Selecting Mature Liveweights

This Infosheet covers:

- The methods for setting a mature liveweight target, and their strengths and weaknesses. The methods are:
  - Liveweight breeding values (Lwt BV)
  - Mature herd weights
  - National breed averages

Key points

- Weight-for-age targets are based on the mature liveweight.
- The Lwt BV method uses genetics to predict an animal's mature liveweight.
- The mature herd weight method uses the weight of a representative sample, or all, of the mature herd to set the mature liveweight.
- The national breed averages method involves grouping animals by breed and then using national breed average weights to set the mature liveweight.
- Farmer preference determines which method to use.

Mature liveweight definition

The mature liveweight is the expected weight of a typical animal in the herd, once it has finished growing. This varies between, and within, breeds. Mature liveweights are particularly variable in the New Zealand national herd due to the widespread use of crossbreeding.

Steps to setting liveweight targets

Industry heifer weight-for-age targets are expressed in relation to mature liveweight.

There are four steps to heifer liveweight target setting (this Infosheet will focus on step 1):

1. Select a mature liveweight for a group of heifers.
2. Set mob weight-for-age targets based on meeting a percentage of the mature liveweight.
3. Set individual weight-for-age minimums.
4. Create an expected, or targeted, seasonal growth rate plan so that heifers achieve their target liveweights.
Methods for selecting a mature liveweight

There are three industry-agreed methods for selecting a mature liveweight. Each method has its strengths and weaknesses; the method used will depend on the specific situation, personal preference and information available. As research has not been conducted to compare the methods it is unknown if any particular method results in a higher lifetime productivity than the others; however, they all have their merits.

The methods are:

1. Liveweight breeding values
2. Mature herd weights
3. National breed averages

Although each method will provide a liveweight to start the process, personal preference and data availability will influence the final selection of a mature liveweight. Before selecting a mature liveweight, consider what information is available to you and its accuracy.

Remember, larger animals have a higher milk production potential, but also cost more to grow and have higher maintenance costs. If you intend to increase your animals’ weights, then you will need to review your stocking rate and feed budget to accommodate the system change.

1. Liveweight breeding values (Lwt BV)

The Lwt BV method uses genetics to predict an animal’s mature liveweight.

While liveweight genetics are highly likely to be passed from a parent to their offspring (i.e. highly heritable), an animal’s liveweight will also be affected by the normal genetic variation which comes from the random inheritance of genes. The normal variation for individual Lwt BVs is within +/- 5 % of the predicted value, but can be up to +/- 10 % from the predicted value. This means the reliability of a Lwt BV at an individual level is relatively low. The reliability of the average Lwt BV is much better for groups of heifers, although the group can be quite small (20 animals is considered acceptable by the industry).

Environmental factors such as calf care, heifer growth, feed, the farm system, or other influences, will also affect a heifer’s mature liveweight.

FARMER VIEWPOINT

With a Crossbred herd and breed variation we use liveweight BVs to set targets.

Dairy farmer, 265 cows, Inglewood, Taranaki
Using Lwt BVs
The equation to estimate the target mature liveweight for a group of heifers is:

\[
\text{Mature liveweight (kg) = 500 kg } + \text{ group Lwt BV (unique to heifer mob)}
\]

Examples:
- If the group Lwt BV is + 20, then the mature target liveweight for the group will be 500 + 20 = 520 kg
- If the group Lwt BV is -15, then the mature target liveweight for the group will be 500 + -15 = 485 kg

This method will be most accurate for herds with well-recorded ancestry, accurate identification of dams and sires, and sires which have been proven in New Zealand.

There are currently two ways to access Lwt BVs or Lwt BV-based targets for a group of animals:

1. Request a Trait Evaluation Report from your herd improvement company.
2. Use the LIC MINDA™ weights program, through MINDA™Live, to access automatically-calculated group and individual Lwt BV-based targets.

Strengths
- Predicts liveweight based on genetics, which is robust at a mob level.
- Uses liveweight information from NZ sire proving schemes.
- Accounts for shifts in breeding programmes.

Weaknesses
- Lwt BVs are too variable to be used accurately for individuals. On average, at the individual level, the mature liveweight estimation has an error range of 70 kg i.e. 35 kg above or below the predicted value.
- Misidentification of dams and sires can influence Lwt BVs. A study on commercial dairy farms in New Zealand found that on average the dam of a calf was misidentified 23% of the time and that sire misidentification is also an issue.
- Lwt BVs are only a prediction of weight and farmers may find their herd’s mature weights differ from those predicted.
- Lwt BVs are calculated using the weights of heifers grown on commercial farms, consequently undergrown animals have contributed to the values so they have been influenced by environmental factors and thus are not a completely accurate representation of the genetic potential of animals.

2. Mature herd weights

Mature liveweights can be set by weighing a representative sample, or all, of the mature herd. A mature liveweight developed using this method will reflect farm management and past breeding policies.

Weighing sample selection guidelines:
- 20 - 50 cows (the more you weigh the more accurate),
- 6 - 8 years old (if there are not enough animals in this age group weigh animals from 4 years old),
- 100 - 200 days in milk,
- BCS 4.5 (add or subtract weight if above or below),
- after the morning milking as cows will have less rumen contents at this time.

Targets based on mature herd weights will be most accurate for herds with consistent breeding strategies and if the herd sample contains similar breeds to the heifers.

Strengths
- Representative of mature cows in the herd.
- Useful for other on-farm decision making, e.g. stocking rates, drench rates, mineral dosing.
- Creates a mature liveweight which takes into account the influence of a farm system’s management and environmental conditions.

Weaknesses
- Time and facilities required.
- Does not capture recent changes in breeding policies, e.g. increasing crossbreeding, and assumes genetic similarity between age groups.
- Will set low targets if mature stock were poorly grown.

3. National breed averages

This method involves grouping animals by breed and then using national breed average weights to set the mature liveweight (Table 1). It is used when herd records or herd weights are absent, or because of limitations in herd management software.

Table 1. Weighted average mature liveweight by breeds for cows of 6-8 years of age (2016).

<table>
<thead>
<tr>
<th>Breed</th>
<th>Mature liveweight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jersey</td>
<td>419</td>
</tr>
<tr>
<td>Crossbred</td>
<td>463</td>
</tr>
<tr>
<td>Friesian</td>
<td>505</td>
</tr>
</tbody>
</table>

More information
- To find out the weight of 1 BCS unit see DairyNZ Facts and Figures (https://www.dairynz.co.nz/publications/dairy-industry/facts-and-figures/).

Herd liveweights are reported annually in the New Zealand Dairy Statistics\(^4\) which can be used to estimate the mature liveweight for each breed. Animals over six years old are used as different breeds mature at different rates, with Jerseys reaching their mature weight by about five years old and Holstein-Friesians by about six years old (Figure 1).

**Figure 1.** The variation in liveweight by age of the different breeds of dairy cattle.\(^5\)

To use this method effectively, each animal should be placed into a breed category (Jersey, Crossbred, or Friesian) based on her coat colour and frame structure. Then groups of 20, or more, animals can be assigned a breed average target, or the mob can be assigned a target using a weighted average based on the percentage of the herd in each breed.

**Example**

Mob composition: 85% Crossbred, 15% Jersey  
Mature liveweight: Crossbred = 463 kg, Jersey = 419 kg  
Mob mature liveweight: \((0.85 \times 463) + (0.15 \times 419) = 456\) kg

**Strengths**

- Simple to carry out through observation or breed make-up (e.g. F10 J6 or F2 J14).
- Uses an animal’s phenotype so it could be more accurate for individual animals than using mature herd weights if animals are typed well.
- Provides a method for use when records are absent.

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\(^4\)New Zealand Dairy Statistics can be found on the Publications/Dairy Industry page of the DairyNZ website https://www.dairynz.co.nz/publications/dairy-industry/

\(^5\)New Zealand Dairy Statistics can be found on the Publications/Dairy Industry page of the DairyNZ website https://www.dairynz.co.nz/publications/dairy-industry/
Weaknesses

- Subjective, as it relies on observation i.e. coat colour and frame structure, rather than breeding records.
- Some groups of heifers will not be representative of their breed average.
- Weights within a breed are quite varied. Historically, farm systems in New Zealand were quite similar and the weights of different breeds were also similar across farms. However, in recent years changes in farm systems, shifts in genetics, and an increase of crossbreeding have led to greater variation. For example, the amount of variation in the 2016 Ranked Active Sires list is significant; the range above or below the breed average was +/- 50 kg for Holstein-Friesians, +/- 56 kg for H-F x J Crossbreds and +/- 26 kg for Jerseys.

Why are mature liveweights different from breed weights in DairyNZ publications?

The weights used in DairyNZ’s publications are derived from herd average weights, and these are calculated from all the cows in the herd i.e. every cow over the age of two. In contrast, the mature liveweight is drawn from cows that are 6 – 8 years old, when there is some certainty that they have finished growing. For example, 450 kg is consistently used for Crossbred cows in DairyNZ publications but the mature liveweight for Crossbreds in this Heifer Infosheet is 462 kg.

**FARMER EXAMPLE**

Alister and Lyn Candy own a 103 ha dairy farm in Northland and were the Northland Focus Farmers for a three year DairyNZ programme. Focus areas for farm improvement included improving heifer growth and runoff development.

The mature cows were weighed in December to set a mature liveweight to base targets on. The whole herd averaged 344 kg, well below the expected breeding value of the herd which was 446 kg. It was decided that targets would be based on a 400 kg mature liveweight, as it was felt that 446 kg was too big a jump in performance.

The Candys made improvements to the runoff’s soil fertility, subdivision, and stock water, increased the stocking rate, and used small amounts of supplement. The results were:

- Heifer weights lifted from 201 kg (17 % below target) at mating to 261 kg (9 % above target) in year one.
- Before the programme the first calvers’ calving pattern averaged 70 % in the first three weeks and 86 % by week six over two years.
- Heifer’s calving pattern lifted to 76 % in three weeks and 94 % over six weeks. Quicker calving led to increased milk production along with meeting the target liveweights.
- A variety of farm improvements along with heifer growth led to the herd’s milk production increasing from an average of 70,000 kg milksolids (MS) (679 kg MS/ha) to averaging 105,000 kg MS (1,019 kg MS/ha) with the same number of cows.

**Definition**

**Phenotype** - observable characteristics of an individual resulting from its mix of genes.