# What Are Your Heifer Replacement Goals?

## Introduction

Several factors are increasing dairy producer interest in their heifer replacement programs. These factors include:

- better awareness of costs (provides impetus for measurement and change);
- research advances (what can be done, to improve things; how can we remove bottlenecks?);
- young, expanding herds (refines quality requirements for replacements, increases number of replacements needed and pressure for change);
- changing industry structure (i.e., contract heifer raising: further defines costs, requirements, bottlenecks, fosters communication).

As a result, many producers have detailed knowledge of their heifer production costs. Despite this, most dairy producers believe that contracting heifer growers at $1.30 a day is excessive, and many heifer growers believe that they won't stay in business at rates below $1.40 or be able to produce a quality heifer at lower prices (Hoffman, et al., 1996; Moen, 1996).

Most authors (Barmore, 1995; Grummer et al., 1995; Hoffman, 1996; Hoffman and Funk, 1992; Heinrichs, 1993; Price, et al., 1994) agree that the following standards are achievable and desirable for Holstein heifers at first calving:

- 1350 lb body weight prepartum
- 22 - 24 months age at first calving (AFC)
- 54 - 56 inches at withers
- body condition score (BCS) = 3.5

Although the above standards are often detailed in the trade press and in university publications (and recited by producers), most youngstock programs have just one defined milestone: breeding (and thus, AFC). The use of intermediate stature and weight goals is very limited in the dairy industry - producers usually change the current program when AFC is determined to be "too old," or heifers are too fat or too small. Furthermore, the goal of increased average daily gain (ADG) is in conflict with the perception that heifers may get too fat, or that the mammary system will be compromised when heifers grow too fast (Sejrsen, et al., 1982; Swanson, 1960).

## Goals and Costs

Accurate and complete accounting of heifer-raising costs is relatively easy to obtain. Table 1 shows the cost ranges encountered by a contract heifer grower (capacity = 700

**TABLE 1.** Heifer-raising expenses: 10 weeks to springer.

| Expense | $Cost/hd/day |
|---|---|
| Bedding | 0.02 - 0.04 |
| Breeding | 0.01 - 0.02 |
| Corn/grain | 0.10 - 0.15 |
| Corn silage | 0.24 - 0.34 |
| Death loss | 0.01 - 0.03 |
| Hay/haylage | 0.24 - 0.34 |
| Insurance | 0.01 - 0.02 |
| Interest | 0.04 - 0.12 |
| Labor | 0.25 - 0.35 |
| Principal | 0.00 - 0.12 |
| Protein/mineral supplement | 0.12 - 0.15 |
| Rent/yardage | 0.10 - 0.15 |
| Repair/misc. | 0.04 - 0.06 |
| Trucking | 0.02 - 0.04 |
| Utilities/fuel | 0.04 - 0.07 |
| Veterinary | 0.05 - 0.07 |
| **Totals** | **$1.29 - $2.07** |

(adapted from Moen, 1996)

head) in Mora, Minnesota. The average cost reported was $1.35/hd/day, or $.78/lb in cost-of-gain terms. In a 1993 survey of western New York dairies, total heifer-raising costs averaged $1.47/hd/day (Karszes, 1994). At total heifer-production costs ranging from $600 to $1300 per heifer, calculations by Smith (1993) indicate that a heifer doesn't return her investment costs until nearly the second lactation (the $600 heifer) and as late as the third lactation (the $1300 heifer). In any case, heifer replacements are very expensive, second only to lactation feed costs on a dairy farm.

Others (Veldman and Cady, 1995; Karszes, 1994; Skidmore, 1995) have reported similar costs, with some regional variation. Although heifer contracts vary widely in content, many contain weight-for-height, maximum ADG, and AFC details to protect the producer's interests. Other defined responsibilities often include age at arrival, right of refusal, vaccinations, nutrition program, AI program, and insurance details.

Suppose a dairy producer has accurate knowledge of youngstock costs, and wants to use some early breeding date goals to shorten AFC by 30 days. How worthy a goal would this be? As pointed out by Cady and Willett (1996), increased AFC costs the producer in three ways: (1) increased days of rearing; (2) increased number of (slower-growing) replacements needed on the farm; and (3) lost lifetime milk production potential. Using the following assumptions, Table 2 shows the economic impacts of shortening AFC by 30 days:

- production cost = $44/mo
- heifer cost = $1200
- herd size = 100 lactating cows
- current AFC = 26 months
- cull rate = 28% /yr (67 heifers aged 0 - 26 months on-hand)
- 1 lb @ calving = 6 lb additional milk in first lactation (Keown, 1986)
- milk margin = $3/cwt.

Other goals to consider in a youngstock program are prepartum bodyweight (milk yield in the first lactation maxes out at 1350 lb), BCS (scores above 3.5 raised dystocia index by several points in the Hoffman et al. [1995] study), and stature (more accurate than BCS, and as useful in determining body composition if combined with weight measurement). As these effectors are further refined by research, producers will press for more efficient youngstock programs, and will try to eliminate biological and economic limits to production.

**TABLE 2.** Economic values of increased ADG pre- and post-puberty.

| Expense Value | $/heifer |
|---|---|
| 30 less days to breeding/AFC | $44.00 |
| 3 less replacements needed (3/67 = 4.4%) | $53.00 |
| 8 lb more weight at calving | $7.00 |
| **Total** | **$104.00** |

## Optimum Growth Rates

To progress toward earlier AFC, we need to grow youngstock faster, yet with appropriate body condition. A common producer question is: "How-fast can we push them without compromising udder development and first lactation performance?" Several recent research trials were designed to help answer this question. The first report, from Van Amburgh et al. (1994), investigated accelerated prepubertal growth rates and their effect on first lactation milk yield. Groups of heifers were targeted to grow at 1.32 lb, 1.86 and 2.2 lb ADG. Results from the trial are shown in Table 3.

**TABLE 3.** Effect of prepubertal growth rate in Holstein heifers on first lactation milk yield.

| | Group 1 | Group 2 | Group 3 |
|---|---|---|---|
| Prepubertal ADG (lb) | 1.57 | 1.86 | 2.1 |
| Age fresh (mo) | 24.2 | 22.0 | 21.0 |
| Calving BW (lb) | 1186 | 1161 | 1126 |

Van Amburgh et al., 1994

In the Van Amburgh study, milk yield and prepartum bodyweight were numerically reduced in the accelerated heifers, indicating that a prepubertal growth rate of 2.1 lb ADG may be near the limit for modern Holsteins.

In another study, Hoffman et al. (1995) fed control (62.5% TDN in ration) or accelerated (68.5% TDN) heifers to be bred at 14 or 10 months of age. Treatments were begun at 10 months, and depending on breeding efficiency, heifers were then divided into target (bred on-time) or

**TABLE 4.** Effect of early calving on development and lactation performance of Holstein replacement heifers.

| | TREATMENT | | | |
|---|---|---|---|---|
| | Accelerated | | Control | |
| | Target | Delayed | Target | Delayed |
| Calving age (mo) | 20.6 | 22.7 | 23.6 | 25.6 |
| ADG (lb/d) | 2.1 | 1.9 | 1.7 | 1.7 |
| Prepartum BW (lb) | 1371 | 1462 | 1407 | 1464 |
| Postpartum BW (lb) | 1215 | 1294 | 1279 | 1327 |
| BCS | 3.5 | 3.7 | 3.4 | 3.6 |
| Pelvic area ($cm^2$) | 259 | 274 | 269 | 291 |
| Dystocia index | 2.7 | 4.2 | 2.8 | 3.4 |
| Milk yield (lb/d) | 55.1 | 57.3 | 60.0 | 58.6 |

(adapted from Hoffman, et al. 1995)

delayed (missed breeding date) groups for analysis. Table 4 shows the results from the early calving study.

Several researchers have investigated the effects of additional protein (Van Amburgh, et al., 1994) or undegradable intake protein (Steen, et al., 1992) in protecting against excessive BCS gain in fast-growing heifers. Park and others (1987) have conducted a series of studies in which heifer growth rates are matched to a "stair-stepped" energy supply to maximize ADG after critical udder development has occurred. These-studies may help to define optimal or maximal ADG or BCS for heifers grown on accelerated programs and calving at 22 months or earlier.

## Nutrient Influencers

Once the baseline ADG and nutrition programs have been established for a set of heifers, how does one adjust for any management or environmental factors that might be encountered? Several researchers have attempted to characterize the effects of housing, weather, etc., on heifer performance and nutritional requirements. Table 5 compares some of these adjustment factors.

## Monitoring Heifer Growth — The Missing Link?

Hoffman (1996) states that measurement programs for replacement heifers "almost always fail at the farm level due to the time commitment involved." Simple schemes of heart girth, wither height, and BCS measurement at

**TABLE 5.** Effects of deworming, mud, wind, cold, and ionophores on heifer energy requirements.

| | Energy Adjustment: (lb corn/900 lb heifer/day) | |
|---|---|---|
| | Hoffman | Cornell system |
| Mud | + 2/3 | + 0 to 2 |
| Deworming | - 2/3 | NA |
| Cold/Wind | + 1/2 | + 2.5 |
| Ionophore | - 1/2 | -1/2 to 1 |

(adapted from Hoffman, 1994; Cornell Net Carbohydrate and Protein System, Fox et al., 1993)

breeding/calving or at a single time for all replacements on-hand (Galligan and Ferguson, 1995) have been proposed as useful tools for goal integration.

## Conclusions

Several recent research reports have helped to define the biological and economic limits to heifer performance. These can be useful for fine-tuning youngstock programs for today's dairy producers. Modern Holsteins necessitate a new set of stature and weight goals and the economic pressure is increasing to produce acceptable heifers at younger AFCs. The emerging industry segment of contract or custom heifer raising has also increased the awareness of these limits.

However, the application of defined goals has been limited-producers are better at reciting expected goals than at measuring performance toward those goals.

The potential impact of setting goals is tremendous, due to the costly nature of raising replacements. Research can now characterize the impacts of deworming, shelter, ionophore feeding, and other management techniques so that resources and growth rates can be managed so as to deliver heifers of acceptable quality. Practical conflicts between high ADG and mammary development, and other biological constraints, such as dystocia, poor first lactation performance, and poor reproductive performance, are also being characterized. These conflicts make it difficult for dairy producers to make improvements. However, dairy producers today have more tools than ever before for self-setting goals that can be measured against and attained-this is how progress will be made in reducing AFC while generating herd replacements of acceptable quality.

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