COST-BENEFIT OF ACCELERATED LIQUID FEEDING PROGRAM FOR DAIRY CALVES

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Second to total feed cost, the cost of raising replacement heifers represents one of the largest costs of doing business for the dairy farm manager. Economic research has documented that the highest daily expense during heifer development occurs during the neonatal feeding period due to high labor and liquid feed costs. The number of variables involved, along with differences between farms and heifer growth rates offers a challenge to the objective appraisal of heifer raising economics and the comparison between investments in and potential paybacks from different heifer development programs.

Conventional neonatal calf feeding programs typically have been based on feeding a 20% protein, 20% fat milk replacer at a rate of 1.0-1.2 lb/day (DM basis). The conventional calf feeding program has the potential to yield an average daily gain (ADG) of 1 lb/day but calf average daily gains are sometimes lower. Fed a conventional program, a 95-lb calf at birth should weight about 150 lb at weaning after 55 d.

In the past decade accelerated calf feeding programs have been developed in which calves are fed a more fortified milk replacer containing higher protein (between 26 and 30%) and fat levels (between 15 and 20%). Accelerated milk replacers are formulated similar to whole milk for content of protein in the milk solids to maximize lean tissue growth. In addition to a different formulation, accelerated milk replacer feeding programs are also fed to facilitate a higher intake of milk replacer (approximately double that of conventional or between 2 and 2.5 lb/day on a DM basis). Research indicates calves fed accelerated feeding programs often have an ADG during the preweaning period of about 2 lb/day live weight. Therefore, a 95-lb born calf fed an accelerated milk replacer program would weight about 205 lb at weaning after 55 d.

Because neonatal calves on accelerated feeding programs are fed higher levels of the accelerated milk replacer, they consume lesser amounts of calf starter than conventional milk replacer feeding programs (e.g., 45 vs. 75 lb during the preweaning period).

Although weight or size tends to converge by 15 months between heifers fed conventional vs. accelerated milk replacer programs, there is some evidence that feeding calves accelerated programs can reduce the time to first calving (e.g., 23 instead of 24 months). Earlier age at calving could bring additional economic benefits due to a lower cost of heifer rearing along with earlier milk revenue generation. Additionally, recent research also indicates that first lactation cows fed accelerated milk replacer feeding programs as calves may have enhanced milk production as a direct result of improved neonatal nutrition.

Multiple trials have demonstrated that accelerated calf feeding programs result in faster, leaner and more efficient calf growth. However, there is little evidence that these calf feeding programs have an economic benefit over conventional calf feeding programs. Accelerated calf feeding programs are more expensive than

conventional calf feeding programs because of additional costs to formulate accelerated milk replacers and because accelerated milk replacers are fed at higher feeding rates. The additional costs need to be evaluated against potential economic benefits such as shorter weaning periods, reduced starter consumption, higher live weight gain during preweaning, younger ages to first calving and enhanced milk production during lactation.

The "Cost-Benefit of Accelerated Liquid Feeding Program for Dairy Calves" computer model allows the evaluation of the likelihood of an economic advantage from the adoption of an accelerated calf feeding program compared to a conventional calf program through user defined farm and market parameters. The model output includes cost-benefit advantage summaries calculated as net present values comparing accelerated versus conventional heifer raising programs at weaning and at freshening as well as the number of hundredweight of milk needed to break-even on the feed investment in heifer rearing. Costs are calculated as the sum of feeding and maintenance costs. The potential benefits of enhanced milk production because of accelerated feeding programs are not included although the amount of milk a first calf heifer needs to produce in order to cover her raising cost is calculated for both conventional and accelerated programs

The computer model has 1 input section: (1) input information, and 3 output sections which include (2) cost benefit at weaning, (3) cost benefit at freshening, and (4) break-even milk to pay rearing. Following is a description of each section to aid the user.

1. Input information

In the input section the user may define biological and economic parameters of conventional and accelerated calf feeding programs. This information will describe the expected accelerated and conventional calf feeding programs and will be used to compare the cost benefit of the accelerated feeding with conventional calf feeding programs. Some of the parameters apply equally to both feeding programs (common), but many are specific for each program. Table 1 depicts example parameters that could be used in the analysis. Birth weight (pounds) is a common parameter used to calculate the weight gain at later stages of life. Weaning time (days) defines the time between birth and weaning used to calculate the feeding costs for the respective calf feeding programs. Weight at weaning (pounds) is used to calculate the weight gain of a calf during the weaning period. Live weight value ($/pound) is a common value assigned to each pound of live weight gained used to estimate an economic gain by multiplying this value times the weight gained. Milk replacer intake (pounds/day) is the estimated amount of milk replacer consumed by a calf during the weaning period. Starter intake (pounds/day) is the estimated amount of calf starter grain consumed by a calf during the weaning period. Milk replacer cost ($/pound) is the market price of the milk replacer for conventional and accelerated milk replacers, which are used to calculate their total costs. Starter cost ($/pound) is the market price of the starter. Weaning to 19 months maintenance cost ($/day) is a common parameter indicating the daily cost of rearing replacement heifers from weaning until 19 months of age. Maintenance

from 20 months to calving ($/day) is a common parameter indicating the daily cost of rearing replacement heifers from 20 months to the estimated calving age. Calving age (days) is the estimated age at which a heifer will be expected to calve depending on the calf feeding program. Finally, discount rate (%/year) is a common parameter used to calculate the present value of the cost-benefits. An example of the parameters in this section is displayed in Table 1.

As the input section is being completed the output sections 2, 3 and 4 will interactively adjust to the input data. Once this section has been completed, results are ready in the following sections.

Table 1. Example input information for section 1 of *Cost-Benefit of Accelerated Feeding Program for Dairy Heifers* application.

	Feeding Program	
Parameter	**Conventional**	**Accelerated**
Birth Weight (lb)	95	*
Weaning (d)	56	56
Weight at Weaning (lb)	150	212
Live Weight Value ($/lb)	2.00	*
Milk Replacer Intake (lb/d)	1.18	2.24
Calf Starter Intake (lb/d)	1.32	0.80
Milk Replacer Cost ($/lb)	0.84	1.00
Calf Starter Cost ($/lb)	0.2	0.2
Weaning to 19 month Maintenance ($/d)	2	*
20 month to Freshening Maintenance ($/d)	2	*
Calving Age (d)	730	697
Discount Rate (%/yr)	12%	*

* Parameters commonly used for both conventional and accelerated feeding programs.

2. Output 1: Cost-benefit at weaning

This section calculates the potential economic advantage of feeding calves an accelerated calf feeding program as compared to a conventional calf feeding program at the time of weaning. An estimated value of the calf (at weaning) is calculated based on the value of live weight. A highlighted number in this section indicates this value ($66.78 in Fig. 1), meaning that at weaning, an accelerated calf feeding program would produce a calf $67 higher in

value than a conventional calf feeding program. Because this calculation is uncertain (variable) depending on differing costs and calf performance parameters, multiple output values are presented in this section.

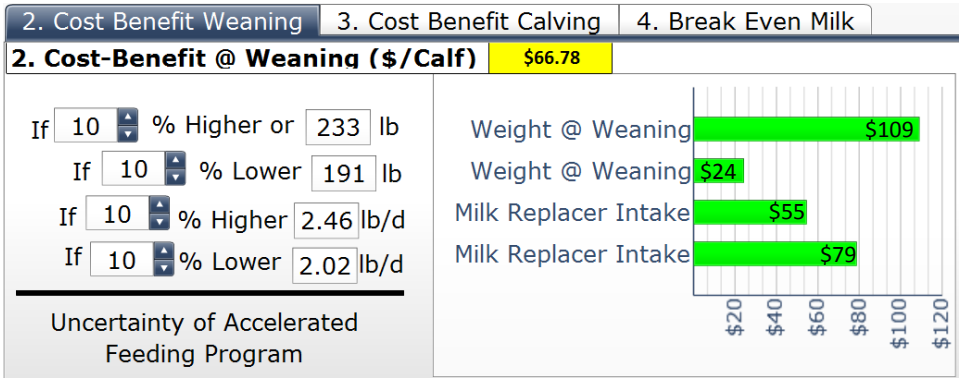

Figure 1. The cost-benefit of an accelerated calf feeding program at weaning

Two of the most important parameters; weight gained to weaning and intake of accelerated milk replacer, are presented in a variance range/sensitivity analysis based on the percentages the user defines. For example, if the calf gains 10% more weight the cost-benefit would be $109, but if the calf consumes 10% more accelerated milk replacer, the cost-benefit would be only $55, Fig. 1.

3. Output 2: Cost-benefit at calving

This section evaluates the potential economic advantage of feeding calves an accelerated calf feeding program at first calving. An estimated value of the calf at the first calving is calculated as the difference in costs of rearing a heifer from birth until first calving. This evaluation separates and totals all the discounted costs including milk replacer cost, starter cost, and the daily cost of maintenance between weaning and age at first calving for each feeding program. Then, it calculates the difference between the accelerated and the conventional calf feeding programs. Therefore, if this value is positive there is a defined advantage feeding calves the accelerated calf feeding program. A highlighted number in this section indicates this value that is $3.49 for the default input parameters of Table 1 (Fig. 2). As with cost-benefit at weaning, a sensitivity analysis is provided for a better assessment of production risk and, consequently values in this section presents the cost-benefit of an accelerated calf feeding program in relation to potential changes in important parameters such as more/less milk replacer intake or longer/shorter time to calving for the accelerated calf feeding program. For example a 5% longer time or 732 d (with the default values of Table 1) to calving decreases the cost-benefit to a negative value of $52, meaning that in such situations a conventional feeding program would have an advantage over the accelerated one.

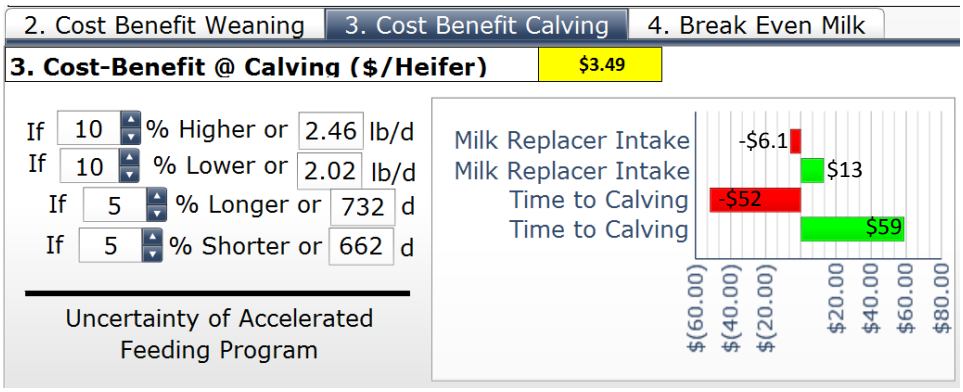

Figure 2. The cost-benefit of an accelerated calf feeding program at calving

4. Output 3: Break-even milk (cwt) needed to pay calf and heifer feed cost

This section estimates how much milk a cow would need to produce to pay for feeding expenses incurred from birth to calving. In order to calculate this value, an additional piece of input information is needed: milk price ($/cwt). With default values of Table 1, the milk equivalent required to cover calf and heifer feed costs incurred to calving are very close for both conventional and accelerated feeding programs of about 141 cwt or 14,100 lb with both feeding programs (Fig. 3).

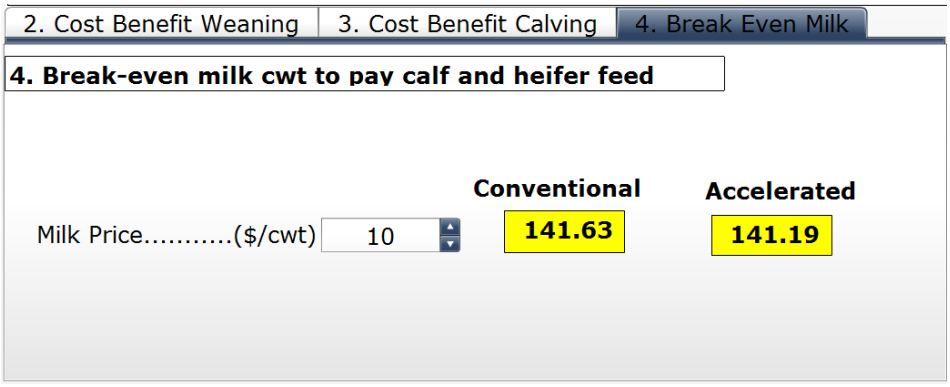

Figure 3. Break-even milk amount (cwt) to pay for heifer feeding rearing