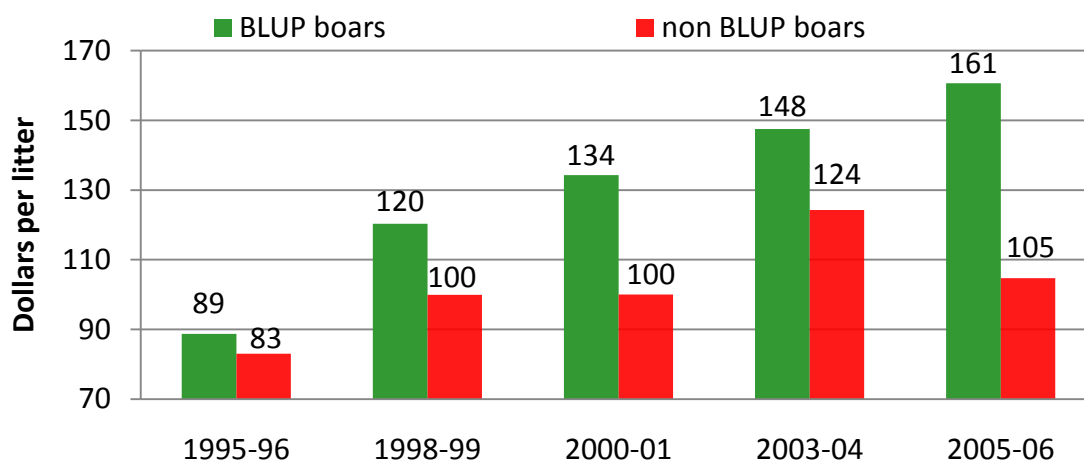


Figure 6 Dollar index comparison (\$ per litter)

Conclusions

This comparison of BLUP selected versus non-BLUP selected boars shows that the superiority of the EBVs for BLUP selected boars has steadily increased over time. Considerable variation exists between BLUP selected boars and producers should combine EBVs into a \$Index to target their individual herd and market requirements. The genetic superiority of BLUP selected boars had increased from \$6 per litter in 1995-1996 to \$ 56 per litter in 2005-2006 based on differences in growth rate (non-feed costs) and backfat alone. Differences in other economically important traits like feed conversion ratio and sow performance could not be considered due to insufficient data for these traits. It is expected that the advantage of the BLUP selected boars for ADG and BF has continued to extend post 2006. However participants of the NPIP have stopped using non-BLUP selected boars and a meaningful comparison of BLUP versus non-BLUP selected AI boars is not possible beyond this period of time.