Ensuring dairy cow welfare with increasing scale of production

DAVID S BEGGS
Dairy is Australia’s 3rd largest industry

- $3.7b production
- Employing 42000 people
- We export 37% of milk production
- 6% of the world dairy trade
Increasing scale of production

- The average Australian herd size has risen 37% over the past 10 years.

- 30% of all dairy farms are now 'large herds' (>500 cows), compared with 17% in 2004.

- Small farms (< 150 cows) now account for 26% of all farms compared with 35% in 2004.

- 33% of farmers surveyed expecting to calve more cows in the following year.
Animal Welfare

Animal health and welfare are

- key contributors to dairy production efficiency
- important to the general public and dairy consumers
- important to dairy farmers
- newsworthy
Consumers equate pretty images with good welfare
But the dairy industry is under scrutiny
Demonstrating good animal welfare will be important in the future
PhD Research aims:

**Complete**
- Undertake a farm practice survey to investigate trends in dairy herd and farm size, associated management practices and problems encountered;

**Writing up**
- Conduct a milking order study to investigate the hypothesis that milking order in large herds is less consistent than in smaller herds, but that cows can nevertheless be divided into groups based on where they commonly sit in the milking order;

**Planning**
- Undertake on-farm studies to determine relationships between farm characteristics and practices associated with scale of production and animal welfare measures.
Survey

- known or proposed risk factors for adverse animal welfare outcomes
- relationship to herd size
- physical questionnaire – Via “The Australian Dairyfarmer”
- email distribution to 1000 farmers via Dairy Australia
Questions

28 closed ended questions with multiple parts – 10-15 mins

farm location, herd size, physical area, level of milk production, grain feeding, dairy type, staffing levels and qualifications

risk factors for animal welfare outcomes that are

- indicative of poor welfare (animal-based indices)
- strategies or policies that are known or hypothesized to affect animal welfare across the three overlapping quality-of-life domains of biological function, affective state and naturalness
Results

863 valid surveys
- representing 13% of Australian dairy farms
- representing 16% of the 1.65 million cows being milked
- biggest survey of its type
- most responses were written rather than electronic

<table>
<thead>
<tr>
<th>Dairying Region</th>
<th>Respondents</th>
<th>No of farms</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy NSW</td>
<td>102</td>
<td>437</td>
<td>23%</td>
</tr>
<tr>
<td>Dairy SA</td>
<td>48</td>
<td>279</td>
<td>17%</td>
</tr>
<tr>
<td>Dairy Tas</td>
<td>66</td>
<td>413</td>
<td>16%</td>
</tr>
<tr>
<td>Gipps Dairy</td>
<td>194</td>
<td>1548</td>
<td>13%</td>
</tr>
<tr>
<td>Murray Dairy</td>
<td>177</td>
<td>1663</td>
<td>11%</td>
</tr>
<tr>
<td>Subtropical Dairy</td>
<td>72</td>
<td>700</td>
<td>10%</td>
</tr>
<tr>
<td>Western Dairy</td>
<td>34</td>
<td>162</td>
<td>21%</td>
</tr>
<tr>
<td>Westvic Dairy</td>
<td>169</td>
<td>1438</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>863</strong></td>
<td><strong>6640</strong></td>
<td><strong>13%</strong></td>
</tr>
</tbody>
</table>
Farm Size

Mean herd size of 304

13% of farms are large herds (>500 cows) but they contain 35% of cows milked

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>Farms</th>
<th>% Farms</th>
<th>% Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 150</td>
<td>172</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>150-300</td>
<td>395</td>
<td>47</td>
<td>33</td>
</tr>
<tr>
<td>301-500</td>
<td>166</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>501-700</td>
<td>66</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>701+</td>
<td>49</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>848</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Welfare Risk Factors

- Increased use of grain or concentrates
- more cows per labour unit
- reduced ability to examine and treat cows individually
- longer milking times
- longer walking distances

Increased stocking densities
Hypothesised risks

Risks increasing with increasing herd size:

Stocking Density

Cows per Labour Unit

Maximum grain fed per day

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>&lt; 150</th>
<th>150-300</th>
<th>301-500</th>
<th>501-700</th>
<th>701+</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean stocking density (cows/ha)</td>
<td>1.42&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.97&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.29&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>2.25&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>2.51&lt;sup&gt;c&lt;/sup&gt;</td>
<td>F(4,821)=30; p &lt;0.01</td>
</tr>
<tr>
<td>Mean stock per person (cows/labour unit)</td>
<td>64&lt;sup&gt;a&lt;/sup&gt;</td>
<td>104&lt;sup&gt;b&lt;/sup&gt;</td>
<td>131&lt;sup&gt;c&lt;/sup&gt;</td>
<td>133&lt;sup&gt;c&lt;/sup&gt;</td>
<td>164&lt;sup&gt;d&lt;/sup&gt;</td>
<td>F(4,833)=72; p &lt;0.01</td>
</tr>
<tr>
<td>Mean maximum concentrates fed (kg/cow/d)</td>
<td>4.8&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.9&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>7.1&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>7.8&lt;sup&gt;d&lt;/sup&gt;</td>
<td>F(4,814)=23; p &lt;0.01</td>
</tr>
</tbody>
</table>
Potential Welfare Advantages

modern dairies that reduce milking time

infrastructure to electronically identify and monitor individual cows

use of professional advice

superior nutrition

greater capacity to provide staff training and general quality assurance systems
## Indices of poor welfare

Reported disease incidence did not increase with herd size

<table>
<thead>
<tr>
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<th>&lt; 150</th>
<th>150-300</th>
<th>301-500</th>
<th>501-700</th>
<th>701+</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean mastitis in first 30 days of lactation (%)</strong></td>
<td>5.3</td>
<td>5.9</td>
<td>7.1</td>
<td>7.1</td>
<td>6.6</td>
<td>F(4,556)=1.7; p=0.156</td>
</tr>
<tr>
<td><strong>Mean treated for lameness (%)</strong></td>
<td>5.7</td>
<td>6.0</td>
<td>6.6</td>
<td>6.9</td>
<td>6.6</td>
<td>F(4,736)=1.1; p=0.341</td>
</tr>
<tr>
<td><strong>Mean treated for milk fever (%)</strong></td>
<td>6.6(^a)</td>
<td>5.4(^{a,b})</td>
<td>4.7(^{a,b})</td>
<td>3.6(^b)</td>
<td>4.0(^b)</td>
<td>F(4,751)=6.6; p&lt;0.001</td>
</tr>
<tr>
<td><strong>Mean treated for gastrointestinal problems (%)</strong></td>
<td>2.8(^a)</td>
<td>2.0(^b)</td>
<td>1.4(^{b,c})</td>
<td>1.3(^{b,c})</td>
<td>1.2(^c)</td>
<td>F(4,518)=12.2; p&lt;0.001</td>
</tr>
<tr>
<td><strong>Mean treated as down cows (%)</strong></td>
<td>2.8(^a)</td>
<td>2.2(^{a,b})</td>
<td>1.9(^{a,b})</td>
<td>1.5(^b)</td>
<td>2.3(^{a,b})</td>
<td>F(4,692)=5.0; p=0.01</td>
</tr>
</tbody>
</table>
### Education and training

Larger farms more likely to have higher levels of training

<table>
<thead>
<tr>
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<th>301-500</th>
<th>501-700</th>
<th>701+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry training (%)</td>
<td>39&lt;sup&gt;a&lt;/sup&gt;</td>
<td>57&lt;sup&gt;b&lt;/sup&gt;</td>
<td>69&lt;sup&gt;b, c&lt;/sup&gt;</td>
<td>90&lt;sup&gt;d&lt;/sup&gt;</td>
<td>84&lt;sup&gt;c, d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Formal qualification (%)</td>
<td>21&lt;sup&gt;a&lt;/sup&gt;</td>
<td>39&lt;sup&gt;b&lt;/sup&gt;</td>
<td>55&lt;sup&gt;c&lt;/sup&gt;</td>
<td>71&lt;sup&gt;c&lt;/sup&gt;</td>
<td>63&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Any training/qualification (%)</td>
<td>44&lt;sup&gt;a&lt;/sup&gt;</td>
<td>67&lt;sup&gt;b&lt;/sup&gt;</td>
<td>78&lt;sup&gt;b&lt;/sup&gt;</td>
<td>97&lt;sup&gt;c&lt;/sup&gt;</td>
<td>86&lt;sup&gt;b, c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Treatment or prevention of disease

Herd health visits

Herd Size

<table>
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<th>501-700</th>
<th>701+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine herd health visits (%)</td>
<td>17\textsuperscript{a}</td>
<td>33\textsuperscript{b}</td>
<td>39\textsuperscript{b}</td>
<td>46\textsuperscript{b}</td>
<td>41\textsuperscript{b}</td>
</tr>
<tr>
<td>Sick herd milked separately (%)</td>
<td>19\textsuperscript{a}</td>
<td>27\textsuperscript{a}</td>
<td>51\textsuperscript{b}</td>
<td>69\textsuperscript{b,c}</td>
<td>82\textsuperscript{c}</td>
</tr>
<tr>
<td>Have biosecurity plan (%)</td>
<td>10</td>
<td>13</td>
<td>17</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Written protocols for mastitis (%)</td>
<td>67</td>
<td>71</td>
<td>75</td>
<td>74</td>
<td>86</td>
</tr>
<tr>
<td>Written protocols for disease (%)</td>
<td>47</td>
<td>44</td>
<td>45</td>
<td>52</td>
<td>45</td>
</tr>
<tr>
<td>Special transition diet before calving (%)</td>
<td>41\textsuperscript{a}</td>
<td>65\textsuperscript{b}</td>
<td>77\textsuperscript{b,c}</td>
<td>76\textsuperscript{b,c}</td>
<td>86\textsuperscript{c}</td>
</tr>
<tr>
<td>Main herd milked in separate groups (%)</td>
<td>2\textsuperscript{b}</td>
<td>6\textsuperscript{b}</td>
<td>15\textsuperscript{a}</td>
<td>26\textsuperscript{c}</td>
<td>45\textsuperscript{c}</td>
</tr>
</tbody>
</table>
Herd monitoring

Monitoring activities more likely in larger herds

No difference in perceived time to identify and treat sick cows

<table>
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<th>501-700</th>
<th>701+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic ID in dairy (%)</td>
<td>5(^a)</td>
<td>17(^b)</td>
<td>41(^c)</td>
<td>64(^d)</td>
<td>92(^e)</td>
</tr>
<tr>
<td>Measure daily cell counts or milk conductivity (%)</td>
<td>5(^a)</td>
<td>5.8(^a)</td>
<td>12(^{a,b})</td>
<td>17(^b)</td>
<td>22(^b)</td>
</tr>
<tr>
<td>Computerised herd records (%)</td>
<td>22(^a)</td>
<td>53(^b)</td>
<td>72(^c)</td>
<td>82(^c)</td>
<td>90(^c)</td>
</tr>
<tr>
<td>Agree sick cows identified and treated quickly (%)</td>
<td>92</td>
<td>96</td>
<td>92</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>Pedometers/activity meters (%)</td>
<td>1(^a)</td>
<td>4(^{a,b})</td>
<td>4(^{a,b})</td>
<td>11(^b)</td>
<td>8(^b)</td>
</tr>
</tbody>
</table>
Time off pasture

Milking takes longer
Further to walk
Longer out of paddock
Similar “shortest time”, increasing “longest time”

<table>
<thead>
<tr>
<th>Herd Size</th>
<th>&lt; 150</th>
<th>150-300</th>
<th>301-500</th>
<th>501-700</th>
<th>701+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean time for typical milking (min)</td>
<td>83&lt;sup&gt;a&lt;/sup&gt;</td>
<td>108&lt;sup&gt;b&lt;/sup&gt;</td>
<td>126&lt;sup&gt;c&lt;/sup&gt;</td>
<td>158&lt;sup&gt;c&lt;/sup&gt;</td>
<td>186&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mean shortest time out of paddock (min)</td>
<td>57</td>
<td>69</td>
<td>71</td>
<td>75</td>
<td>57</td>
</tr>
<tr>
<td>Mean longest time out of paddock (min)</td>
<td>137&lt;sup&gt;a&lt;/sup&gt;</td>
<td>179&lt;sup&gt;b&lt;/sup&gt;</td>
<td>207&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>231&lt;sup&gt;c&lt;/sup&gt;</td>
<td>236&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Walking distance to furthest paddock (km)</td>
<td>1.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.9&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>2.0&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>2.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Conclusions

35% of cows milked are in large herds

Increasing herd size associated with known or proposed risk factors:
  ◦ decreased labour; increased stocking density, grain fed, milking time

No evidence for a commensurate increase in reported disease or contentment

May be partially explained by greater capacity for mitigating strategies:
  ◦ Staff training, herd health visits, milking separate herds, electronic ID and monitoring, written protocols, transition diets

Further work needed on effects of time away from paddock

Messages for industry about biosecurity plans and captive bolts
But ...

Some questions remain

• Unsure whether long milking times affect cows equally
• Farmer reported levels of disease (esp lameness) are questionable
• Difficult to assess the Human-Animal Relationship in a survey
Research aims:

**Survey**
Undertake a farm practice survey to investigate trends in dairy herd and farm size, associated management practices and problems encountered;

**Analysis**
Conduct a milking order study to investigate the hypothesis that milking order in large herds is less consistent than in smaller herds, but that cows can nevertheless be divided into groups based on where they commonly sit in the milking order;

**On Farm**
Undertake on-farm studies to determine relationships between farm characteristics and practices associated with scale of production and animal welfare measures.
Milking order of dairy cows in large herds
Milking order

Cows typically leave the paddock as a group, but return over a long period

If the same ones return last, they may be at a disadvantage

95% of farmers agreed that cows generally enter the shed in a similar same order in the survey

Not much research in large herds – especially in consistency of order
Milking order

Do cows in large herds enter the shed in the same order?

1975 – Gadbury – 100 cow herds – 15-20% enter at ~ the same position
  ◦ 3 herds, 8-13 observations made over 6-9 months

1975 – Soffie – 30-50 cow dutch herds – order consistent and related to dominance

1982 – Rathore – Milking order negatively related to production (5-6 observations)

2004 – Sauter-Louis – 10 NZ dairy herds – milking order Kappa of 0.31, lameness risk increased for cows at last quarter, milking order more stable in late lactation (5 observations at 3 times of year)

2012 – Berry – Milking order on herd test day in 1143 herds over 8 years – Milking order repeatability 0.63 within a day, correlated with genetics, parity, weakly with production
Milking order

With increased use of electronic ID, milking order data is more available
## Dataset

<table>
<thead>
<tr>
<th></th>
<th>Days</th>
<th>Milkings</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>98156</td>
<td>196312</td>
</tr>
<tr>
<td>AD</td>
<td>89308</td>
<td>178616</td>
</tr>
<tr>
<td>SN</td>
<td>119098</td>
<td>238196</td>
</tr>
<tr>
<td>TF</td>
<td>78650</td>
<td>157300</td>
</tr>
<tr>
<td>BW</td>
<td>98675</td>
<td>197350</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>483887</strong></td>
<td><strong>967774</strong></td>
</tr>
</tbody>
</table>
Milking Data

1. Capture to database

2. Calculate number milked at each milking
   - Farmer milks second herd sometimes
   - A gap of > 20 in the RunPos#

3. Calculate the rank and rank% for each cow
How to compare?

Does position in am relate to position in pm?

Does variation in position relate to position?

Does position in one month relate to the next month?
RANK POSITION OF COWS AT MORNING VS EVENING MILKING ON THE SAME DAY
72% within 20%; 85% within 30%
First and last quintiles are tighter

Percentile difference between cow rank order at am and pm milking on the same day by farm

- Rank Group
  - 1-2
  - 3-4
  - 5-6
  - 7-8
  - 9-10

No of cows vs percentile difference

0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, 90-100
How to compare?

Does position in am relate to position in pm?

Does variation in position relate to position?

Does position in one month relate to the next month?
Variance vs mean position in the milking order
Variance greater in the middle
How to compare?

Does position in am relate to position in pm?
Does variation in position relate to position?

Does position in one month relate to the next month?

<table>
<thead>
<tr>
<th>Farm</th>
<th>Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO</td>
<td>768</td>
</tr>
<tr>
<td>MW</td>
<td>676</td>
</tr>
<tr>
<td>PW</td>
<td>667</td>
</tr>
<tr>
<td>SF</td>
<td>663</td>
</tr>
<tr>
<td>SN</td>
<td>809</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>3583</strong></td>
</tr>
</tbody>
</table>
Variation from one month to the next
Conclusions

Rank in am is related to rank in pm \( (r=0.72) \)

Not perfectly

Cows like to be at about the same spot

No obvious difference in farm

1\textsuperscript{st} and last quintiles better at it

Rank in one month strongly related to rank in next month

Could reliably identify early and late cows for analysis

It is possible that some cows spend less time at the paddock and get there after much of the grass has been harvested
Research aims:

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**On Farm**

Undertake on-farm studies to determine relationships between farm characteristics and practices associated with scale of production and animal welfare measures.

- On-Farm Welfare Assessment Study
- On-Farm Lying Time vs Milking Duration Study
Part 1  On-farm study examining relationships between farm characteristics and animal welfare indices.

Quantitative assessment of welfare has been well described in housed dairy cows - “Welfare Quality®”

The Welfare Quality® system is not ideal for Australian conditions

**Good Feeding**
- 1. Absence of prolonged hunger
- 2. Absence of prolonged thirst

**Good housing**
- 3. Comfort around resting
- 4. Thermal comfort
- 4. Ease of movement

**Good Health**
- 6. Absence of injuries
- 7. Absence of disease
- 8. Absence of pain (husbandry procedures)

**Appropriate Behaviour**
- 9. Expression of social behaviour
- 10. Expression of other behaviours
- 11. Good human-animal relationship
- 12. Positive emotions
Aim

To conduct welfare assessments using a method based on Welfare Quality®, but modified to suit Australian conditions, in order to investigate the effect of management practices and herd size of the welfare of dairy cows.
Method

50 Farms

Farm Visit

- Questionnaire
- Score 50 cows for body condition / lesions / mud
- Avoidance testing 50 cows
- Score 100 cow pats for acidosis testing
- Lameness score entire herd

<table>
<thead>
<tr>
<th>Farm Size</th>
<th>No of farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300 Small</td>
<td>16</td>
</tr>
<tr>
<td>300-499 Medium</td>
<td>13</td>
</tr>
<tr>
<td>500-749 Large</td>
<td>11</td>
</tr>
<tr>
<td>750+ Very large</td>
<td>10</td>
</tr>
</tbody>
</table>
Scoring Cows for BCS/Lesions etc

<table>
<thead>
<tr>
<th>Flight Distance</th>
<th>Hairless Areas</th>
<th>Lesions</th>
<th>Condition Score</th>
<th>Lower Legs</th>
<th>Hind Quarters</th>
<th>Udder</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>0</td>
<td>0</td>
<td>55</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>
Acidosis Risk

Score 1: Faeces extremely liquid, bubbling and containing grain.

Score 2: Runny – stools do not form up – little evidence of fibre.

Score 3: Porridge-like consistency, forms ‘chocolate cake’ stools. Well-digested fibre is evident.

Score 4: Excessive fibre evident throughout stool, forms piles more than 50 mm high.
Prolonged Thirst

All cows had access to water for a minimum of 12 hours in a 24-hour period

All the larger farms (>400 cows) had water points on the farm tracks or at the dairy

<table>
<thead>
<tr>
<th>Farm Size</th>
<th>Water &gt; 12 Hours per day</th>
<th>Paddock</th>
<th>Track</th>
<th>Dairy</th>
<th>Track or Dairy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300 Small</td>
<td>100%</td>
<td>100%</td>
<td>38%</td>
<td>13%</td>
<td>50%</td>
</tr>
<tr>
<td>300-499 Medium</td>
<td>100%</td>
<td>100%</td>
<td>46%</td>
<td>54%</td>
<td>69%</td>
</tr>
<tr>
<td>500-749 Large</td>
<td>100%</td>
<td>100%</td>
<td>64%</td>
<td>82%</td>
<td>91%</td>
</tr>
<tr>
<td>750+ Very large</td>
<td>100%</td>
<td>100%</td>
<td>70%</td>
<td>70%</td>
<td>90%</td>
</tr>
</tbody>
</table>
Thermal Comfort

Shade more common on smaller farms

All farms did something on very hot days

<table>
<thead>
<tr>
<th>Size</th>
<th>Shade in all paddocks</th>
<th>Sprinkler at Dairy</th>
<th>Change milking time</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300 Small</td>
<td>94%</td>
<td>63%</td>
<td>75%</td>
</tr>
<tr>
<td>300-499 Medium</td>
<td>92%</td>
<td>46%</td>
<td>38%</td>
</tr>
<tr>
<td>500-749 Large</td>
<td>73%</td>
<td>100%</td>
<td>45%</td>
</tr>
<tr>
<td>750+ Very large</td>
<td>60%</td>
<td>80%</td>
<td>30%</td>
</tr>
</tbody>
</table>
Euthanasia

Bigger farms more likely to have captive bolts
More improvement needed
Small farms more likely to have delayed euthanasia

<table>
<thead>
<tr>
<th></th>
<th>Firearm</th>
<th>Captive Bolt</th>
<th>Knackery</th>
<th>Knackery / off farm only</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300 Small</td>
<td>38%</td>
<td>13%</td>
<td>75%</td>
<td>44%</td>
</tr>
<tr>
<td>300-499 Medium</td>
<td>69%</td>
<td>0%</td>
<td>62%</td>
<td>31%</td>
</tr>
<tr>
<td>500-749 Large</td>
<td>82%</td>
<td>18%</td>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>750+ Very large</td>
<td>60%</td>
<td>40%</td>
<td>50%</td>
<td>20%</td>
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</tbody>
</table>
Human Animal Relationship

Avoidance Testing

50 cows in each herd

No relationship to herd size

Big variation
## Avoidance Distances

<table>
<thead>
<tr>
<th></th>
<th>Median AD (m)</th>
<th>% cows where AD=0m</th>
<th>% cows where AD &lt;=1.0m</th>
<th>% cows where AD &lt;= 1.7m</th>
<th>% cows where AD &gt; 2.2m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.4-4.2</td>
<td>0-30</td>
<td>0-80</td>
<td>0-96</td>
<td>0-100</td>
</tr>
<tr>
<td>Median</td>
<td>1.7</td>
<td>2</td>
<td>19</td>
<td>55</td>
<td>20</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>1.2-1.9</td>
<td>0-6</td>
<td>10-38</td>
<td>35-77</td>
<td>8-32</td>
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</table>

Figure 2. Frequency of Avoidance Distance measurements over fifty farms in 0.5m increments
Lameness

I lameness scored 19154 cows as they left the dairy

0 – Walks normally
1 - Walks unevenly
2 - Lame
3 - Very lame
Lameness

Conclusions:

Farmers detected all very lame cows

Farmers detected only 24% of cows identified by lameness scoring
  ◦ Big variation (prevalence 0-11%, farmer identified 0-100%, IQR 4-31%)
  ◦ This is similar to other studies (27% Fabian NZ, 22% Whay UK)

It is necessary to score the whole herd to find most lame cows
  ◦ Only 62% of lame cows in the last 33% of cows to be milked

Lameness scoring the last 100 cows can give a reliable estimate of lameness prevalence
Figure 1. The relationship between the proportion of the herd lame overall and the proportion of lame cows in the last 100 cows milked

\( R^2 = 0.834 \)
Figure 2. The relationship between the proportion of the herd lame overall and the proportion of lame cows in the last 200 cows milked

(R² = 0.949)
Implications of prolonged milking time on time available for grazing and lying behaviour in pasture-based dairy herds
Icetags

Ten herds milking more than 500 cows

Icetags applied to 15 cows at the beginning and 15 at the end of milking

Left on for 7 days

Milking Data downloaded from dairy computer

Matched with Ictetag records
Cows lay for a mean of 9.6 hours, but there was wide distribution
Cows walked an average of 5919 steps per day
No obvious relationship between extra delay in dairy and time spent lying down
Maybe some relationship with distance walked
Linear regression, adjusting for site, age, steps and delay in dairy. All significant

For every step, lying time reduced by 0.001 hr (1000 steps = 6 minutes)

For every Minute delay, lying time reduced by 0.003 hrs (60 minutes delay = 11 mins less lying)

Not very dramatic!
Conclusions

Within the normal spread of milking times, lying time was not particularly affected by being milked later in the milking order.

Presumably grazing time was affected.

Need to discuss welfare implications of this.

Perhaps need to investigate production implications?
Survey

We showed that:

35% of cows milked are in large herds

Increasing herd size associated with decreased labour; increased stocking density, grain fed and milking time

There was no evidence for a commensurate increase in reported disease

This may be partially explained by greater capacity for mitigating strategies such as staff training, herd health visits, milking separate herds, electronic ID and monitoring, written protocols, transition diets

Further work needed on effects of time away from paddock

There are messages for industry about biosecurity plans and captive bolts in farms of all sizes
A Milking Order Consistency Study

We showed that:

Even in large herds, the milking order has a degree of consistency and there are groups of cows that are consistently milked at the beginning and the end of the milking order.
Animal Welfare on farm study

We showed that:

Animal welfare on the farms measured was generally very good

Areas of concern for larger farms include:
- the provision of shade on hot days
- management of lame cows
- design of rotary dairy stalls
Lameness Study

We showed that:

Farmers had only identified 25% of lame cows

Much variation

Lameness scoring whole herd is necessary to find lame cows

2/3 of lame cows in the last 1/3 of the milking order

Lameness scoring last 100 cows will not underestimate prevalence
Icetag Study

We showed that:

- Cows rest 9.5 hours per day
- Even when milking takes 6 hours
- Presumably they graze less
- Implications of this on animal welfare and production are not clear
Acknowledgments

My family

My committee:
  ◦ Supervisors: Andrew Fisher, Ellen Jongman, Paul Hemsworth
  ◦ Chair: Peter Mansell

Funding Sources:
  ◦ Dairy Australia
  ◦ DEPI

The farmers and vets at the Warrnambool Vet Clinic for their cooperation.