Comparing selection strategies of AI boars – BLUP selection is superior

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Selection of AI boars

- EBVs available for selection decisions since early 1990s
  - Based on BLUP genetic evaluation systems like PIGBLUP

- However, AI boars selected on phenotypic performance are still available in the industry

- EBVs are a more accurate predictor of genetic merit than phenotypic performance only

Hypothesis:
AI boars selected using EBVs are superior to AI boars selected using phenotypic information only
Comparison of AI boars

- **BLUP group:**
  - EBVs were available for selection decisions

- **Non BLUP group:**
  - Selection of AI boars was based on their own phenotype
  - Pedigree of boars selected on phenotype was unknown
    - Some boars might have been sons of EBV selected boars
Aim

To analyse the mean genetic merit of two boar groups

- BLUP selected boars and non BLUP selected boars
- Growth rate (ADG) and backfat (BF)

- Compare EBVs of boar groups
  - Compare performance of offspring
- Explore variation between boars
- Compare $Index of boar groups
Data source and limits

- National Pig Improvement Program (NPIP) data
  - Multiple herds
- Large White pigs only
- Only herds using sires from both boar groups in the same year included
- Only sires with 20 or more offspring in the combined years used
Data combined into 5 subgroups

Based on year of birth of progeny

- 1995-96 (2,990 records from 25 boars)
- 1998-99 (5,799 records from 35 boars)
- 2000-01 (3,049 records from 20 boars)
- 2003-04 (10,482 records from 48 boars)
- 2005-06 (2,998 records from 27 boars)
Boar numbers by BLUP group status
Number of offspring by BLUP group status

- **non BLUP offspring**
- **BLUP offspring**
EBV origins and accuracies

- EBVs for non BLUP boars derived from offspring performance
- EBVs for BLUP boars derived using all information
- Accuracies of EBVs were high

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<th>non BLUP group</th>
<th>BLUP group</th>
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<td></td>
<td>Mean</td>
<td>Min</td>
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<tr>
<td>ADG</td>
<td>0.90</td>
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<td>BF</td>
<td>0.94</td>
<td>0.72</td>
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Least Squares Means

- Models
  - $\text{ADG} = \text{sex, herd, test year, test month and BLUP status}$
  - $\text{BF} = \text{sex, herd, test year, test month, test weight and BLUP status}$

- Why not use phenotypes?
  - Phenotypes affected by fixed effects (e.g., sex, herd, ...)
  - LSmeans are adjusted for the influence of other fixed effects
Average daily gain EBV trend

- **Mean average daily gain EBVs**


- **Lines:**
  - Red line: non BLUP boars
  - Green line: BLUP boars

The chart illustrates the trend of mean average daily gain EBVs for non BLUP boars and BLUP boars over the specified years.
Average daily gain LSmeans

Differences between groups were not significantly different to expectations.
Backfat EBV trend

Mean backfat EBVs

-3 -2.5 -2 -1.5 -1 -0.5 0


non BLUP boars
BLUP boars
Backfat LSmeans

Differences between groups were not significantly different to expectations
Variation between boars – ADG EBVs

- BLUP boars
- non BLUP boars
- mean BLUP boars
- mean non BLUP boars

Average daily gain EBVs g/d

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Variation between boars – BF EBVs

Lower EBVs are better
2003-04 boar groups

- Backfat EBVs (mm)
- Average daily gain EBVs (g/d)

- non BLUP boars
- BLUP boars

Preferred region
**$Index trend**

- **$Index ($/litter) = 1.0 * EBV_{ADG} – 20 * EBV_{BF}**
- Based on mean ADG and BF EBVs only (other traits ignored)

![Bar chart showing trend of BLUP boars and non BLUP boars from 1995-96 to 2005-06.](chart.png)
Conclusions

- The superiority of BLUP selected boars has increased over time

- Use EBVs to select boars
  - Variation between boars within groups is larger than variation between groups

- Combine trait EBVs into $Index to target specific production and market requirements
  - $Index is the basis for selection