

The Economics of Automatic Calf Feeders

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Introduction

The profit and financial feasibility for installation of automatic calf feeders is highly dependent on labor savings, calf health, and changes in milk and starter feed intake. No direct income changes have been found as a result of using an automatic calf feeder. However, the potential to feed more nutrients may have long term effects associated with increased milk production. Decreased expenses have resulted from a reduction in feeding labor and labor management. Calf treatment change is highly variable based on the change in housing and management before and after installation of the automatic calf feeder and therefore can be a positive or negative impact for the operation. Increased expenses result from capital recovery cost of the initial investment, increase in insurance, milk replacer intake, calf starter intake, utilities, supplies, repairs and change in records management labor. Research and data is available on a majority of the variables within the analysis, but there is conflicting data on the change in calf health and feed intake and only limited data on the change in utilities and supplies and repairs.

Calf Inventory and Financial Information

There are numerous companies selling automatic calf feeders in the U.S. Feeders can vary widely in sophistication and price ranging from systems which record minimal data and have simple feeding programs to more involved feeder systems with extensive capabilities to program feeding plans and monitor calf performance.

One automatic calf feeder can supply milk for up to four feeding stations. Each feeding station has one nipple and can handle 20 to 30 young calves or 15 to 20 veal calves (because of higher milk consumption). The number of total calves one feeder will successfully handle annually will depend on days on milk and range of calf age in a group. When calves are within a close birthing date and fed milk for eight weeks, the automatic feeder can handle up to a total of 325 young calves.

Calf housing when using automatic calf feeders must be in an enclosed facility. Current systems are set up in new or retro-fitted buildings to account for the feeder mixing room and proper group pen space and ventilation. Cost of housing should include all of the cost for the new building or modification to current facilities. Estimated average cost for a feeder is \$18,000 with an additional \$4,000 for the computer management software used with the transponders and feeder. Less sophisticated models are considerably less costing as low as \$2,000 with each feeding station capable of feeding up to 25 calves.

Calf feeders installed ten years ago are still being used; therefore, "years of useful life" is an unknown variable. Software updates may be more frequent than life span of the feeder. For useful life, 7 years is a conservative estimate while 15 years is a risky estimate with changing technology. 10 years of useful life would be a reasonable expectation. The value after useful life is unknown due to lack of used models on the current market.

Interest rate on money should reflect the rate which represents the cost of interest paid or opportunity cost of the owner's money, or, a combination of both. Insurance rate entered is the rate per \$1,000 of value of the feeder. Value of feeder system used for interest is full investment less salvage value and for insurance is increase in value of automatic feeding system and calf housing to current housing.

Feed Intake Changes

One highly variable factor between farms is the amount and cost of milk fed to calves based on management decisions. A dairy may choose to feed milk replacer, pasteurized waste or whole milk, or a combination. Cost of either option highly depends on the nutrient and solids content and amount fed to each calf. Pasteurized milk can depend on the value per hundredweight to the producer; it can be valued based on cost of production, price received for shipped milk, or local waste milk market.

Value of pasteurized whole or waste milk can be estimated using the "Calf Milk Pasteurization Evaluator" tool from Penn State.

Milk intake may increase or remain constant based upon current and desired feeding protocols. Current conventional calf feeding protocols typically feed between one to three pounds of milk replacer powder per calf per day (4-6 quarts of milk). Automatic calf feeders estimate between 1.05 and 3.3 pounds of milk replacer or use of pasteurized whole or waste milk per calf per day (4-13 quarts of milk). Typically calves are not introduced to the calf feeder for two to ten days after birth, so the analysis included in this paper compares time only on the calf feeder. Weaning age varies from farm to farm; but according to the 2007 NAHMS heifer study, 64% of dairy calves are weaned 6 to 8 weeks of age or later. During the weaning stage it is assumed milk intake is half the average milk intake. Due to the socialization effects of group housing, calves typically start eating calf starter more aggressively at an earlier age than in individual housing.

Labor Changes

The largest benefit of automatic calf feeders is labor savings through reduction of feeding labor. Current time spent feeding and managing calves needs to be compared to anticipated minutes per calf spent after the automatic calf feeder is installed. Average time spent feeding includes mixing and delivering milk and cleaning of equipment in a current system. A study by Iowa State University allocated 7.7 minutes per calf per day for mixing and delivering milk. Several studies document less than one minute per calf in an automatic calf feeder scenario which includes refilling powder bin, cleaning of hoses and equipment, and training calves to the feeder. A reduction in labor management can also be another source of decreased expenses.

Each calf has a transponder that records management information at each feeder visit. The information tracked may include milk intake, number of rewarded/unrewarded visits, length of feeding time, and rate of consumption. With the automatic calf feeder, there will be an increase in amount of time to analyze the management information. This information can help detect sick calves which can further lead to cost savings.

Calf Health Changes

Research indicates mixed results on change in calf health. These variables are highly variable and dependent upon the facility layout and management. It can be generally inferred from research results that incidences of

diarrhea/scours decrease while respiratory cases increase in an automatic calf feeder situation when moving from individual pen housing. Expected change based on individual farm changes from before and after installation should be accounted for in the analysis.

Utility and Supply Changes

Limited documentation on the increase of electricity or supplies is available. These costs will likely increase due to ad libitum feeding throughout the day compared to the conventional timed feeding method.

Sample 200 Cow Dairy Converting to Automatic Feeder

A 200 cow herd, raising both heifers and bulls is used as a basis for installing 1 Automatic Calf Feeder with 2 feeding stations at a cost of \$18,000. Calf management software is purchased at an additional \$4,000. The producer expects a ten year useful life out of the feeder at which time the calf management program will be re-evaluated and estimates the feeder can be sold for \$1,800. Using a combination of capital and borrowed money, the interest cost is 5.5%. The producer further increased insurance value by \$30,000 over the current system at a rate of \$0.005 per \$1,000 per valuation.

Calves are currently being fed twice a day at a rate of 1.25 pounds of milk replacer powder per day. An average increase of .75 pounds of milk replacer powder per day is anticipated due to ability of calves to feed more frequently. The calves are currently weaned at 56 days with a 7 day weaning period where milk replacer intake is reduced to half. With an increase in milk replacer and calf starter intake, the producer will decrease weaning age to 49 days with a 14 day weaning period. Average calf starter intake to 56 days is currently 90 pounds of DM. The calf's ability to socialize at an early age may allow for a 10-20% increase in calf starter intake.

Calf feeding labor is currently at 8 minutes per calf which includes feeding the calves and cleaning equipment daily. A decrease to 1 minute per calf is expected for refilling the powder bin, cleaning hoses and equipment, and training calves to feeder. The labor rate for feeding and cleaning equipment is currently hired at \$12.50 per hour, including benefits and employment taxes.

The producer recognizes that there will be an additional half hour per day of records management with the feeder but also estimates there will be a reduction of a half hour per day in management of labor. The labor rate for record and labor management is valued at \$16.00 per hour.

Current calf treatment rate is at 10% for all calves on milk for scours and respiratory. An anticipated slight increase in respiratory treatment rate in group housing is expected; producer will expect a 14% treatment rate.

The producer will expect a \$325 per year increase in electricity and maintenance over previous calf system. Cleaning and feeding supplies for the feeder is expected to increase by \$200 per year.

Partial Budget Analysis for 200 Cow Dairy

A partial budget considers changes to an operation due to installation of an automatic calf feeder including increased or decreased incomes or expenses. All costs are on an annual basis. In the sample analysis, there was no impact on increased income.

Decreased expenses that created a positive impact include feeding labor savings of 7 minutes per calf per day. This equates to financial savings of \$14,408 in calf feeding labor annually. Reduction in labor management time for the owner was valued at \$2,920. An expense that could decrease, but this scenario saw an increase is change in treatment rate due to moving to group housing. The decreased expenses and positive impacts due to reduced management labor and decreased days on feeder total \$19,811.

The negative impacts side included increased expenses as no decreased incomes are expected. The capital recovery cost of the feeder includes the depreciation and annual interest cost of owning the Automatic Calf Feeder. Depreciating the feeder out over ten years and charging 5.5% interest against the purchase value yields a cost of \$13,460 annually.

Increased insurance costs stem from the additional value to insure the feeder at a total of \$150. Additional milk replacer cost of \$5,453 and calf starter cost of \$570 is associated with increased feeding frequency and socialization. Increased utilities and supplies are associated with cleaning, repair, and feeding supplies for the automatic calf feeder. The increased expenses and negative impacts total \$23,108.

Net financial impact, which is the difference between the positive and negative impacts, is calculated at -\$3,297 for this example. But, quality of life improvements from a flexible management schedule and not being tied to a feeding schedule is valued at \$2,000. Valuing the ability to

micro manage the calves with the computer system at another \$750 annually, the net impact becomes -\$547. A longer term impact that needs to be considered and not exclusive to the automatic calf feeder is the potential for increased milk production. Research has shown an average increase of 1,500 lbs. of milk production when heifer calves were fed 50% more nutrients than a conventional feeding program during the pre-weaning stage. This may not be recognized in the automatic feeding system if increase in intake is not achieved or feeding levels were already high in previous feeding system. Using the all-milk price average for 2013 at \$19.30, this would be equal to \$18,240 for this scenario. The potential net financial impact including milk production gain, quality of life, and software totals \$17,693 annually once heifers start entering the milking string.

The adjusted value of the automatic calf feeder depends heavily on the variables used, value of the quality of life, and the ability to profit further from the computer software. Payback period is based on net financial impact plus additional return to software. Return to software would be additional revenue or decreased expenses not realized in the budget, so this is likely to be a profit or cash change as well thus influencing the potential actual payback period. An operation would not see a result for payback period unless the net financial impact plus additional return to software equates to a positive return. A positive return enables the operation to payback the net feeder and housing investment over the resulting period of years or calves per year.

Cash Flow Changes

The cash flow changes when evaluating the Automatic Calf Feeder must be differentiated from the net financial impact. The net financial impact in the partial budget focuses on all changes in incomes and expenses, whether paid in cash or not. The cash flow change only focuses on the sources and uses of cash.

In the sample farm, the net financial impact was -\$3,297, not considering value to quality of life or unknown factors with the calf management software. Since depreciation is not a cash cost, the capital recovery costs of \$13,460 needs to be added back and the principal and interest of the loan need to be deducted. In this example, a 10 year loan of \$65,000 was needed with an interest rate of 5.5%. The annual payment on this loan would be \$8,465, meaning the net cash flow would change by +\$2,289.

A second cash flow change from the partial budget is the difference between paid and unpaid labor. The net financial impact showed a labor savings of \$14,408. Subtracting paid labor from labor savings equals the amount of unpaid labor of \$592 which is a non-cash expense. This non-cash difference needs to be subtracted from the net financial impact to get to a net cash flow impact.

The labor and records management change in the partial budget showed no change.

So, the **net financial impact** of example was: -\$3,297

Principal and interest payment over the **capital recovery costs** adds: \$8,465

Adjustment for unpaid calf feeding labor and management for:

Records and labor management adds: \$592

Thus, the **total change in cash flow** using the net financial impact from the partial budget as a base is: +\$2,289

So, the net financial impact of -\$3,297 includes all changes of income and expenses including depreciation and unpaid labor. The change in cash flow considers principal and interest payments and subtracts out expenses such as unpaid labor that were not paid in cash.

In other words, when balanced with quality of life concerns and other positive financial assumptions, an Automatic Calf Feeder may or may not be a good investment both on a profit and cash flow basis due to the calf management software. This is highly dependable on labor savings and changes in calf intakes.

Sensitivity Analysis

The following depicts the change in financial impact as a dollar value and percent change when the tested variable was changed by a positive ten percent with all other variables held constant.

Variables	NFI \$ Change
Number of Calves on Feeder, annual	550
Estimated Cost of Automatic Calf Feeding Housing	1023
Estimated Cost per Automatic Calf Feeding Feeder	279
Estimated Cost of Optional Computer and Program	62
Years of Useful Life	1771
Value of Feeder after Useful Life	18
Interest Rate of Money	484
Insurance Rate per \$1,000 Value	15
Increased Insurance Value of Feeder System	15
Milk Replacer Cost per Pound of DM	546
Current Milk Replacer Intake	2143
Anticipated Milk Replacer Intake	2672
Current Days on Milk	6286
Current Number of Days in Weaning Stage	158
Anticipated Days on Milk	5470
Anticipated Days in Individual Starter Pen Stage	4
Anticipated Number of Days in Weaning Stage	505
Anticipated Dump Milk per Day	18
Calf Starter Cost per Pound of DM	57
Current Total Calf Starter Intake, Pounds of DM	513
Anticipated Total Calf Starter Intake, Pounds of DM	570
Current Feeding Labor Time Per Day	1615
Anticipated Feeding Labor Time Per Day	175
Current Calf Labor Management Per Day	1808
Anticipated Calf Labor Management Per Day	1561
Labor Rate for Feeding Calves	1440
Increased Hours for Record Management	292
Reduced Hours for Labor Management	292
Labor Rate for Records and Labor Management	215
Current Calf Treatment Rate	7
Anticipated Calf Treatment Rate	11
Cost of Treatments per Calf including labor	3
Anticipated Change in Electricity and Maintenance	33
Anticipated Change in Supplies and Repairs	53
The authors have used their best judgement and shall not be liable for any use of this software decision-making aid.	

Users are cautioned that slight changes in input values can dramatically influence the net financial impact of an Automatic Calf Feeder analysis. The table above shows net financial impact when changing input values by 10%. Change in days on milk and milk replacer intake are the most significant variables.

In summary, Automatic Calf Feeder variables require careful review in order to confidently make decisions as to what financial and cash flow impact the feeder will have on managing replacement animals.