Precision breeding opportunities in an evolving breeding objective landscape

Peter Amer, PhD
Look back over old ground
Where we are now
Forks in the road ahead
What is behind us?
What genetic progress has been made?

<table>
<thead>
<tr>
<th></th>
<th>WWT epd</th>
<th>YWT epd</th>
<th>Cow WT epd</th>
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</thead>
<tbody>
<tr>
<td>last 10 years</td>
<td>2.0</td>
<td>3.6</td>
<td>3.3</td>
</tr>
<tr>
<td>last 50 years</td>
<td>1.7</td>
<td>3.0</td>
<td>3.2</td>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Lbs/yr</th>
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<tbody>
<tr>
<td>2002</td>
<td>0.0</td>
</tr>
<tr>
<td>2004</td>
<td>2.0</td>
</tr>
<tr>
<td>2006</td>
<td>4.0</td>
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<td>2008</td>
<td>6.0</td>
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<td>2010</td>
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<td>2012</td>
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<tr>
<td>2014</td>
<td>12.0</td>
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<tr>
<td>2016</td>
<td>14.0</td>
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<tr>
<td>2018</td>
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<tr>
<td>2020</td>
<td>18.0</td>
</tr>
<tr>
<td>2022</td>
<td>20.0</td>
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Key:
- Yearling weight
- Mature cow weight
- Weaning weight
- Birth weight
Key measurement technology!

Number of records in the database
The value of growth rate

• Beef packer $$
  • Labour
  • Transport
  • Infrastructure (throughput)

• Feedlot $$$$  
  • Efficiency (dilution of maintenance)
  • Infrastructure (days on feed)

• Cow-calf $
  • Weaner calf
Market signals are clear for weights!!

[Graph showing the price trends of different beef products from 1995 to 2016.]
Where are we at now?
Marbling

Stayability

Heifer Pregnancy

Feed Efficiency
Farmer typologies ...  
... favour different traits

Visual attributes
  Product quality
  Specific disease resistance

Yield maximizer  <->  Cost minimizer

Livestock is domestic animals whose life is...
What lies ahead?
Wearable technology
Wearables

Monitoring cow fertility using physical activity

Activity counts per hour

Time of day

Why 911 Dispatchers Hate Apple Watches

Dispatchers are being inundated with false, automated distress calls from Apple devices owned by skiers who are very much alive.
In Canada, producing 1kg of beef now creates 15% less greenhouse gases than in 1981, due to improved production practices.
Dairy Indexes

- Emissions (↓)
- Growing population (↑)
- Gross
- Intensity

Genetic Indexes

Sustainability Index
A breeding tool for a greener future
## Measuring methane.....?

<table>
<thead>
<tr>
<th>Caeli’s Criteria</th>
<th>GreenFeed</th>
<th>Sniffer</th>
<th>SF6</th>
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<tbody>
<tr>
<td>Accuracy</td>
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<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
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<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
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<tr>
<td>Cost</td>
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<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
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<tr>
<td><strong>Average score</strong></td>
<td>2</td>
<td>1.5</td>
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Progress to date on methane

**Positives**
- Works well in sheep
- Works well in dairy
- Lower (slightly!) cost options emerging
- Smaller faster rumen
- Change in the rumen microbiome
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**Negatives**
- Unknowns around mature cows at pasture
- Hard to measure feed intake
- Cost of recording
- Roughage intake important in beef cows in extensive systems

What are the market signals?
Breeding for low emissions farming systems?

**Extensive**
- Low supplementary feed = lower farm GHG
- Extended backgrounding/ grass finishing
- Lower national emissions
- Moderate sized, fertile, functional cow with easy to finish calf
- Lower cost of production

**Intensive**
- Dietary manipulation
- Productivity to dilute capital costs
- North American default system
- Ongoing reductions in emissions per lb of beef
- Don’t throw away the weigh scales!
In summary

Extensive beef systems
requiring moderate size
fertile functional cows

++ Fertility
++ Body condition score
+ Stayability
+ Fatness/finish
? Methane
? Feed intake

Intensive beef systems
feeding methane reducing
supplements

++ Feed intake
++ Methane