Understanding BREEDPLAN and recording economically important traits

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BREEDPLAN

- Modern genetic evaluation system for livestock breeders
- Used in a number of countries worldwide
- Nation beef recording scheme in:
  - Australia
  - New Zealand
  - Namibia
  - Thailand
  - Philippines

- Increasing used in:
  - South Africa
  - United States
  - Canada
  - United Kingdom
  - Hungary
  - South America
BREEDPLAN

Takes the guesswork out of SELECTION!

Who is genetically the better bull?
Which bull will produce progeny with:

- ↑ Marbling?
- ↑ Carcass weights?
- ↑ Milk production?
Estimated breeding values (EBVs)

- Animal’s genetic merit/ value as a parent
- Difference between an individual animal’s genetics and genetic base to which animal is compared

**ESTIMATE**

- Will never know exact breeding value
- Will change over an animal’s lifetime, as more info is included
Estimated breeding values (EBVs)

- On average, half of difference will be passed on to animal’s progeny.
- Information used:
  - Pedigree
  - Own performance
  - Progeny performance
  - Performance in genetically correlated traits
Estimated breeding values (EBVs)

Figure 1. Sources of information to estimate breeding value

- Progeny
- Pedigree
- Own Performance

% contribution to breeding value vs. Number of progeny
# BREEDPLAN Traits

<table>
<thead>
<tr>
<th>Weight</th>
<th>Fertility/Calving</th>
<th>Carcase</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth Weight</td>
<td>Scrotal Size</td>
<td>Eye Muscle Area</td>
<td>Docility</td>
</tr>
<tr>
<td>Milk</td>
<td>Days to Calving</td>
<td>Fat Depth</td>
<td>Net Feed Intake</td>
</tr>
<tr>
<td>200 Day Growth</td>
<td>Gestation Length</td>
<td>Retail Beef Yield</td>
<td>Structural Soundness</td>
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<tr>
<td>400 Day Weight</td>
<td>Calving Ease</td>
<td>Intramuscular Fat</td>
<td>Flight Time</td>
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<td>600 Day Weight</td>
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</tr>
<tr>
<td>Mature Cow Weight</td>
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<td>Shear Force</td>
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</tr>
</tbody>
</table>
Economically important traits
Economically important traits
Traits are not inherited in isolation
Some traits are genetically correlated
Genetic correlation

- Selection for one will cause a genetic change in other
- Same underlying genes influence both traits
- How the EBVs of two traits vary together

Figure 2: Traits may have a positive genetic correlation (left) or a negative genetic correlation (right).
Genetic correlation

Examples:
- BW & WW
- BW & Calving ease
- 400-day weight & Mature cow weight
- Carcass weight & Marbling
Genetic correlation

- Positive: Indirect selection (Indicator traits)
  - Easier to measure
  - Less expensive
  - Higher heritability

- Negative:
  - Selection for one trait, may cause a undesirable change in another trait
  - E.g. selection for ↑ carcass weight → ↓ marbling
Performance data is needed for EBV calculations
How to submit data?

- Excel spreadsheets
- HerdMASTER
- Online (Society website/Internet Solutions)
### Overview of BREEDPLAN recording

<table>
<thead>
<tr>
<th>Minimum requirements...</th>
<th>Optional recording</th>
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<tbody>
<tr>
<td>Record Birth dates of calves</td>
<td>Birth weight</td>
</tr>
<tr>
<td>Tag your calves</td>
<td>Calving ease</td>
</tr>
<tr>
<td>Record sire and dam of each calf</td>
<td>Later weights</td>
</tr>
<tr>
<td>Weigh calves at least twice</td>
<td>Live animal fat depth, muscle &amp; intramuscular fat scans</td>
</tr>
<tr>
<td>Joining date of cow</td>
<td>Scrotal size</td>
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<tr>
<td></td>
<td>Joining details ( AI &amp; Natural)</td>
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<tr>
<td></td>
<td>Cow weight when calf weaned</td>
</tr>
<tr>
<td></td>
<td>Abattoir carcass data</td>
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</table>
Birth weight

- Record BW on the whole calf crop
  - Not just difficult births
- Measure within 24 hours of birth
- In Kgs
- Do not guess BWs
  - weigh or do not record BW
- Also record BW of calves dead at birth
- Put calves in different management groups if
  - premature born calf
  - Dam was sick
Calving Ease

Codes:

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<thead>
<tr>
<th>Blank</th>
<th>Unknown</th>
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<tr>
<td>1</td>
<td>No difficulty</td>
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<tr>
<td>2</td>
<td>Easy pull</td>
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<tr>
<td>3</td>
<td>Hard pull</td>
</tr>
<tr>
<td>4</td>
<td>Surgical (non-elective)</td>
</tr>
<tr>
<td>5</td>
<td>Abnormal presentation</td>
</tr>
<tr>
<td>6</td>
<td>Elective surgical</td>
</tr>
</tbody>
</table>

- If cows checked regularly:
  - cow that calves without assistance between visits - unassisted (no difficulty)
- Record whole calf crop
- “Blank” - no measure, rather than “no difficulty”
- There needs to be some level of calving difficulty in herd for this data to be useful in analysis
ET calves

- Birth cow normally not biological dam
- NB Record recipient dam info:
  - breed
  - age
  - identification
- No recipient cow info - calf performance not used
- Schedule O forms
- ET calves only directly compared to ET calves
- Usefulness of performance info ↓ if all calves in group have a common parent
Post-birth weights

- **200 day (Weaning weight)**
  - weighed between 80 & 300 days

- **400 day (Yearling weight)**
  - weighed between 301 & 500 days

- **600 day (Mature weight)**
  - weighed between 501 and 900 days
Post-birth weights

- Min x 2 post birth weights
- Suggested weighing date
  - choose date that fits into your management
  - date close to suggested weighing date
  - weigh all the animals that fall into this group
- Weights will be **adjusted** to 200, 400 or 600 days
- 200-day weight - adjusted for cow age
Post-birth weights

- Weigh calves when they are a large group
- Weigh calves **before** they are treated differently
  - E.g. show team are separated
  - Moved to another camp
- > 1 weights for a trait can be accommodated (first 2 used in analysis)
Post-birth weights

- Record date of measurement
  - animals in same group - weighed on same day
  - BREEDPLAN split management groups if weighed on different days
  - groups are also separated according to sex
- Units = kilogram (to nearest unit)
Mature cow weight

- Cow’s weight when her *calf’s weaning weight* is taken
- BREEDPLAN analyze **first 4**
- Mature cow weight EBV indicator of:
  - Cow mature weight - feed requirements
    - Selection for increased growth rate - increased mature maintenance feed requirements
Days to Calving

- # days from first joining/mated to consecutive calving
- All cows & heifers
- Info recorded:
  - Bull date in and bull date out
  - AI date
  - mating/joining for each cow/heifer
    - even if mating was not successful
- Cow fate/disposal details
  - Date & reason
- Record all pregnancy results (pregnant or not pregnant)
- Donor cow embryo/ovum flushes
DTC Fate codes

Culled or sold

A Cast for age
B Sold surplus breeding female - but not code J or F
C Calving incident
D Disease (e.g. pesti, eye cancer, etc)
E Eyes (pigment, hooding, etc)
F Not in calf (i.e. failed preg test or did not calve)
G Genetic condition (e.g. genetic carrier)
H Horns
J Cull unjoined heifer surplus to requirements
K Coat Type
P Poor performance (e.g. poor milking, low body condition, etc)
Q Appearance (type, colour, markings, Society standards, etc)
R Reproduction abnormality (e.g. freemartin, mal-formed uterus, small pelvic area)
S Structural problem (e.g. feet, legs, navel, etc)
T Poor temperament
U Udder or teat problems
V Poor EBVs
W Calved but failed to rear calf to weaning
X Susceptible to parasites (ticks, buffalo fly, worms, etc)
Scrotal size

- Scrotal size
  - cm (to 1 decimal)
  - use a consistent technique for the whole group
  - measure around puberty
    - 350 - 600 days (12 - 19 months)
    - normally measured with 400-day weight
    - max days is 700
    - measure on the same day as weight is taken
Carcass Traits

- RTU Scanning (live animal)
  - Accredited scanner
  - 300 - 800 days
  - Preferred with 400 or 600 day weight

- Traits:
  - EMA
  - Fat depth
  - IMF - not accurate for Wagyu
Carcass Traits

- At slaughter (Abattoir)
- Traits:
  - P8 fat
  - Rib fat
  - EMA
  - Marbling score
  - Marbling fineness
  - pH
  - Tenderness
  - Carcass weight
  - Etc.
Feed efficiency

- RFI
- Send animals in CG to test station
  - Sernick
  - Feedlot finishing
    - 300 - 400 days old (at start)
- Actual vs expected (feed intake)
\[ P = G + E \]
Contemporary groups

- BREEDPLAN analyses cattle in contemporary groups to take out the influence of as many non-genetic effects (environmental) as possible.
- Animal’s performance compared to group average.
- Larger CGs → more informative.
WHOLE HERD RECORDING!!!

- Problematic when only selection of CG is performance recorded
  - Only “best” animals
  - Lead to bias in estimation
WHOLE HERD RECORDING!!!

- All animals recorded: A7 4kg heavier than avg
- Only selection recorded: A7 15 kg lighter than “avg”

<table>
<thead>
<tr>
<th>Animal</th>
<th>200 Day Wt (1)</th>
<th>200 Day Wt (2)</th>
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<tbody>
<tr>
<td>A1</td>
<td>255</td>
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<td>265</td>
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<tr>
<td>A7</td>
<td>237</td>
<td>237</td>
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<tr>
<td>A8</td>
<td>195</td>
<td>X</td>
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<tr>
<td>A9</td>
<td>258</td>
<td>258</td>
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<td>A10</td>
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<tr>
<td>Average</td>
<td>233 kg</td>
<td>252 kg</td>
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</table>
## Construction of CG

<table>
<thead>
<tr>
<th>BREEDER SUPPLIED</th>
<th>AUTOMATIC, BUT CAN BE BREEDER INFLUENCED</th>
<th>AUTOMATIC</th>
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<tbody>
<tr>
<td>1 Breeder Defined Management Groups</td>
<td>2 Calf Age</td>
<td>4 Herd</td>
</tr>
<tr>
<td></td>
<td>3 Weight Date</td>
<td>5 Calving Year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 Sex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 Twins/Single</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Birth Status (ET)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 Dam age</td>
</tr>
</tbody>
</table>
### Table 1. Summary of Trait Age Ranges and Slicing

<table>
<thead>
<tr>
<th>Trait</th>
<th>Age Range (days)</th>
<th>Standard Age (days)</th>
<th>Slice (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving Ease (Cow)</td>
<td>2 to 20 yrs</td>
<td>2 yo hfr</td>
<td>120</td>
</tr>
<tr>
<td>Gestation Length</td>
<td>0</td>
<td>0</td>
<td>365</td>
</tr>
<tr>
<td>Birth Weight</td>
<td>0</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>200 Day Milk</td>
<td>760 - (20 yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 Day Weight</td>
<td>80 – 300</td>
<td>200</td>
<td>45</td>
</tr>
<tr>
<td>400 Day Weight</td>
<td>301 – 500</td>
<td>400</td>
<td>60</td>
</tr>
<tr>
<td>600 Day Weight</td>
<td>501 – 900</td>
<td>600</td>
<td>60</td>
</tr>
<tr>
<td>Mature Weight</td>
<td>870 – 3900</td>
<td>2050</td>
<td>360</td>
</tr>
<tr>
<td>Scrotal Size</td>
<td>300 – 700</td>
<td>400</td>
<td>60</td>
</tr>
<tr>
<td>Days to Calving</td>
<td>270–640 (hfr)</td>
<td>436 (hfr)</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>641-990 (3yo)</td>
<td>807 (3yo)</td>
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<tr>
<td></td>
<td>991-1737 (later)</td>
<td>1250 (later)</td>
<td></td>
</tr>
<tr>
<td>Scan P8 Rump Fat</td>
<td>300 - 800</td>
<td>500</td>
<td>60</td>
</tr>
<tr>
<td>Scan Rib Fat</td>
<td>300 - 800</td>
<td>500</td>
<td>60</td>
</tr>
<tr>
<td>Scan EMA</td>
<td>300 - 800</td>
<td>500</td>
<td>60</td>
</tr>
<tr>
<td>Scan IMF%</td>
<td>300 - 800</td>
<td>500</td>
<td>60</td>
</tr>
<tr>
<td>Carcase Weight</td>
<td>300-1000</td>
<td>650</td>
<td>60</td>
</tr>
<tr>
<td>Carcase Fat (Rib and Rump)</td>
<td>(300-1000)</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Carcase EMA</td>
<td>(300-1000)</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Carcase IMF%</td>
<td>(300-1000)</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Carcase RBY%</td>
<td>(300-1000)</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

While most analyses use 45 day slices for birth weight and 200 day weight, some analyses use 120 day slices for calving ease.
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<td>4 Herd&lt;br&gt;5 Calving Year&lt;br&gt;6 Sex&lt;br&gt;7 Twins/Single&lt;br&gt;8 Birth Status (ET)&lt;br&gt;9 Dam age</td>
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<td></td>
<td></td>
<td>9 Dam age</td>
</tr>
</tbody>
</table>
Management groups

- Better recorded = better (more acc) EBVs
- **Breeder indicate** groups
- Animals treated different than rest
- Same opportunity to perform
- Indicate with: 1 - 9 or A - Z (Max 3 characters)

- If left **BLANK** animals treated as 1 management group
Management groups

- Assign animals to different management groups if:
  - Sick
  - Fed extra (show)
  - Fed grain vs veld
  - Growth promotants
  - Paddocks with different veld quality
Keep management groups/CG as large as possible

- Whole herd record
- Compact mating/calving season
- Weigh animals in management group on same day
  - Split in bull & heifers if necessary
- AI cows so that they calf with natural mating cows
- If 2 herd run on same property, link them on system
# Management groups

<table>
<thead>
<tr>
<th>#Herd</th>
<th>Animal Id</th>
<th>Disposal Code</th>
<th>Weigh Date</th>
<th>Weight</th>
<th>Mgmt Grp</th>
<th>Analysis Indicator</th>
<th>Wet Dry Cond</th>
<th>Castrate Flag</th>
<th>Date</th>
<th>Scrotal Size</th>
<th>Hip Ht</th>
<th>P8 Fat</th>
<th>Rib Fa</th>
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Management groups
Thank you!

Any Questions??