THE UNIVERSITY OF MELBOURNE
POSTERA CRESCAM LAUDE

Fertility and genetics

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What is the aim of a Dairy Farm business ?

Make a profit

Make a profit from sale of milk

Make a profit from sale of milk and stock

Make a profit by efficiently producing and selling milk and stock

Maximise profit by efficiently producing and selling milk and stock

- Nutrition

- Fertility

- Health

- Milk Quality

Fertility and Genetics

Fertility – reproductive efficiency

In breeding enterprises, when an animal becomes pregnant is very important

Giving birth is necessary for:

- Producing offspring where they are sold
- Starting a lactation for milking animals

Genetics – having high quality animals

- Cattle can have different genes suitable for particular purposes

KPIs – Seasonal/Split calving herds

Primary KPIs

- 6-week in-calf ("pregnancy") rate
- Not-in-calf rate ("empty") rate

Factors affecting 6-week in-calf rate

- 3-week Submission rate
- A.I. Conception rate

Factors affecting not-in-calf rate

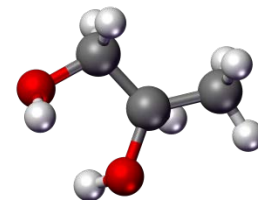- 6-week in-calf rate
- Bulls

Reproduction is important!

Cows calve at the "right time" for the farm

They produce more milk and get in calf quicker

More AI replacement calves

1% change in 6 week in-calf rate:

- $3.02 (ADHIS/Dairy CRC economic model behind the Australian Profit Ranking index calculation)
- $4.00 (Australian InCalf economic model)
- $3.34 (NZ Dexel whole farm model)

Table 1: Measures of reproductive performance in 2009

Measure	Lowest herd	Typical herd	Highest herd
6-week in-calf rate	22%	50%	70%
12-week not-in-calf rate	10%	31%	57%
21-week not-in-calf rate	9%	21%	53%
3-week submission rate	22%	72%	98%
First service conception rate	11%	38%	65%

Graph 1: Measures of reproductive performance in 2009.

Typical herd: median, i.e. middle herd
Lowest herd
Highest herd
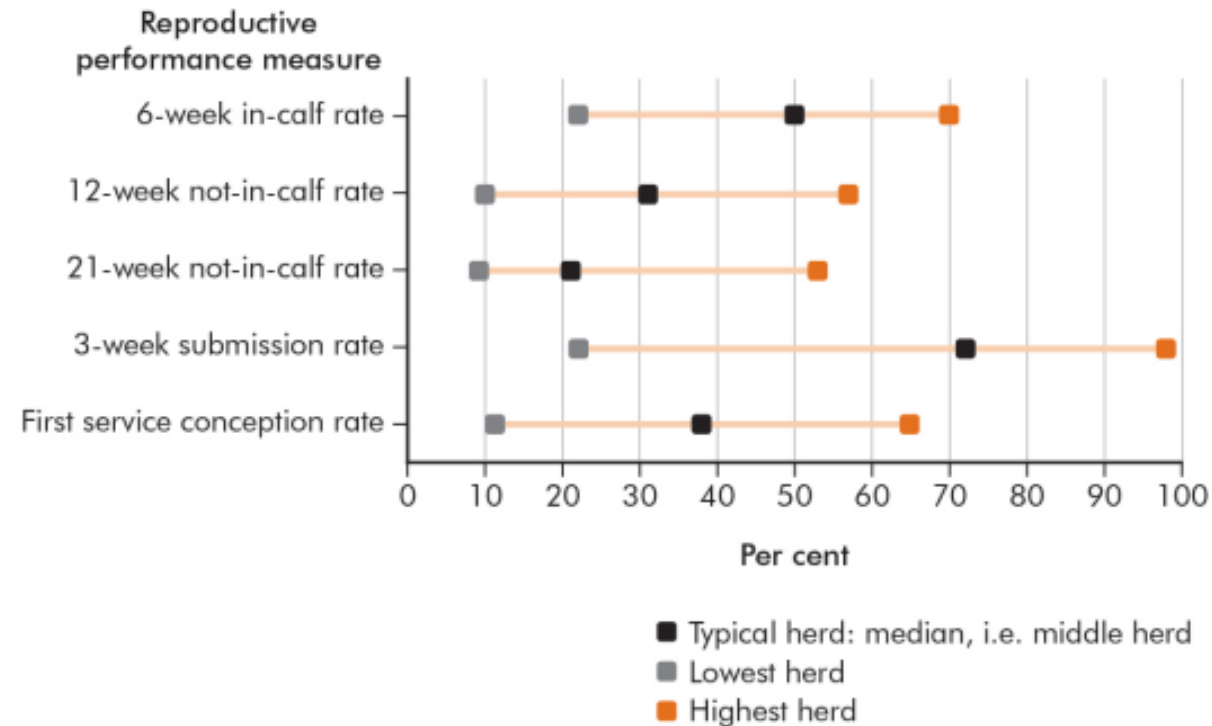
KPIs – year round herds

Overall performance

- 100 day in calf rate

- 200 day in calf rate

Drivers of in-calf rates

- 80-day submission rate

- Conception rate

How do we achieve this?

- Growing heifers well

- Maintaining body condition and providing adequate nutrition

- Sound heat detection practices

- Good AI technique

- "Bull power" and bull management

- Minimising cow health problems at calving and in early lactation (i.e. transition cow management!)

- Genetics (fertility)

Genetics: Breeding better cows

The benefits of AI...

| Production Averages by % of Artificially Bred Cows in Herds				
Percentage of Artificially Bred Cows in Herd	**Number of Herds**	**Production Averages**		
		Milk ltres	**Fat kg**	**Protein kg**
< 10	539	5,921	238	197
10-19	137	6,268	247	208
20-29	143	6,546	256	215
30-39	167	6,721	264	223
40-49	217	6,533	262	217
50-59	**262**	**6,871**	**276**	**227**
60-69	320	7,080	278	233
70-79	368	7,404	291	243
80-89	352	7,245	284	241
> 89	518	7,242	287	240
Total, AVG	**3,023**	**6,890**	**273**	**228**
> 89	% of AVG	105.1	105.1	105.3
< 10	% of AVG	85.9	87.2	86.4

Australian Dairy Herd Improvement Scheme (ADHIS)

Australian database of herd test results and conformational data

Australian Breeding Values (ABVs)

- Calculated bi-annually (Feb/August)
- Numerous traits:
  - Milk (L)
  - Protein (kg)
  - Fat (kg)
  - Cell count
  - Fertility
  - et al...
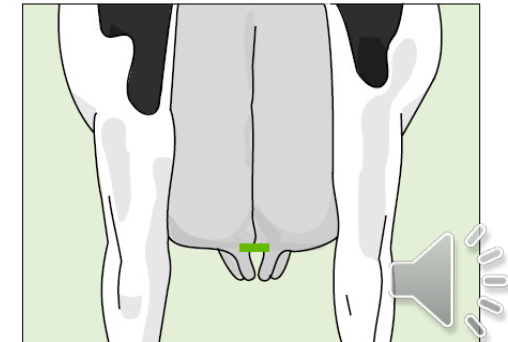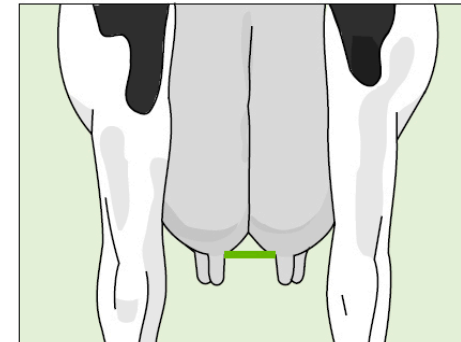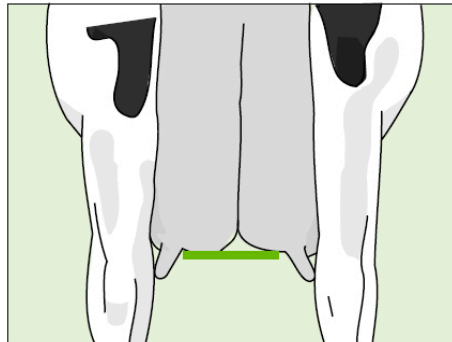
Combining Breeding Values

Balanced Performance Index

The Balanced Performance Index (BPI) is an economic index that drives improvements in the traits that affect lifetime contribution to the farm business: production, type, health, fertility, longevity, workability, feed efficiency and type. The BPI is measured in $, compared with the breed average (or 'base') which is set at zero.

Health Weighted Index

The Health Weighted Index allows farmers to fast track genetic gain for traits such as fertility, mastitis resistance and feed saved. The HWI places greater weighting on these traits than the BPI. Breeding for HWI is expected to reduce cow size and show little improvement in production. This is because it places less emphasis on milk yield per cow. The HWI is modelled on a strictly seasonal calving system.

Source: Datagene

Genomics

- Sequencing of bulls and cows <1 year old

- Collection of tail hair samples (from birth!)

- Genomic sequencing to determine ABV(g)s

- ↑ reliability for young animals esp. for traits such as fertility/longevity
  - Equivalent of 25-30 milking daughters (Bulls)
  - Or, 7 lactations (Cows)

- More rapid genetic gain!

Choosing a Bull

Recommendations from ADHIS

- Use the highest BPI bulls you can afford ($15-45/straw)

- Use progeny test semen on some of the herd ($\downarrow$ $$$)

- Keep good records to reduce inbreeding

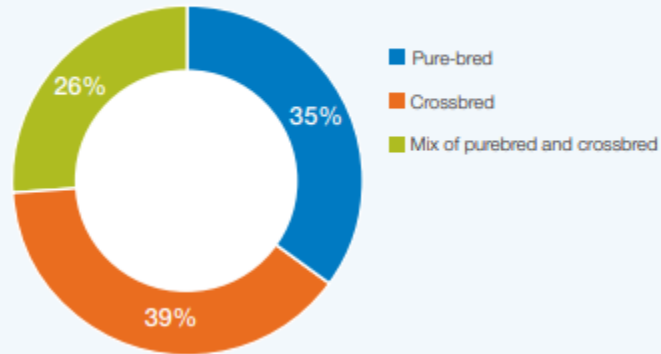- Breed enough replacements to enable older cows to be culled

Also…

Select a range of sires rather than only one or two

Crossbreeding – another option

Breed structure of Australian herds

"Younger farmers are more likely to have a crossbred herd than older farmers."

- Pure-bred — 35%
- Crossbred — 39%
- Mix of purebred and crossbred — 26%

AEPS – DAIRY WEEK 1