B+LNZ  Genetics + ICAR
Agenda

• B+LNZ Genetics Background
• New Zealand Livestock Farming
• B+LNZ Genetics & Beef
• B+LNZ Genetics & Sheep
• Why B+LNZ Genetics + ICAR?
Partnership >

Government + Sheep & Beef Farmers
B+LNZ Genetics

PURPOSE
Provide the Information Infrastructure for Breeders, Farmers and Industry to make profitable breeding choices
NZ Sheep, Beef & Dairy Numbers

% Change 1990-91 to 2015-16e

Dairy +89%
Beef -22%
Sheep -51%

Source: Beef + Lamb New Zealand Economic Service
Statistics New Zealand

beef+lamb GENETICS
NZ Production Changes

1990-91 to 2012-13e

MORE DAIRY: +175%
MORE BEEF AND VEAL: +19%
LESS LAMB: -7%

But -51% fewer Sheep
B+LNZ Genetics: Beef
Challenges & Opportunities

- Sheep & Beef Farming System
  - Beef provide more value than a lawn mower?
  - Describe & Select Genotypes specifically for NZ?
Challenges & Opportunities

• NZ Dairy Farming No 1 source of NZ Beef
  – Describe specific Genotypes for Dairy-Beef versus traditional Beef System?
NZ Beef Genetic Evaluations > Australia

ICAR
THE GLOBAL STANDARD FOR LIVESTOCK DATA
B+LNZ Genetics: Sheep
<table>
<thead>
<tr>
<th></th>
<th>Within-Flock</th>
<th>Across-Flock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique animals</td>
<td>14 million</td>
<td>8.3 million</td>
</tr>
<tr>
<td>All flocks</td>
<td>1,135</td>
<td></td>
</tr>
<tr>
<td>Current active flocks‡</td>
<td>564</td>
<td></td>
</tr>
<tr>
<td>2015 born (NAI*)</td>
<td>330,649</td>
<td></td>
</tr>
<tr>
<td>eBV’s stored</td>
<td>22 billion</td>
<td>416 million</td>
</tr>
</tbody>
</table>

*NAI = new animal indicators
‡Flocks selling rams
- Base Year 1995

Figures from Aug 2016
### 2016: Genetic Engine Upgrade (SIL)

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Flocks</th>
<th>Animals</th>
<th>ASREMEl</th>
<th>MIX99</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perendale</td>
<td>57</td>
<td>653,826</td>
<td>33 hours</td>
<td>1½ hours</td>
</tr>
<tr>
<td>Texel</td>
<td>79</td>
<td>491,988</td>
<td>15 hours</td>
<td>0.5 hours</td>
</tr>
<tr>
<td>Coopworth</td>
<td>101</td>
<td>1,612,649</td>
<td>48 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Multi-Breed Across flock</td>
<td>456</td>
<td>5,348,205</td>
<td>&gt;1 week</td>
<td>26 hours</td>
</tr>
<tr>
<td>NZGE (Weekly)</td>
<td>1,135</td>
<td>14,387,346</td>
<td>Not Possible</td>
<td>31.5 hours</td>
</tr>
</tbody>
</table>

- **ASREMEl** indicates the time required for analysis using ASREMEl software.
- **MIX99** indicates the time required for analysis using MIX99 software.

**Notes:**
- Multi-Breed Across flock: >1 week, multiple computers, simplified models.
- NZGE (Weekly): Not Possible.
GE System Upgrade: Pre – 2016

- Collect data manually
- Transcribe to forms
- Bureau Data Entry
- Validation and Storage
- JADE Core Database
- Genetic Engine
- Email out PDFs
- Printed reports to breeders
GE System Upgrade: 2016-2017

- Web site/App
  - Validation
  - Review
  - Reporting

Integration APIs**

- Breeders / Farmers
- In-field data capture
- Decision support tools
- Integration with other farm systems & industry via API’s

Ped & Perf SQL DB

BV’s SQL Database

Genotype SQL Database

2017 New SSBLUP Genetic Engine (BLUPF90 Cloud)

**Application programming interface (API)
Genetic Evaluation Data Flow

CURRENT FLOW OF INFORMATION

- BREEDER
- FARMER
- PROCESSOR
- CONSUMER

GENETIC EVALUATION SYSTEM

OPPORTUNITY & CHALLENGE:
INDUSTRY CONNECTION
Sheep Genotyping & Genomics

- SNP Parentage
  - Current 80,000 animals / year & growing
  - € 13.00 Euro

- Genomics
  - 36,170 in training: (50k & HD) & 10,000 p.a. genotyped LD
  - € 40.00 Euro

- Challenge & Opportunities
  - Parentage: < € 5.00 Euro
  - Genomics: < € 15.00 Euro
  - Transition from totally Parentage > Genomics
# Sheep Genomic Predictions

<table>
<thead>
<tr>
<th>Trait</th>
<th>Romney 2016</th>
<th>Coopworth</th>
<th>Perendale</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Lambs Born</td>
<td>NLB 64%</td>
<td>54%</td>
<td>43%</td>
<td>47%</td>
</tr>
<tr>
<td>Lamb Weaning Weight</td>
<td>WWT 63%</td>
<td>67%</td>
<td>60%</td>
<td>45%</td>
</tr>
<tr>
<td>Weaning Weight Maternal</td>
<td>WWTM 47%</td>
<td>46%</td>
<td>41%</td>
<td>40%</td>
</tr>
<tr>
<td>Live Weight 8 months</td>
<td>LW8 61%</td>
<td>61%</td>
<td>53%</td>
<td>45%</td>
</tr>
<tr>
<td>Live Weight 12 months</td>
<td>LW12 58%</td>
<td>53%</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td>Carcase Weight</td>
<td>CW 58%</td>
<td>60%</td>
<td>46%</td>
<td>43%</td>
</tr>
<tr>
<td>Ewe Live Weight</td>
<td>EWT 51%</td>
<td>55%</td>
<td>42%</td>
<td>45%</td>
</tr>
<tr>
<td>Eye Muscle Area</td>
<td>EMAc 57%</td>
<td>59%</td>
<td>49%</td>
<td>39%</td>
</tr>
<tr>
<td><strong>Meat Yield</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat Yield</td>
<td>FATY 47%</td>
<td>67%</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Hind Qtr Yield</td>
<td>HQLY 45%</td>
<td>62%</td>
<td>42%</td>
<td>50%</td>
</tr>
<tr>
<td>Loin Lean Yield</td>
<td>LNL 44%</td>
<td>62%</td>
<td>42%</td>
<td>49%</td>
</tr>
<tr>
<td>Shoulder Lean Yield</td>
<td>SHLY 50%</td>
<td>62%</td>
<td>41%</td>
<td>47%</td>
</tr>
<tr>
<td>Lean Yield</td>
<td>LEANY 47%</td>
<td>62%</td>
<td>42%</td>
<td>49%</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facial Eczema</td>
<td>GGT21 63%</td>
<td></td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>Lamb Dag Score</td>
<td>LDA 48%</td>
<td>62%</td>
<td></td>
<td>59%</td>
</tr>
<tr>
<td>Adult Dag Score</td>
<td>ADA 52%</td>
<td>58%</td>
<td></td>
<td>53%</td>
</tr>
<tr>
<td>Feecal Egg Count</td>
<td>FEC1 61%</td>
<td>68%</td>
<td>53%</td>
<td>61%</td>
</tr>
<tr>
<td>Feecal Egg Count</td>
<td>FEC2 52%</td>
<td>50%</td>
<td>41%</td>
<td>44%</td>
</tr>
<tr>
<td>Adult Ewe Faecal Egg Count</td>
<td>AFEC 46%</td>
<td>45%</td>
<td>34%</td>
<td>39%</td>
</tr>
<tr>
<td><strong>Wool</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleece Weight 12m</td>
<td>FW12 51%</td>
<td>69%</td>
<td>50%</td>
<td>54%</td>
</tr>
<tr>
<td>Lamb Fleece Weight</td>
<td>LFW 34%</td>
<td>31%</td>
<td>28%</td>
<td>31%</td>
</tr>
<tr>
<td>Ewe Fleece Weight</td>
<td>EFW 42%</td>
<td>26%</td>
<td>25%</td>
<td>27%</td>
</tr>
</tbody>
</table>
BLG Sheep Genomic Pipeline

1. HD Genotype key Sires with good phenotypes
2. Impute to Sequence
3. GWAS: Causative Mutations & QTL
4. Add SNPs to Panel to improve accuracy for Genomic Selection

Challenge: ROI on GWAS vs. Phenotypes & Genotypes
Main Areas Sheep Research

Feed Efficacy (RFI)

BCS

Meat Yield & Shape

Maternal Ewe

Meat /Eating Quality
Challenge > Knowledge Transfer (KT)

1. KT of R&D outcomes onto Farms
2. Assist Seed Stock producers to increase Genetic Merit of flock/herd
B+LNZ Genetics + ICAR > Sheep
Why BLG + ICAR?

• Identifying /implementing key traits of economic value across countries

• Dialog on standardisation / guidelines /codes of practice for the recording of these traits

• The standardisation between countries of nomenclature (IDs, names, units and abbreviations)
Why BLG + ICAR?

• Sharing/access to hard/expensive to record phenotypes (e.g. RFI)

• Opportunities stimulate across country evaluations/progeny tests and exchange of germplasm

• Exchange and use of data including genomic data for gene discovery and evaluations
CERTIFICATE OF QUALITY

Beef+Lamb New Zealand Genetics

for Identification and production recording in dairy cattle; Laboratory analysis (milk samples); Data processing

Rome, 10 October 2016
Certificate number: 2016/10
Valid up-to: April 2018

Hans Wilmink
President
The End