# Feed efficiency in heifer management

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Growth of dairy replacement heifers varies for two reasons – genetics or management. Differences in heifer growth may be due to genetics or management.

Variance in heifer growth due to genetics is normal but variance caused by management outside of growth objectives is not.

Traditionally, breed based heifer growth, breeding weight and calving weight guidelines have been used to evaluate heifer performance.

The problem with this approach is that variance in mature size and corresponding heifer size within a breed can be as great as between breeds.

Compounding this issue is the resurgence of crossbreeding dairy cattle which not only affects mature body size, but may make it difficult to even identify a heifer's breed.

## Heifer monitoring systems

A monitoring system requires good basic records including birth date, dam body weight, sire, and permanent identification.

From these basic data, more complex data systems are then built.

A simple method such as a weight tape and an altitude stick will be abandoned because of the time and handling requirements.

More effective systems collect data within normal management routines. For example, heifers are vaccinated, bred, pregnancy checked, or foot trimmed in a common chute fitted with automatic weighing devices and computer interfaces.

In this way growth data is collected without added labour.

Heifer growth data should be monitored at key management times – birth, vaccinating, breeding, pregnancy check, calving – while the calf or heifer is otherwise restrained.

Basic components of a high efficiency weighing system include an animal handling corral or drovers alleys, electronic scale, and a digital or computerised recording device and possible RFID technology. In these systems, heifers can be handled, sorted and moved efficiently. The final step is data evaluation.

Generally, growth data (average daily gain and height) are plotted against breed standards to evaluate heifer growth performance.

## Evaluating growth variance

However, even breed specific standards may cover too wide of a performance range because the data used to develop the standards comes from a variety of management situations and genetic bases.

A different problem may occur if a specific animal is genetically extreme (either large or small) for their breed; in other words, the animal's genetics are 'off the curve'. This happens because genetic variance within a breed can be as great as between breeds.

***Table 1. Universal heifer growth chart for 24 month age at first calving.***

| Heifer age (months) | % of mature bodyweight |
|---|---|
| calf | 6.5 |
| 1 | 9.7 |
| 2 | 12.8 |
| 3 | 16.5 |
| 4 | 20.2 |
| 5 | 24.0 |
| 6 | 27.7 |
| 7 | 31.4 |
| 8 | 35.0 |
| 9 | 38.9 |
| 10 | 42.5 |
| 11 | 46.3 |
| 12 | 49.9 |
| **Breeding target** | |
| **13** | **53.7** |
| **14** | **57.4** |
| **15** | **61.1** |
| 16 | 64.7 |
| 17 | 68.5 |
| 18 | 72.2 |
| 19 | 76.0 |
| 20 | 79.6 |
| 21 | 83.3 |
| 22 | 87.1 |
| 23 | 90.8 |
| 24 (7 days pre-calving) | 94.0 |
| 24 (7 days post-calving) | 85.0 |

Van Amburgh and Meyer (2005) suggest expressing heifer growth or body weight as a percentage of mature body weight (MBW) to account for variance in genetic potential for animal size.

However, we cannot know the MBW of a heifer until she reaches maturity. Since size is highly heritable, a heifer's MBW can be estimated from her dam's weight (either an actual or tape weight).

This is called a surrogate MBW (MBWs). The following factors may be used to adjust 0-21 day post calving body weights for lactation number in order to have an MBW for the dam:

- Lactation number 1. Multiply by 1.176.
- Lactation number 2. Multiply by 1.087.
- Lactation number 3. Multiply by 1.042.

Once the dam's MBW is calculated, the heifer's weight may be expressed as a percent of MBWs for evaluation of growth performance.

An example calculation for a heifer weighing 875lb, whose dam weighed 1,275 at 21 days into her first lactation, is: 875lb/(1275 x 1.176) = 0.583, so the heifer is 58.3% of MBW.

In a perfect model, size of the sire would also be accounted for; however factors to adjust for the sire's influence do not currently exist.

In the case of crossbred cattle, the influence of both parents should be accounted for in some way.

The author proposes the following: MBWcrossbred = (MBWs + sire breed average MBW)/2.

## Universal growth standards

Universal growth standards based on MBWs have the advantage of suppressing genetic effects, as well as making multiple breed based charts unnecessary. A universal standard allows all comparison to a single reference curve regardless of breed or genetic size.

Published data from several breeds was used and only minor differences in heifer

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growth occurred between breeds when heifer growth is expressed on a MBW basis.

## Example of utility

Age and weight data from 168 heifers at the Marshfield Agricultural Research Station was used to evaluate the concept of a universal growth standard. Comparison of this data to a traditional Holstein growth benchmark (Midwest Plan Service, 2003) led to the conclusion that there was a large growth variance in the herd. However, there was no obvious explanation for this variance.

The fact that about 30% of the herd was Holstein-Jersey crossbreds might explain some of the variance. A Universal Heifer Growth Chart was developed where growth is expressed as percentage of MBWs (see Table 1).

When the Marshfield heifers were evaluated against this growth standard, the true herd dynamics become obvious. This evaluation suggested that older, crossbred heifers were well above the MBWs standards which agreed with the fact that these heifers had excessive body condition scores.

This example is representative of many dairy and heifer growing operations that must successfully manage a variety of genetics in the heifer pens.

Managing heifer growth using MBWs may not only help pinpoint problems, it may be useful in preventing problems.

For instance, if all heifers are bred at a certain breed benchmark, genetic differences in size may well result in variable breeding and calving ages, as well as over conditioned animals at calving.

Using a benchmark of percent of MBWs for breeding should reduce variability in these measurements, although actual body weights at breeding and calving might be more variable (this is genetically normal).

## Days on feed variance

The single greatest influence the range observed for days on feed in heifers is reproductive efficiency. For example, with heifers growing at 1.8lb per head per day and normal reproductive efficiency (63% pregnancy rate), it will take 43 days to get 95% of the heifers pregnant.

This will result in a 77lb spread in body weights at first calving. This level of variation will not present a management challenge. However, if pregnancy rate were to drop to 50%, 210 days would be required to get 95% of heifers pregnant.

This translates into a spread of 378lb in body weight at first calving. In this case, the manager is likely to have major challenges with over conditioned fresh heifers.

Our conclusion is that heat observation and insemination techniques must be intensively managed to prevent a management breakdown in the fresh pen.

## Manage the bunk

Combining proper bunk design with feeding to a minimal refusal rate will reduce feed cost and increase feed efficiency. It should also help prevent over conditioning of heifers.

To minimise refusals, the author suggests a simple feed bunk scoring system;

- 0 if no feed remains.
- 1 for a few particles of feed scattered about.
- 2 if many feed particles remain but the bunk surface is still visible.
- 3 if the bunk surface is completely covered in feed.

Feed deliveries are adjusted up or down in small increments (2% per day) to achieve a score of one on a daily basis. In this way, the heifers are not allowed to sort feed and are truly consuming the diet which has been formulated for them.

Of course, this approach will not work well in groups with a large range of body sizes or when not all the heifers can eat at the same time. In these situations, the larger and/or more aggressive heifers will get more than they should and will become overly fat.

The smaller and more timid heifers will end up growing poorly.

## Limit feeding

Limit feeding as a more nutrient dense ration may reduce feed cost and feed efficiency. Higher feed efficiency will lead to reduced nutrient excretion in the manure. Recent research has shown positive performance results with limit fed heifers.

When changing to a limit feeding system, there are two major management considerations. Limit fed heifers will vocalise for approximately one week until they become accustomed to the system.

Bunk space must be adequate for all animals to eat at the same time, since the heifers will consume all the feed in approximately one hour. Lack of bunk space will lead to uneven rates of gain in a limit fed situation.

## Heifers sort feed

Heifers can sort feed just as well as lactating cows. This is a particular problem when feeding fibrous forages and corn silage. Heifers will sort out long forage particles and corn cobs, preferring higher energy feedstuffs.

As a result, heifers frequently consume higher energy diets than those formulated for them. Harvest, feeding, and feedbunk management all become critical to ensure that heifers consume the higher fibre, low energy components of their rations.

## Conclusions

Variance of heifer growth can be controlled and monitored to improve heifer performance and farm profitability. Using MBW as a benchmark, rather than an expected rate of gain can account for normal genetic variability in growth, thereby improving management.

Proper feed bunk design and management can reduce feed wastage while managing for high efficiencies in breeding to control days on feed will help reduce variations in heifer growth. ■

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