

# WEANING TO MILKING, GROWING GREAT HEIFERS

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## Key points

- Select a method for setting mature liveweight and then target 30% at 6 months, 60% at 15 months (mating) and 90% at 22 months (two months pre-calving). Focus more on achieving targets rather than how you get there.
- Mobs should achieve the average target as a group and individuals that are more than 5% behind should be assessed and if more than 10% behind then action should be taken. This action may include addressing animal health issues and low feeding levels.
- Compensatory growth exists but should not be relied on to get animals back on target if a group of animals fall behind target.
- Dairy heifers are one of the most difficult stock classes to manage because of their ever increasing feed requirements; good management will include monitoring, communication between graziers and stock owners and an agreed management plan to meet targets.

## Background

Although farmers have a keen interest in heifer management and the topic is covered nearly every year at SIDE. McNaughton and Lopdell (2012) reviewed heifer weights in the national database and found: 73% of heifers were more than 5% behind their liveweight for age targets at 22 months. These results indicate that despite interest in heifers the interest is not translating to well grown stock. The impact of recent changes to liveweight BVs announced by NZAEL have yet to be analysed but the percentage of heifers below target weight is to reduce from those report by Naughton and Lopdell (2012).

To develop a strategy for heifer management, DairyNZ led eight focus groups across the country in November and December 2013. Farmers and rural professionals participated in a process to discuss regional challenges for heifer performance as well as solutions for these issues. From the workshops there were frequently asked questions about heifers that neither farmers nor rural professionals had the answers for.

. This paper will respond to those commonly asked questions both with industry knowledge and how one Cantabrian farmer manages the issues in practice.

Tim Lissaman is a grazier, managing a dairy support block consisting of multiple properties, one of which he has an equity share with Caroline and Bob Goslin. Farm information and stock carried is outlined in Table 1.

**Table 1.** Mount Donald farm details—Pleasant Point, South-Canterbury

<b>Farm area</b>	1,055 hectares
<b>Effective area</b>	700 ha grazed, 17 0ha in cash crops and 185 ha in forestry and underdeveloped gorse gullies
<b>Rainfall</b>	740 mm (this year only 190 mm from 1 July to 31 March)
<b>Clients</b>	Five stock owners Working relationships for the last 4-7 years
<b>Stock numbers</b>	
Heifers	1,200 R1 heifers November/December –April 1,200 R2 heifers May to May
Dairy cows wintered	500-800
Mating bulls	100-500—depending on feed position
Beef	30-50 (depending on annual feed availability)
<b>Pasture Species</b>	471 ha ryegrass/white clover permanent pasture 40ha unimproved hill pasture
<b>Cropping</b>	65 ha fodder beet 25 ha maize for silage 25 ha rape 30 ha plantain/red clover 40 ha Lucerne
<b>Feed made on farm</b>	2,000 bales of silage cut annually (only 800 in the 2014/15 season)

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Notes:

## Frequently asked questions

### *What are the targets for heifers?*

Start with the end in mind and set a mature liveweight target. The mature weight represents the average liveweight of cows 4 years and older in the milking herd when at BCS 4-4.5 in the 4 month of lactation.

- There are three industry agreed methods for setting mature liveweight targets for heifers
  - Liveweight breeding values (Lwt BV)
  - Average weight of the mature herd
  - Typing animals and assigning a national breed average weight.

All mature liveweight setting methods have their strengths and weaknesses, outlined in Table 2, and farmers will find that one method suits them and their situation best.

**Table 2.** Industry agreed mature liveweight setting methods and their strengths and weaknesses

<b>Liveweight Breeding Value</b>	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Objective measure</li> <li>• Best prediction based on genetics</li> <li>• Actual data used from sire proving herds</li> <li>• Accounts for individualised farm breeding programmes</li> <li>• Greater accuracy for than breed table for crossbred herds</li> <li>• Majority of animals have a Lwt BV</li> </ul>	<ul style="list-style-type: none"> <li>• Only accessible through MINDA herd management software (MINDA weights or a trait report)</li> <li>• Using data for individual animals or groups of less than twenty animals</li> <li>• Typically 23% of animals are mis-identified to their mothers</li> <li>• Genes are randomly inherited so animals may not have “average” genes</li> <li>• Normal variation is -5% to +5% of the prediction</li> <li>• Liveweight is 35% heritable so management can mask genetics</li> <li>• Data will be less accurate for herds with a high proportion of overseas genetics</li> </ul>
<b>Average weight of mature herd</b>	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Representative of actual herd</li> <li>• Improves information for the herd (e.g. stocking rates, drench rates, mineral dosing)</li> <li>• Captures management and environmental conditions of the farm system</li> </ul>	<ul style="list-style-type: none"> <li>• Time required</li> <li>• Does not capture recent changes in breeding policies (e.g. increased crossbreeding)</li> <li>• Will set targets too low if mature stock were poorly grown</li> </ul>

<b>Typing and assigning breed average weight</b>	
Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Assigned easily through observation or breed make up (e.g. F10 J6 or F2 J14)</li> <li>• Can be more accurate than herd average if animals are typed well</li> <li>• Can be used in the absence of records</li> <li>• Effort to match phenotype with genotype</li> </ul>	<ul style="list-style-type: none"> <li>• Subjective</li> <li>• There is significant variations within a breed</li> <li>• Not every herd represents their breed's average</li> </ul>

Liveweight BVs are one of the most robust ways to set a target for a mob of animals, the BV account for the breed mix and genetic strains of a group.

Weighing the mature herd is the second option for setting mature liveweight targets. Although this option is often put in the “too hard basket”, the increase in walk over weighing (**WOW**) systems in dairy sheds offers the potential to capture the information without extra work. Entering weight data into the national database will contribute to stock BWs and improve the accuracy of Lwt BV predictions for your young stock. Currently WOW data cannot be entered in the national database however from 2016 this data is likely to be accepted. Using a standardised breed table is the third option and the most historical method, Bryant and McRobbie (1991) wrote that McMeekan first introduced the method in 1954. Farmers are familiar with the current breed table—it’s been in use for the last twenty five years. However, New Zealand Animal Evaluation Ltd. (NZAEL) has recently reviewed mature cow weights and found, on average; animals were heavier than published breed averages. An updated breed table is summarised in Table 2.

**Table 2.** Mature liveweight averages by breed (kg)

	<b>Historical</b>	<b>Updated</b>
<b>Jersey</b>	350 – 400	415
<b>Crossbred (J x Fr)</b>	450	465
<b>Friesian</b>	500	500

Notes:

Heifer targets are 30% of mature liveweight at 6 months, 60% mature liveweight at 15 months (mating) and 90% mature liveweight at 22 months

Heifer calves are normally re-located to grazing farms at either 3 months or 9 months of age. Industry agreed guidelines are that heifers should be 20% of mature weight at 3 months and 40% of mature weight at 9 months

Heifers reaching mating liveweight target should have achieved puberty, triggered at 42-50% of mature liveweight, and had multiple oestrus cycles prior to mating. Waiting until pasture growth increases in September to lift feeding levels will be too late.

**Table 3.** Effect of weight on conception rates on Holstein-Friesian heifers—Mature Lwt 600kg (Morton, 1997)

Weight (kg)	Per cent of mature liveweight	Conception to first service (%)
340	<55	55
340-355	57	59
356-370	60	70
>370	>61	72

90% of mature liveweight at 22 months sets animals up to be structurally well grown, milk well, sufficient condition to allow for body condition score (BCS) loss in early lactation and meeting BCS targets at mating. Studies in Northern Ireland and Ireland found exceeding targets to be expensive and reduced lifetime productivity of the animals. Exceeding targets may be of no benefit and a costly exercise (Carson et al., 2003; Archbold et al., 2012).

### ***What the Lissaman's use for targets***

- Mature liveweight is based on the average weight of 6-8 year old cows weighed in April
- Use kill sheets as a base but tend to underestimate weight as culled cows tend to be lighter than the herd average.

To set the mature liveweight and in the absence of actual weight data the herd is assessed and an educated estimate made to whether they are a typical crossbred Canterbury herd, bigger or smaller. Over time expectations have increased from both dairy farmers and for ourselves. Once the mature liveweight target has been set then; 30-60-90 are applied targets at 6, 15 and 22 months of age. We looked at using MINDA weights but targets appeared to be pretty inaccurate on an individual cow basis, although they may be more accurate on a herd basis.

***Does 90% of mature liveweight at 22 months include the weight of late pregnancy (foetus, uterus, foetal fluid, placenta and cow condition)?***

- Yes, targets were set by having first calf heifers at 80-85% of mature liveweight at their second mating; so, 90% allows for the extra weight of pregnancy.

These targets have been derived from research that concluded the optimum weight was 80-85% of mature liveweight at their second mating (Troccon, 1993) An adjustment has been made to pre-calving liveweight to account for the extra weight of pregnancy and cow condition, hence the target of 90% of mature at 22 months of age.

***How the Lissaman's approach 90% of mature liveweight***

- We try and keep it simple; we work on actual animal weights with full gutfill.

It gets a bit subjective when you start adjusting for unknowns like pregnancy or gut fill. If the mature cow weight is 475 kg then 90% is 427.5 kg, and in Canterbury that needs to be the weight at the start of June if calving starts in August—we then adjust the target weight back to 30<sup>th</sup> April for our contracts.

***Should targets be set for mobs or individuals?***

- Targets should be applied to the mob average. Individual targets have a number of pitfalls.

In 2004 the idea of using Lwt BVs as individual targets for heifers was introduced (Bryant et al.). The arrival of MINDA weights simplified the use of Lwt BVs on an individual level and has led to the increased use. With a large number of crossbred animals in New Zealand that have varying portions of each breed individual targets may seem more relevant.

Individual targets have never been compared with standardised breed weights to see if one is better than the other, this includes Lwt BVs. There are risks with using Lwt BVs on an individual basis because normal variation of -5% to +5% of the predicted genetic value and Bryant et al.'s (2004) logarithm has a 10% accuracy range. It is also possible that the genetic mix will be different than predicted and the variation will be even greater. Another complexity

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is mis-mothering; a New Zealand study found that an average of 23% of heifers were mis-mothered at birth, with the most extreme example with 70% of heifers mis-mothered (Bowley et al., 2012).

If using individual targets there should be confidence in the parentage and a tolerance range of 5-10% should be used. Example: if a heifer has a mature liveweight target of 500 kg she would be within an acceptable range if she was 135 kg to 165 kg at 6 months and 405 kg to 495 kg at 22 months.

### ***How the Lissaman's approach mob vs. individual targets***

- Contractually we work on mob averages, but are now focusing more on individual animals for management.
- We are always trying to lift the bottom 25% up toward the average.
- There is a bonus at the end of the grazing term (December to following May) that is allocated on an individual basis.

We have a final weight that is targeted for 1 May at the end of the contract, and target liveweights by fortnight from weaning until pre-calving. Achieving weights on key dates is left to the grazier and if stock are tracking behind then that is communicated to stock owners.

### ***What are the minimum weights for animals?***

- Minimums should be linked to heifers target weights for age.
- 10% behind target is a guide for the minimum for individual animals.

It is common for graziers to apply minimums for re-location after weaning (100 kg), however, enforcing this can be difficult as many South Island dairy aim to remove calves from the dairy platform by 1 December. Industry weight targets and guidelines are in Table 4 and animals should be no more than 10% below the target.

**Table 4.** Industry targets and guideline weights for stock re-location

Age	Percentage of mature liveweight	Minimum per cent of mature liveweight
3 months	20%	18%
6 months*	30%	27%
9 months	40%	36%
12 months	50%	45%
15 months (mating)*	60%	54%
22 months (pre-calving)*	90%	
*Industry agreed weight for age targets		

In regions of limited summer or winter feed, maximising liveweight gain when feed is available is the most sensible option (Armstrong, 1982). Lifting heifer weights above target going into risk periods gives the greatest chance of reaching the 30-60-90 percent of mature liveweight at key times.

#### ***How the Lissaman's apply minimums***

- Minimum individual heifer weights are meant to be 100 kg on arrival.
- Bonuses are set on a mob basis and paid when targets are exceed by more than 10kg.

Although there is a 100 kg minimum arrival weight; for some clients heifers have been accepted in mid-November weighing less but the expectation is that the stock reach 100 kg by 1<sup>st</sup> December. Typically 100 kg is not met at arrival for all animals and an agreement on these animals needs to be reached. Either extra feed is supplied at stock owner's expense (meal), or the below weight animals are removed from weight gain expectations. A number of clients send 1-2 tonne of meal with the stock to aid with transitioning farms regardless of weight. If animals are less than 100 kg then meal is required.

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### ***What is the ideal pattern of growth for heifers?***

- Achieving mating and pre-calving targets are most important, pattern of growth is less important.
- Some farmers think consistent growth is important to develop a heifer's frame size, they believe frame allows heifers to be more competitive with mature cows once in the herd.

Typical dairy heifer growth patterns of New Zealand match feed quantity and quality. Research studying growth in dairy heifers and the factors impacting milk production is complicated and includes : mammary development, onset of puberty, post-pubertal management, age at first calving, feed types, liveweight at first calving, frame size, animal genetics, compensatory growth, the statistical power of the study or duration of the trial work (Macdonald et al., 2005; Roche et al., 2014).

The only growth pattern study completed in New Zealand was a controlled feeding trial was completed by Macdonald and Penno at Ruakura, Hamilton in the mid-90s. Feeding levels targeted specific growth rates and compared the differences with milk production on an animal level. This study found that if the liveweight difference (plus or minus) compared between treatment groups was established pre-puberty there was no effect on first lactation milk production and milk production was significantly less in the third lactation. If the liveweight difference was established post-puberty milk production was significantly greater in the first lactation with no difference in subsequent lactations, (Macdonald et al., 2005). It should be noted that in this trial all heifers were treated with CIDRs to synchronise their mating and consequently any impact on the number of days in milk due to the delayed onset of puberty was not able to be measured.

In real life farmers would not notice the difference in production because they seldom look at this level of detail. In practice, graziers grow heifers as well as the quality and quantity of feed allows assuming animal health is not limiting, adding a specific pattern of growth will add expense that may or may not be worth it and require skill that is not common.

### ***The Lissaman's view on growth patterns***

- To manage risk, the ideal pattern of growth is always more than we are currently achieving—particularly before 12 months of age.
- Our farm is dryland so we cannot expect linear growth through the year.

We are always pushing for higher growth rates to create a buffer to cover growth shortfalls later in the year—there have been short periods when growth drops close to zero and we have to compensate at other times. Winters can be harsh on R1s and weight gains drop because of heat loss and green feed crop wastage due to prolonged wet periods on clay soils and snow can be a factor. Some years weight gains have dropped to near zero for a month or more;

stock owners can struggle with this reality – it helps to have a long term relationship and proven track record of delivering good results. Our weight gain model seems to work for our operation but it may not reflect what others are able to do.

### ***What are realistic growth rates for my local area?***

- This is a tricky question with an unsatisfying answer of: **it depends.**
- There are a number of farm specific interactions that drive realistic growth rates: location, land class, soil type, seasonality, feed quality and quantity and animal health.

Heifers require high quality feed and constantly need to be growing, on average they will need to grow at 0.55 – 0.82 kg Lwt/day to achieve target weights. McNaughton and Lopdell (2012) found that average growth rates were 0.54 kg Lwt/day, this is not enough to reach optimal weights for mating and pre-calving. The most economic growth rates for graziers will be those that match feed demand with feed supply on the grazing block—to do otherwise is an added expense.

### ***Growth rates the Lissaman's achieve***

- Individual months fluctuate considerably from one year to another but if growth rates are broken in to 3 month blocks, seasonal variation is low.
- Often a period of high growth rate can be followed by a tougher period or vice versa.
- Mature liveweight targets lifted in 2011 which required higher growth rates throughout the growing period.

Growth rates achieved over four years are summarised in Table 5. The significantly lower growth rates in the 2010 born line occurred in the second summer and autumn because the R2 heifers were only grazing dry land grass. The target mature liveweight for stock was lifted for the 2011 line and so farm policy changed the following summer/autumn to grow crops for R2's to try and meet the increased target weights. Low growth rates in the 2012 born line occurred during a wet spring in 2013 when 420 mm rain occurred during a six week period from mid-August onward. The 2014/15 growth rates declined in the 2013 born line because of the

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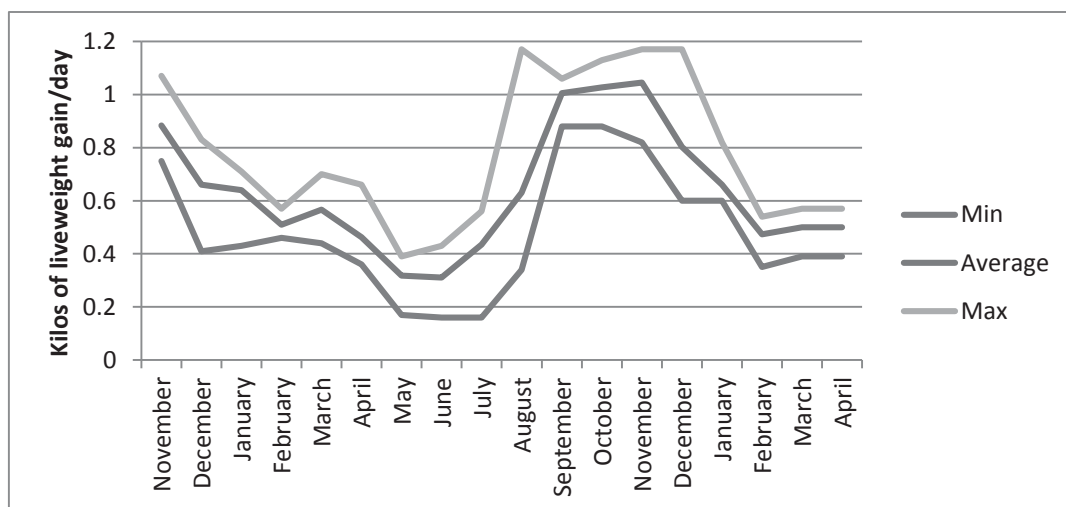
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severe drought over that summer and stock were sent off farm early, final autumn weighing was not completed for this line.

**Table 5.** Lissaman’s heifer weight gain kilos Lwt/day/animal per season

	Year of birth			
	2010	2011	2012	2013
First summer (Dec-Feb)	0.55	0.54	0.65	0.69
First autumn (Mar-May)	0.45	0.48	0.42	0.37
First winter (June-Aug)	0.49	0.43	0.50	0.46
Second spring (Sep-Nov)	1.02	1.08	0.86	1.10
Second summer (Dec-Feb)	0.57	0.71	0.73	0.62
Second autumn (Mar/April)	0.46	0.57	0.54	

The differences in growth rates from month to month is shown in Figure 1, where the centre line represents average weight gains for the animals but both maximums and minimum growth rates over four years, 2010-2014. While the average growth rates achieved each month is a similar pattern to the lowest growth rates—high growth rates are less predictable. When growth rates drop below 0.2 kg Lwt/day it is related to difficult environmental conditions.



**Figure 1.** Lissaman’s variation in weight gain by month over five years (2010-2014)

The very low May, June and July growth rates (<0.2kg/d) occurred due to climatic events:

- June 2013 was very wet, 250mm rain fell immediately followed by 40cm snow. At the late July weighing, potentially, animals were not weighed with full gut fill. An August growth rate of 1.17kg/day followed that weighing, which is unrealistically high for that time of year.
- Very wet late April 2014, 230mm rain fell, and continued through May with waterlogged clay soils leading to poor feed utilisation and lower intakes.

Feed transition impacts on the first autumn seasonal weight gains, lower gains are shown in Table 5. April has historically been a difficult period on dry land; with high demand and summer crops running out, a dry autumn significantly impacts feed quality. This year we grew maize on farm for silage to fill the autumn feed gap. We have also identified May growth rates as a time of year to improve; this month coincides with transitioning stock to winter crops.

### ***Does compensatory growth exist?***

- Yes there are numerous studies and farmer experiences that indicate that compensatory growth exists (Roche et al., 2014).
- National heifer data indicates that even if compensatory growth exists it is not enough to catch stock back up to targets (McNaughton and Lopdell, 2012).
- Beef + LambNZ work showed compensatory growth existed for young Friesian bulls but the lesser grown animals never caught up with their better fed counterparts (Boom, 2014).

When heifers fall behind target, farmers question whether or not they can catch back up using compensatory growth, or if targeting higher growth rates feed conversion efficiency will be missed—so can compensatory growth be counted on? In McNaughton and Lopdell’s study heifers fell significantly behind target between 9 months and 12 months of age and never recovered the gap (2012). This does not mean that compensatory growth could not close the gap, however, in practice it does not seem to. Differences in liveweight are likely to be due to a multiplicity of reason, not just low feeding levels, eg worms, toxins ie FE, and also the fact that

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calf misidentification and the genes the calf has got for growth. No two full sisters/brothers will grow exactly the same because of the genes they have

An on farm study, part of a Beef + Lamb programme in Northland, compared supplementing R1 Friesian bull calves with 0.8 kg DM of PKE/barley vs. pasture only over their first summer. In June the supplemented R1 bulls were 38 kg heavier than their counterparts, however, when re-weighed the following December they were only 30 kg heavier than the pasture only bulls. The lesser grown mob had some compensatory growth that narrowed the weight gap over time but was never enough to catch up the difference in the year of observation (Boom, 2014).

### ***Lissaman's observations of compensatory growth***

- Compensatory growth occurs if animals have restricted growth rates for a period of time.
- Following a tough winter, exceptional growth is possible in early spring.
- Relying on compensatory growth after winter can be dangerous, if pasture growth is slow in early spring getting to mating targets is difficult.

Compensatory growth definitely occurs after restricted growth rates; however, if stock achieve target weight gains then compensatory growth is small. We see outstanding growth rates after hard winters—particularly when heifers went in to winter with good frame size. Weather events are the main influence on monthly weight gains. Snow and cold wet conditions in the winter can increase maintenance requirements and reduce feed utilisation which drops intakes; poor feed quality in droughts can also have an impact.

### ***What does “good” look like with heifer management?***

- The farm system will have flexibility to provide quality feed at levels to achieve heifer targets at key times.
- Stock owners will pay a fair price or be willing to make sufficient investment of their time and resources to produce animals that achieve targets.
- Stock owners and stock managers will have shared expectations of outcomes, monitoring will be in place and good communication between parties will be timely.

In farming, as in life, we define our own “good”. One of the key issues that came out of the focus groups was that relationship management between stock owners and graziers was perceived as the greatest barrier to improving the way that heifers are grown. First steps to well grown stock is to have agreed expectations, regular communication and a grazing agreement in writing.

Dairy heifers are one of the most unforgiving stock classes in pastoral farming as their feed demand is constantly rising and must be met to reach liveweight targets. Multiple levels of

feed flexibility are required to maintain heifer growth rates. Stocking rates, enterprise mix and farm policies will account for: seasonal feed supply, risk management and farm contour. If a stock owner is paying to have their heifers contract grazed then a fair price should be established that reflects the growth, labour and services provided by the grazier.

### ***Lissaman's approach to good management***

- We use grazing contracts with final weights set for 1 May.
- At the start of the grazing relationship contact is frequent but after multiple years the level of contact reduces and becomes more informal—providing targets are met.
- Recently we have been trying to lift the bottom quartile of the mob to improve the average.
- Communication is generally by a phone call with texts and emails as required.
- Stock owners visit when they want to, providing reasonable notice.
- Weighing is more frequent in newly formed relationships and as the relationship strengthens it becomes less important, providing stock are exceeding targets.
- If stock fall behind target then weighing frequency and reporting increases.
- Animal health costs are paid by stock owner but administered by us after developing an agreed plan, this includes: drench, leptospirosis, BVD, 7-in-1, and minerals.
- Involve the grazier in the animal health plan, they will know the level of worm challenge on their farm and stock will be treated with the most suitable product.
- Drenching is up to us to choose timing and suitable products; we purchase the product and on-charge them, making sure products are on-hand for when it suits us to administer them.
- Pricing is structured around a base price with a bonus of \$1.50/kg over target weight. First 10 kg over target = no bonus but at 11 kg over all 11 kgs gets paid—this takes out any arguments over gut fill.
- We communicate concerns to the stock owner and it is better that animals are removed and grazed elsewhere than wait too long and create a problem which can't be fixed, this year's drought is an example.

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This year has been exceptional due to drought; the farm received only 144 mm of rain from 1 July to end February, when the average is 510 mm. In a normal year we would have fully covered the cost of feeding the animals but this year alternative grazing was needed. Without measurable pasture growth from December to mid-March we were without economic options to get all the animals through and to meet weight targets.

In December stock owners were notified about feed shortages; in January, asked to look for alternative grazing for any/all of their animals. PKE became half the heifer's diet by early January but stock still had to be moved off the farm. Some of the owners sent PKE or baleage at their cost to make our feed last longer because alternative grazing was hard to find. None of the dairy farmers were overly happy with the expense or changing grazing, however, most took the view that they were protecting their future income stream and mating results.

## Summary

To have well grown heifers, stock owners need to focus on a good working relationship with their grazier. Relationships should start with a written grazing agreement that establishes shared expectations about management during grazing and outcomes at the end of the contract. Having a known management plan and remedial action plan in case stock fall behind target while out at grazing, reduces the risk of disagreement. On-going communication and weighing, the only objective measure of performance, will reduce the risk of conflict.

Selecting a mature liveweight target is the first step to monitor whether heifers are being well grown in their first two years. While the mob average should achieve the target, not every animal can be "average"; so individual animals should not fall more than 10% behind the target. Particular patterns of growth can be hard to achieve if weather events are the main influence on monthly weight gains. Focusing on achieving pre mating and pre calving targets is more sensible than specific growth rates each month. Lifting heifers weights above targets going into seasons that are known for low growth gives a weight buffer because in practice compensatory growth is unreliable for meeting targets.

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