

## Heifer Management at Harper Adams

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Simon Marsh, Senior Lecturer at Harper Adams University College provides an overview of heifer management from birth to calving.

The benefits of calving down well grown heifers at 2 years old have been well documented and include the following:

- Increased lifetime production.
- Speeding up of genetic gain i.e. reduction in generation interval.
- Reduction in fixed costs associated with heifer rearing i.e. land, labour, building etc.

Whilst the aim on many farms is to calve replacement heifers at 2 years old, a recent Holstein UK survey showed that the majority of heifers calve at approximately 29 months of age.

### Heifer Rearing Problems in the UK

All too frequently replacement heifers are treated as 'second rate citizens' and are reared 'by accident', not 'by design' with moderate quality feed, poor housing and too little time and attention. Attention is all too often given to the milking herd but in theory the reverse should occur. Latest figures from DairyCo show that the PIN and PLI of cows milking in the UK herd is markedly below that of the heifers waiting to join the national herd. Most milk producers are now 'well down the track' of producing high genetic merit heifers **therefore heifers should get the attention they deserve.**

### The Harper Adams Dairy Herd

The herd currently consists of some 345 cows with an average lactation yield of 9,027 litres per cow @ 3.83% fat and 3.20% protein (at May 2009). In January this year the herd moved into a new state-of-the-art dairy unit on a 'greenfield site'. During 2009/10 the herd will be expanded to 400 cows. The unit has the potential to expand to 600.

The herd calves all-year-round. A particular area for attention is the cost of replacements and we are attempting to breed more 'easy care' cows, with greater longevity, feet, legs and mastitis resistance. Emphasis is placed on creating a herd of high type cows capable of high output while maintaining longevity. Since this policy has been in place herd replacement rate has fallen from 30% in 2002 to 19%.

### Target growth rates

At Harper Adams the feeding and management of dairy heifers is given the same priority as dairy cows. The growth of frame, development of rumen function and body capacity is stimulated by the use of high quality forages, good quality grazing and use of appropriate supplementary feeds to achieve the target wither heights and daily live weight gains (DLWG) shown in table 1.

**Table 1** Harper Adams weight and wither height targets for Holstein Heifers

| <b>Age<br/>(months)</b> | <b>Wither height<br/>(cm)</b> | <b>Weight<br/>(kg)</b> | <b>DLWG required<br/>(kg/day)</b> |
|-------------------------|-------------------------------|------------------------|-----------------------------------|
| Birth                   | 74                            | 42                     | 0.55                              |
| 2                       | 85                            | 74                     | 0.9                               |
| 3                       | 91                            | 105                    | 0.8                               |
| 4                       | 95                            | 130                    | 0.8                               |
| 6                       | 102                           | 180                    | 0.8                               |
| 8                       | 114                           | 225                    | 0.75                              |
| 10                      | 118                           | 270                    | 0.75                              |
| 12                      | 121                           | 315                    | 0.75                              |
| 14                      | 124                           | 365                    | 0.85                              |
| 16                      | 128                           | 415                    | 0.85                              |
| 18                      | 131                           | 465                    | 0.85                              |
| 20                      | 134                           | 515                    | 0.85                              |
| 22                      | 136                           | 565                    | 0.85                              |
| 24 (pre calving)        | 138                           | 605                    | 0.65                              |
| 24 (post calving)       | 138                           | 545                    | -                                 |

### Birth to 12 Weeks

It is vital that the calf gets a 'good start in life' and achieving early and adequate intake of high quality colostrum is the single most important management factor in determining calf health and survival. Colostrum is rich in nutrients but most importantly immunoglobulins (Ig) or antibodies, which provide the calf with passive immunity.

The priority with new born calves is to ensure at least 2 litres of colostrum is fed within the first six hours of life, with up to 6 litres within the first 24 hours. The calves are supervised suckling colostrum and typically stay with their dam for 24 hours. If colostrum intake is not observed, the calf is either bottle or tube fed. The calf's navel is dipped in a tincture of iodine to help prevent joint and navel ill.

Colostrum is fed for the next 4 days and at 5 days the calf is fed warm (37°C) milk replacer twice daily (2-3 litres per feed) to weaning at 6-8 weeks old. Fresh water, clean straw and 18% CP early weaning concentrates are offered from day 7. Weaning is dictated by concentrate intake with 1kg/calf for 3 consecutive days the target with calf health and vigour also considered. Calves are dehorned at 4-6 weeks old and vaccinated with Rispoval 4 to protect again RSV, Pi3, IBR and BVD.

Calves are individually penned on straw and moved into groups of 8-15 calves post weaning into well-ventilated yards with concentrate offered *ad lib*. Batches of calves have also been reared outdoors using a New Zealand 'Milk Bar' system. Calves go onto the system after about 7-10 days of age having had colostrum and trained to a teat. Detailed performance has not been monitored but anecdotal evidence suggests that the system works well with improved calf health and batches of 30 calves can be fed within half an hour.

Over the last few years we have carried out a number of calf rearing trials including; effect of feeding either a coarse mix or pelleted concentrate; weaning dairy-bred calves gradually or abruptly; rearing calves individually in pens bucket fed twice per day or grouped and fed via a computerized machine; once versus twice per day milk replacer feeding systems; effect of weaning calves at low (0.75kg) or high (1.25kg) levels of concentrate intake. Reports of these trials are available on request.

## 12 weeks to 12 months old

At 12 weeks old the early weaning concentrate is gradually changed to a rearing concentrate with a protein content of 20% and high dry matter big bale silage/haylage is introduced and fed *ad lib*. During the winter the calves remain in groups of 12-20 bedded on straw in draught free well ventilated yards with a 2/3 bedded area and 1/3 scraped concrete feeding area.

Post weaning is a transition for the calf which necessitates increased dependence on forage and hence development of rumination. It is a period when calves seldom 'look at their best'. Rumen development is vital for the future of the heifer to give capacity to utilise high levels of forage throughout her rearing period and subsequent entry into the herd. The ability to maximise forage intake is the key to profitability with either high or low concentrate feeding systems.

It is accepted that growth rates in excess of 0.8kg/day to puberty can cause fat deposition in the udder and have a negative influence on mammary growth and milk production. Various forage options are available to rear a heifer to 12 month old indoors to achieve 0.7-0.8kg DLWG. Energy supply and protein quality are highly critical together with an adequate supply of minerals for muscle and bone development. Shown in Table 2 are alternative rations for different forages. The ration should contain an overall crude protein content of 14-16% in DM.

**Table 2** Concentrate feed requirements for various forages to achieve 0.75kg daily live weight gain with 150kg Holstein heifers

| Forage<br>(fed <i>ad lib</i> ) | Forage ME<br>(MJ/kg DM) | Concentrates |      |
|--------------------------------|-------------------------|--------------|------|
|                                |                         | kg/d         | % CP |
| Grass silage*                  | 10.8                    | 1.5          | 16** |
| Grass silage*                  | 10.0                    | 2.25         | 16** |
| Hay                            | 9.4                     | 2.5          | 20   |
| Straw                          | 6.5                     | 3.0          | 20   |
| Maize silage                   | 11.2                    | 1.0          | 40   |

\* Grass silage must have good preservation and high intake characteristics, ideally @ 25-30% dry matter.

\*\* Protein content of concentrate dependent on forage quality.

With maize silage and good grass silage, straw should always be available fed at either 0.25kg/head/day within a TMR or offered from racks to provide long fibre. The use of palatable high quality forage together with good quality mineralised concentrates containing balanced levels of effective rumen degradable protein (eRDP) and digestible un-degradable protein (DUP) from feeds such as soya are vitally important with 3-12 month old heifers. This last winter to simplify management the heifers were fed a proportion of the Milking Cow TMR. The proportion fed is based on providing a targeted level of concentrates.

Winter and spring born calves are grazed on silage aftermaths and fed 2kg per day of concentrates until housing. Calves are dosed with Huskvac prior to turnout to create immunity against lungworm. They are treated at turnout and 8 weeks later with a long acting pour-on anthelmintic to protect against gut worms.

## First summer at grass

The target sward height at turnout is 7-9 cm and concentrates are fed at 2kg/head/day for the first 2-4 weeks (longer for calves under 200kg). Mineral blocks are offered during the summer. A very high stocking rate of 2,500kg of calf live weight per hectare is implemented for the first month of the grazing system and part of the field is shut off. If good grass growth occurs this buffer is made into silage, in poor conditions, this grass buffer is grazed. Operating a buffer grazing system helps to avoid under grazing, maximising tillering and production throughout the season.

As the grazing season progresses the dry matter intakes of the heifers increases, yet herbage growth inevitably declines. Stocking densities are therefore relaxed with the use of silage aftermaths with typical grazing stocking densities gradually reduced to 1,100kg live weight per hectare by September. In the later grazing season the target sward height is increased to 8-10 cm, eliminating the requirement to feed concentrates and achieving target DLWG's.

The key to achieving target growth rates is to maintain sward heights of 7-10 cm during the grazing season on clover rich (30%) pastures. At lower grass heights supplementary feeding with 1.5-2kg/head/day of concentrates will be required. In drought conditions, supplementary forage (big bale silage) will be needed. 'Spot-on' insecticide are used as necessary from mid summer.

## 12 to 18 months old

To achieve 2 year calving, the heifers must be bulled at 15 months of age. During the bulling period and when in-calf, the heifers are managed to achieve high (0.8-0.9kg) DLWG's. Energy is the key nutrient and Table 3 illustrates feeding options when housed.

The majority of heifers are served by sexed semen to an easy calving Holstein, the remainder to an easy calving Angus sweeper bull. The target bulling weight is 400kg with a wither height of 126cm at which they have developed sufficient rumen capacity to be wintered on a predominantly forage based diet.

**Table 3** Concentrate feed requirements for various forages to achieve 0.9kg daily live weight gain with 400kg Holstein heifers

| Forage<br>(fed <i>ad lib</i> ) | Forage ME<br>(MJ/kg DM) | Concentrates |      |
|--------------------------------|-------------------------|--------------|------|
|                                |                         | kg/d         | % CP |
| Grass silage                   | 10.8                    | 0.75         | 16*  |
| Grass silage                   | 10.0                    | 2            | 16*  |
| Hay                            | 9.4                     | 2.5          | 20   |
| Straw                          | 6.5                     | 4.5          | 20   |

\* Protein content of concentrate dependant on forage quality

The overall ration should contain protein content of 14 - 16% in the dry matter. Two weeks prior to turn out, concentrate feeding is reduced/removed. If the winter ration is based on straw, some grass silage should be introduced to adapt the rumen to a diet of spring grass to minimise any growth check. With very good quality grass silage (11.0+ ME MJ/kg DM) target DLWGs can be achieved without the use of concentrates with minerals fed at 100g/head/day.

If the heifers are at grass during this phase of their development the target sward heights and stocking densities as outlined previously for younger heifers is adopted. Concentrates are not fed and immunity to gut and lung worm will have developed in their first grazing season so they are not wormed. Heifers are vaccinated against Leptospirosis at 12 months and BVD at 14 months. Heifers are also freeze branded at about 14 months old and housed in cubicles for some time during their rearing period.

## Out-wintering

For the last two winters in-calf heifers have been out-wintered and strip grazed on forage brassicas (stubble turnip or Swift - a kale/forage rape hybrid). The forage crops are grown as 'catch crops' following whole crop winter wheat and the fields are planted with maize following grazing. The Harper Adams system is based on extensive stocking within a 'low cost system' to provide soil protection. Out-wintering systems have the potential to reduce costs and increase dairy farm profitability and have offered us the potential to increase herd size, within the constraints of NVZ restrictions without the capital costs associated with waste storage. In 2007-08 a trial funded by DairyCo was carried out to

compare the performance of heifers either housed or out-wintered on stubble turnips which is summarised below.

- Target DLWG's of 0.7-0.8kg to achieve 2 year calving can be achieved with out-wintering systems based on stubble turnips and haylage/silage on a low cost extensive system.
- Utilisation of the stubble turnips was estimated at 38-44% and 0.75ha provided sufficient stubble turnips for 1 heifer for 120 days.
- There were no welfare implications.
- Out-wintered heifers do not suffer a growth check when moved onto grass in the spring.
- Variable costs per kg gain were very similar however the out-wintered heifers recorded lower fixed costs.

### **Summer and pre-calving management**

With in-calf heifers at grass similar stocking densities (kg live weight per ha) as outlined for the first summer at grass are followed. If the heifers are due to calve at grass the DLWG's is restricted in the last 2 months to about 0.65kg to minimise calving difficulties and they are transferred to the milking herd dry cow group.

High magnesium mineral buckets are offered during the summer to dry cows and in-heifers. Magnesium affects vital enzyme systems, the normal functioning of muscles and the nervous system, therefore important for good muscle tone at calving and in the control of milk fever. 21 days prior to calving the heifers are brought into the 'close-to' dry cow group. A Leptospirosis booster vaccination is given at 24 months old.

### **Management in first lactation**

With a pre-calving weight of 605kg, the heifer will typically enter the herd at a calved weight of about 545kg. She will strive to achieve her mature weight of some 650-700kg and will therefore attempt to grow at an average of 0.25-0.5kg DLWG during her first lactation. It is this desire to achieve mature size that causes low peak yields yet very flat lactation curves and is why calving interval is often some 400+ days especially with heifers that fail to achieve wither height and growth rate targets. At Harper Adams calved heifers are kept in a separate management group which significantly improves their performance.

### **Summary**

- **Colostrum fed within 6 hours of birth to give the calf the 'best start in life' that is possible.**
- **Growth rates and wither heights regularly monitored**
- **Heifers accommodated in spacious, well-ventilated buildings.**
- **Body capacity and frame are developed with feeding good quality *ad-lib* forages with appropriate supplementary feeds to achieve an overall crude protein content of 14-16% in the DM.**
- **Emphasis placed on grassland management and target grass heights of 7-10cm.**
- **In-calf heifers out-wintered on light land sown with forage brassicas and fed big bale haylage to reduce fixed costs.**
- **Priority given to disease control, health and welfare.**
- **Heifers put in-calf to easy calving sires and given specialist pre and post calving management.**