

PARTIAL BUDGETING ANALYSIS OF ON-SITE CALF RAISING VERSUS OFF-SITE  
CALF RAISING

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## ABSTRACT

This study examined whether it is more cost effective for a dairyman who operates two dairies (A and B) in west Texas to own-raise or custom raise his dairy calves. The two dairies currently raise calves differently: calves are own raised on Dairy A and custom raised on Dairy B. Existing resources would allow a switch to own raising on Dairy B or custom raising by Dairy A, so an analysis of the comparative costs was appropriate.

This study analyzed information on key costs associated with own raising calves on Dairy A during a 135-day period in 2011. Because differences in revenues under the two calf-raising methods were minimal, revenue changes were ignored in this study. Data were collected through phone interviews with the dairy owner, based on existing record-keeping systems at the two dairies. The costs included feed, labor, health, equipment operations costs, opportunity costs and other miscellaneous costs. The total costs were analyzed using a partial budgeting approach during the period were estimated and used to calculate a cost per calf per day for own raising on Dairy A. This value was compared to the cost of custom raising based on existing contracts for Dairy B.

During the 135-day period examined, custom raising was less costly than own-raising: own-raising costs were \$2.45 per calf per day compared to \$2.23 per calf per day under current custom raising contracts. The total cost difference between own and custom raising for the period examined was more than \$15,000, or more than \$40,000 on an annual basis. This suggests that the owner of the dairies may find it advantageous to contract with the current custom raiser for the calves on Dairy A. However, the period of time for which data were available was limited, so cost data for a longer time period should be examined to reach a more definitive conclusion about the best management choice for this dairy owner.

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## CHAPTER I

### INTRODUCTION

According to Dairy Farming Today (2011), dairying is the number one agricultural business in many states. In California alone, milk production and dairy processing is a \$31 billion industry that employs over 400,000 people. California produces more milk than any other U.S. state, 21% of the more than 180 billion pounds of milk produced annually by the U.S. (Dairy Farming Today 2011). With the U.S. population relying on dairy farms nationwide to provide them with dairy products such as milk, cream, cheese, ice cream and butter, the care provided to dairy cows at all stages of their lives is important. The care provided to the dairy cows is also important for the dairy farm's financial performance.

Before the drastic downturn of the price of milk in 2009 and increased costs of feed, most dairymen had sufficient financial resources to ensure their animals were taken care of in the best possible way. Today, while dairymen still hold the animal's best interest above anything else, they must seek ways to reduce expenses to be able to stay in business. In addition, due to the volatility of milk prices, many dairy farms have suffered a dramatic loss in income during low-price or low-margin periods and have had to lower the size of their herds as well as cut back on other expenses or explore new, cheaper options with the way their business is run (Dairy Farming Today 2011). Dairy farms throughout the U.S. were affected by this downturn and many still struggle with the repercussions including reduced equity and challenges with debt service. Now more than ever, dairymen are searching out management alternatives to have the highest possible income, which typically involves reducing costs because opportunities to increase revenues per unit of milk produced are limited.

One area for potential cost savings for many dairymen is the way in which they raise their replacement animals. Many dairymen have a choice between raising their own replacement animals and contracting with another business to do so. For example, Dairyman X is the owner and operator of two dairies in West Texas. Dairy A has roughly 4,600 milking cows and Dairy B has roughly 5,300 milking cows. Dairy A averages 14 heifer calves born per day and Dairy B averages 16 heifer calves born in one day. He currently raises his own calves on Dairy A at the home farm and for Dairy B he sends his calves to an off-site location to be raised by a contractor. A key question is which of these approaches is less costly.

### STATEMENT OF THE PROBLEM

Because the two dairies use different approaches, it is likely that one is raising calves at a higher cost than necessary. Which dairy is using the more cost effective way of raising their calves, Dairy A or Dairy B?

### HYPOTHESIS

The hypothesis of this study is that it is less costly for Dairyman X to contract for calf raising. The flat rate charged per calf per month will decrease the dairy's expenses for calf raising by an estimated 10%, which will result in higher profitability.

## OBJECTIVES

1. To determine the costs of own-raising calves on the dairy operated by Dairyman X during a 135-day time period during 2011.
2. To determine the cost of custom raising calves during a 135-day time period during 2011.
3. To compare the costs of own-raising versus custom raising and determine which has the lower cost.

## SIGNIFICANCE OF THE STUDY

Dairymen all over the world are struggling to find ways to stay in business or to make their current business more profitable. Change in the dairy industry is inevitable, and therefore dairymen are always looking for more efficient and less expensive ways to run their business. The significance of this study will be to provide Dairyman X with the knowledge needed to determine whether on-site or off-site heifer raising is more cost effective. This information may also be useful to other dairymen, in part because it describes the calculations and costs necessary to assess the two options.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### INTRODUCTION

According to Dairy Farming Today (2011), nearly all dairy farms in the U.S. are family-owned and -operated and have been for many years. Dairying is a tradition that is passed down from generation to generation and will most likely remain that way for many years to come. It is an occupation that many people take pride in and is a job that means something to the dairyman and his family whether they are making a profit or not. The job of a dairyman requires them to always look after the animals and make sure they receive proper care and nourishment. This includes the practices by which their calves are raised. When raising calves, dairymen have the option to raise the dairy calves themselves or send them to a contract raiser. Both options have their advantages and disadvantages but some of the key questions to consider when deciding what to do are what environment is most suitable for the calves and which option is most profitable.

#### BACK TO BASICS

Pennington (2001) states that dairy heifers represent the future of any dairy herd. To appreciate the importance of heifer raising and how they are the future of the dairy herd, it is necessary to identify a dairy heifer at the various stages of her life (especially the stages of her first year) and be able to distinguish the names given to the animal depending on her age.

Poelo (2009) provides the names a female dairy animal is given based on her age and where she is in her production cycle (A male dairy animal is always called a bull no matter what stage of life he is in). Initially when the animal is born, she is labeled a *calf*. She will be called a calf until she reaches the appropriate weight for breeding or when she reaches fifteen months of age. The term *heifer* is also used frequently when referring to these animals. A heifer is a female that has not yet had a calf of its own (Poelo 2009). Typically, the animal will be considered a calf while young and a heifer when it reaches appropriate age for breeding. Poelo states that when the heifer is seven months pregnant for the first time it is called a *springer* and after she has a calf of her own for the first time she is “rightfully called a *cow*” and will continue to be called a cow for the rest of her life.

With the terminology as background, the importance that heifer raising has to the future of a dairy farm is of interest. Some main issues that dairymen must address are whether the calf should be raised on-site or off-site, whether these environments are similar and which approach would be less costly for the dairy.

## ENVIRONMENT

Whichever method is chosen, the health of the calves is very important. A clean and safe environment is absolutely necessary and if foregone, the health of the animal will be in serious jeopardy. According to Poelo (2009), when calves are younger, they do not have a strong immune system. She also states that it takes weeks for the calves to develop sufficient immunity to fight off potential disease. For this reason alone, it is important to care for the calves in a clean environment. If the calves get sick, the probability of death is increased drastically. It therefore

makes sense to make sure they are raised in the best possible and most suitable environment, and for many dairies there is a choice between own-raising and custom raising.

All dairymen have to consider what is best for the calf when deciding if they should raise the calves themselves or send them to a calf ranch. Many problems can arise when raising dairy calves, such as poor living conditions, illness, disease and death. Goodger and Theodore (1986) explain that a clean environment is very important in raising calves. The dirtier the environment, the more likely it will be that the calves will get sick or die. So making sure the area where the calves are born on a dairy is clean is the first of many important factors to consider in making sure the calves get on the right start to a healthy life.

According to Amaral-Phillips (2009), the housing environment provided for the calves is another important factor to consider when raising these animals. She states that calves need warm, draft-free housing because for the first two weeks of life, calves spend 75%-80% of their time lying down (Amaral-Phillips 2009). Newborn calves have very little body fat and consequently their comfort zone is between 50°F and 78 °F. By a month of age, a calf's comfort zone widens and is between 32°F and 73 °F. Thus, during cooler temperatures young calves need to be bedded with straw. Straw allows the calf to “nest” into the straw and stay warm. Studies have shown that nesting where the calf's legs are covered by the straw decrease the incidence of respiratory disease. While straw is a good practice for the calves during colder weather it is also important to make sure the bedding is clean, as wet bedding would be no help to the calf if it is cold outside (Hibma 2011). During the summer when temperatures are greater than 80 °F, shade cloth or some sort of covering over the calf hutches can help modulate heat stress and improve the immunity of calves as well as it protects the calves from the intense sunlight (Amaral-Phillips 2009).

A clean and sterile housing environment for the calves is critical to ensure a healthy life. If the calves are not taken care of properly, this can significantly disrupt the functioning of the dairy. Cows do not live forever, so it is the dairyman's job to make sure his future generation of dairy heifers grow up to be healthy animals. By following some of the basic steps mentioned above to maintain a healthy environment, the dairyman will be able to do so.

### ON-SITE VERSUS OFF-SITE CALF RAISING

The two methods available to most dairymen are to raise calves on-site or to contract raise calves off-site. Both options have advantages and disadvantages. Contract raising is when the dairyman sends his dairy calves to a ranch where someone else will then raise the calves for him for a specific period of time (usually between three and six months) and then the calves are brought back to the dairyman where he will continue to raise them and care for them himself (APHIS 2007). Clearly, it is important to select a contract raiser who has the appropriate skills and experience and who can be trusted (Benson 2002). Some contract raisers are dairymen themselves which means have the necessary experience and would make them more qualified than someone who does not have this experience.

After determining if the contract raiser is qualified or not, before going into business with him, a contract must be drawn up between the dairyman (owner) and the contractor (grower). According to Benson (2002), several contract elements are essential. These include:

1. The individuals involved in the agreement, that is, the dairy farmer who owns the cattle and the grower, who will raise them, should be clearly identified.
2. The length of the contract time should be specified.

3. The animals covered by the agreement should be clearly identified, for example, by head count and by means of a permanent numbering system such as branding or by a written or photographic description.

4. The agreement should specify who owns the animals.

5. The basis for the payments to the grower must be described together with the frequency and timing of payments. The amount of each payment must be specified and will reflect the specific features of the agreement. Payment rates may vary over the life of the contract, for example, to reflect differences in raising costs for animals of different ages.

6. The contract should specify the basis for accepting or rejecting any of the animals delivered to the grower, including age, weight and health.

7. Some death loss is likely, so the agreement should specify who will absorb the costs associated with these deaths, including the value of the animal and the raising costs previously incurred.

8. The contract should specify when and by whom the heifers will be delivered to the grower and returned to the producer.

9. To protect each party from unrelated liabilities, the agreement should state that no partnership or joint business venture is created and that compliance with environmental regulations is the responsibility of the grower.

10. Other provisions should be clearly stated, including dispute settlement procedures.

As for all types of business arrangements, contracts should be in writing, drawn up by an attorney and should cover all of the animals being raised under contract. Even when the contract covers many contingencies that should ease the mind of the dairyman, contract raising can still have positive and negative effects on the dairy herd.

According to the APHIS (2007), it can be cost efficient to send heifers to a calf ranch because one flat rate per calf is charged regardless of miscellaneous expenses the calf incurs. That is, the calf ranch often assumes the risks of cost increases that a dairyman who chooses to own-raise his calves would have to assume. Also, calf ranch employees are there solely to take care of the calf and can focus their attention to only them. This can make a difference to the quality of care because in most cases on a dairy farm, the employees take care of the calves as well as the cows. At an off-site location, the employees are able to put all of their time and effort into caring for the calves. Another advantage is that contract raising allows the dairyman to focus more on the milking herd of his dairy. It can also free up a lot of corral space on the dairy so that the dairyman could possibly increase his milking herd or explore other options.

Nevertheless, there are disadvantages to off-site heifer raising that makes on-site heifer raising seem like the better method. One major downside to sending calves away is the increased risk of those calves bringing back a disease to the home dairy (APHIS 2007). One infected calf can spread illness to the rest of the calves. Another major disadvantage to sending calves away is the loss of control over how to raise the calves (Pennington 2001). If the calves are being raised at home, the dairyman would have complete control of what he feeds them and the environment of which they live in. If sent away, the dairyman may not see the calves again for six months or more. This limits control over what calves are fed and the over vaccinations and medicines administered. Some dairymen prefer not to relinquish control over these important practices. Although contract raising can be a feasible and convenient option for most dairymen, there still are dairymen that would rather raise their heifers themselves.

## FINANCIAL ASPECTS

The cost of raising a dairy heifer is a very important factor to consider when deciding how the heifer should be raised. "The cost of raising dairy heifers varies dramatically, and the economics of raising heifers depends on several financial decisions" (Pennington 2001). A number of previous studies have examined the costs of raising calves and heifers. Benson (2002) did a study of costs associated with heifer raising and concluded that because all dairies are run and operated differently, it is hard to determine whether contract raising is always less or more expensive. Even if custom raising typically is more expensive, it could sometimes be beneficial for the dairyman to contract raise his calves to avoid unexpected expenses that could arise while own-raising. On the other hand, if the dairy operation does not own the equipment and supplies necessary or have the space to raise the calves, alternative supplies and land must be purchased or leased in order to begin raising calves at the home farm, which would usually make off-site raising a better method.

A number of previous studies have examined the costs of raising heifers. Although these analyses consider a longer time horizon the methods and findings are relevant for calf raising also. "Heifer costs are the second largest behind feed costs in the annual operating expenses of a dairy farm" (Tozer and Heinrichs 2001). They state that two of the many factors that need to be considered when rearing your calves are the costs directly associated with growing the heifers and the number of heifers grown. The most important costs are feed, reproduction expenses, health, housing and labor. Benson (2002) explains in his study that a partial budget is necessary to "estimate the changes on costs and income." He breaks down the estimated cost of heifer raising over a 24-month period, and the expenses incurred in raising dairy calves are roughly \$1500 per calf (including the initial value of the newborn calf). The average cost per day to raise

a calf is estimated at \$1.71. (This amount does not include the unforeseen expenses such as medicines or special food that may be involved.) Benson arrived to the \$1.71 amount by taking all costs typically involved in own-raising dairy heifers, added them together and divided by the number of calf-days to calculate average cost per day for each heifer. The variables Benson considered included costs such as feed, water usage, labor, equipment, medicines and vaccinations, bedding and other miscellaneous costs such as the process of dehorning the calves. The data used in this study were estimated based on past research and accumulated experience. The difference between Benson's study and the current one is that Benson did not compare own-raising costs to contract raising. According to Pennington (2001), it often is cheaper for calves to be contracted with a calf ranch than for the calves to be grown on the home dairy. In most cases, the calf ranch charges one flat, fixed amount per calf once or twice a month, depending on what the contract states. For example, the rate in the Southern California area for contract calf raising at present is roughly \$2.25 per head per day. Contract raising could save the dairyman money because fluctuations in feed and other inputs could mean that in some months it may be more expensive to raise the calves at home than other months.

Another study that examined the costs of heifer raising was done by Karszes, Wicksat and Vokey (2007). These individuals from Cornell Cooperative Extension conducted a survey in 2007 that involved seventeen participating farms. The study described the various costs associated with raising dairy heifers (rather than just calves) and also suggested "opportunities where costs can be decreased, where efficiencies can be improved, and the quality of animals entering the dairy herd maximized" (Karszes et al 2007). Although the purpose of this study is to examine all of the expenses involved in heifer raising, it also "highlights the main expense areas"

that could allow dairymen to change production practices to lower total monthly costs (Karszes et al 2007).

The study grouped the heifers from the seventeen participating farms based on rations of feed being consumed and the age of the heifers. The study also examined previous years' heifer records, and assumed that the prices for the inputs involved would remain the same for the whole period (despite the fact that many prices in the dairy industry change daily). The heifers being considered in the case study are 24 months old, rather than the 135-day period considered for the present study.

The results of the case study show that to own-raise one dairy heifer for one day, it will cost roughly \$2.49. The top three expenses are listed along with their individual totals are as follows:

- Feed- \$1.281 (51%)
- Labor- \$0.333 (13%)
- Interest on Daily Investment- \$0.196 (8%)
- Other Expenses- \$0.68 (28%)

According to the information above, it is apparent that with regard to this case study, the main expenses involved in own-raising dairy heifers are feed and labor, which will be key to examine in this study. Comparing the current study's financial information to previous studies allows an assessment of the accuracy and implications of the findings.

## PARTIAL BUDGET ANALYSIS

A number of methods can be used to assess the decisions to own raise or custom raise calves. One of these methods is a partial budget. According to Alimi and Manyong (2000), a partial budget is "a farm management method that is intended to assist researchers, extensionists,

and farmers in the decision-making process." According Kay (2008), a partial budget provides a formal and consistent method for calculating the expected change in profit from a proposed change in the farm business.

A partial budget consists of costs or expenses and sales and revenues (Kay et al 2008). The costs and revenues needed for a partial budget can be identified by considering the following four questions about a proposed change in management practices (such as switching from own raising to contract raising of calves):

1. What new or additional costs will be incurred?
2. What current costs will be reduced or eliminated?
3. What new or additional revenue will be received?
4. What current revenue will be lost or reduced?

The format of a partial budget varies depending on the preference of the user. However, the additional costs, reduced revenue, additional revenue and reduced costs are always included in a partial budget no matter what the layout or organizational methods may be (Kay et al 2008). Aside from considering these four categories, Alimi and Manyong (2000) state that it is necessary to consider the availability of required additional production resources such as labor, credit, skill, farmland and equipment as they will come into play when determining which option is more feasible for the business. Thus, it is usually possible to develop a partial budget, but the method is more useful when the resources needed to implement the changes are available.

Aside from using a partial budget to determine which method is more cost effective, there are other approaches that can be considered. One alternate approach is a statistical analysis that would collect data from more than one dairy and compute the average cost of raising a dairy heifer per day and (or) for contract raising. An example of this approach would be the case study

discussed in the previous section done by Karszes, Wickswat and Vokey (2007). Another alternate approach that could be used is called whole-farm planning. As discussed by Kay (2008), whole-farm planning is an outline or summary of the production to be carried out on the entire farm and the resources needed to do it. It may contain sufficient detail to include fertilizer, seed, and pesticide application rates and actual feed rations for livestock, or it may simply list the enterprises to be carried out and their desired levels of production. When the expected costs and returns for each part of the plan are organized into a detailed projection, the result is a *whole-farm budget* (Kay et al 2008). A whole-farm budget would project income and expenses for a particular farm plan which in this case would include either custom raising or own raising. By preparing two plans, one can determine which method is more cost effective. Although these two alternative approaches would be helpful in determining which method is better, the partial budget approach is more appropriate here because it directly addresses the question of cost effectiveness for one specific dairy.

## CHAPTER III

### METHODOLOGY

#### INTRODUCTION

Dairyman X has requested this study in the hopes of improving the profitability of his business through the choice of calf-raising practices. He currently uses both own and custom raising and would like to know which approach costs less (and by how much the costs differ). Thus, this study will determine the expenses associated with calf raising and compare them to the costs for custom raising.

#### PROCEDURES FOR DATA COLLECTION

For this study, the two calf raising methods will be compared. Dairy A own-raises dairy calves while Dairy B custom raises calves. Thus, data needed for this study include any costs and revenues associated with the calf raising operations for both Dairy A and Dairy B. The main source of the information provided in this study will be provided directly by the dairy owner via phone interviews and email. The data needed for this study will be the records from Dairy A and Dairy B for the period of May 1, 2011 to September 12, 2011.

The period considered for Dairy A will be 135 days because that is the number of days that calves from Dairy B spend at the off-site location. It is necessary for the costs from both dairies to be expressed on a per calf per day basis to facilitate comparisons between the farms and with previous studies such as Benson's (2002) and Karszes, Wickswat and Vokey's (2007). The information received from Dairyman X is the total amount of expenses that he spends on his calf operation at Dairy A and the cost per calf per day for calves from Dairy B under contract

with the calf ranch. The main expense categories that need to be included for the calf operation of Dairy A are:

- Labor
- Feed
- Health
- Equipment operation
- Water
- Bedding
- Insurance
- Building
- Transportation
- Opportunity costs

Once the initial data are received from the dairyman for Dairy A, the cost per calf per day can be calculated by taking the total cost and dividing it by the total number of calves and then again by the total number of days associated with the selected time period. The expenses for Dairy B will be a fixed rate that is stated in the contract that Dairyman X has with the custom raiser. Under the contract, the rate is per calf per day, which means that no matter how many calves are sent to the off-site location, the amount per calf is the same and that changes in input prices will not affect what Dairyman X pays. Included in the fixed rate per calf per day is a fee the dairyman pays to have his calves delivered back to the dairy.

As noted in Chapter 2, in a typical partial budget, revenues are included into the calculations. However, for this partial budget, neither Dairy A or Dairy B have a calf operation

that directly generates any income so the revenue component of the partial budget will not be considered.

### PROCEDURES FOR DATA ANALYSIS

The main goal of this study is to provide Dairyman X with the information necessary to determine which option is best for him. A typical partial budget will compare the changes in revenues and costs of a new practice compared to current practices. In this case, the analysis compares two practices currently used on two different farms operated by the same owner. Under the assumption that the cost per calf per day of Dairy A to custom raise would be equal to the cost Dairy B currently is paying per calf and that the cost Dairy B would have to pay to own-raise would be equal to the cost Dairy A is currently paying per calf to own-raise, a comparison of the costs of custom raising versus own-raising is the same thing as a partial budget that compares current and alternative practices on Dairies A and B.

The main cost categories involved in this study are feed and labor with some other important costs being health and equipment operation (Table 1). The total feed cost is a combination of powdered milk, alfalfa and grain. Powdered milk costs will be calculated based on of the number of bags used per day (calves on Dairy A only consume powdered milk in their diet for the first 48 days of the collection period) and the cost per bag. The total cost calculation will be the number of bags used multiplied by the total cost. Because powdered milk is not a component of calf diets beyond 48 days, these costs occur early in calf raising. Alfalfa costs will be calculated based on the pounds fed per day, converted to total tons and multiplied by the average price per ton during the period. Grain fed is a pre-mix, and costs are calculated based on total pounds fed per day converted to total tons during the period multiplied by the average price

per ton. In contrast to powdered milk, grain is fed later in the calf's life, so these costs are incurred between day 26 and day 135.

Table 1. Calculations for Own Calf-Raising Costs Considered in This Study

Cost Item	Calculation Description
Feed, lbs	
Powdered Milk (bags)	$(\# \text{ of bags} * \# \text{ of days})(\text{Cost per Bag})$
Alfalfa	$(\text{Pounds per Calf} * \# \text{ Number of Days}) * (\text{Cost/lb})$
Grain	$(\text{Pounds per Calf} * \# \text{ Number of Days}) * (\text{Cost/lb})$
Labor, hrs	
Hired (5 workers)	$(\# \text{ of Hours/worker/day}) * (\# \text{ of workers}) * (\# \text{ of days}) * (\text{total wages/total hours})$
Owner-operator	$(\# \text{ of Hours/\# of days}) * (\# \text{ of days}) * (\text{Total Wage/Total Hours})$
Water, gallons	$(\text{Water Usage/day}) * (\# \text{ of Days}) * (\text{Cost/ gallon})$
Bedding (tons)	$(\text{Cotton Burr Usage/day}) * (\# \text{ of Days}) * (\text{Cost/ton})$
Health <sup>a</sup>	$(\text{Health Usage}) * (\# \text{ of Days}) * (\text{Cost/day})$
Buildings (Operation)	See Table 2
Equipment Operation	
Feed Truck, hrs	$(\text{Hours/day}) * (\# \text{ of Days}) * (\text{Cost/hour})$
Small Tractor, hrs	$(\text{Hours/day}) * (\# \text{ of Days}) * (\text{Cost/hour})$
Insurance	
Facility (fixed per month)	Total value obtained directly from dairyman
Employee (fixed per month)	Total value obtained directly from dairyman
Transportation	Total value obtained directly from dairyman
Interest charges on borrowing for calf assets	Total value obtained directly from dairyman
Opportunity Cost	See Table 3

<sup>a</sup> Health includes: dehorning, medicine, vaccinations, hoof trimming etc.

The total labor cost will be calculated based on the number of paid employees working entirely with calves and the average number of hours per day worked. These labor costs include both salary and fringe benefit costs. Another cost involved with labor is the owner/manager's labor, which will also be based on the hours worked per day on calf raising. For both hired and

owner/operator labor, an hourly wage equivalent including benefits was multiplied by the number of hours worked during the period to estimate total costs.

The health category contains all of the expenses associated with the health of the animals. This includes costs such as: dehorning expenses, hoof trimming expenses and vaccination and medicines expenses. This amount varies depending on the calf, so an average value is calculated. Thus, total health costs for calves during the period will be summed and divided by the total number of calves produced.

Equipment costs include two pieces of equipment that Dairy A uses for their calf operation. One piece of equipment is a small tractor that is used for the moving of manure, bedding, straw and any other miscellaneous materials. The other piece of equipment is the feed truck that is used for combining the alfalfa with the grain pre-mix. The information needed for the equipment calculation will be the hours used per day and how much it costs to run each piece of equipment per day. The usage of the equipment will be calculated by determining how many hours per day the equipment is used specifically for the calf operation. This number varies depending on the day, but for purposes of this study, the number taken will be the average amount used per day during the 135-day period.

The annualized cost of the buildings and opportunity costs require somewhat different calculations (Tables 2 and 3). For the annualized cost, the initial cost of the buildings (calf hutches) need to be found, along with the interest rate the dairy uses and the remaining value that the dairyman thinks the calf hutches have left. After the fixed amount data has been received from the dairyman, these numbers will then be inserted into the formula found in Table 3.

The opportunity cost will be calculated based on the dairies calf-operation assets, calf-operation liabilities and calf-operation equity. Assets include what the dairy owns such as: calf

hutches, feed and the animals. Liabilities include what the dairy currently owes which for purposes of this study is 60% of calf-operation assets. When using the basic accounting equation, (Assets = Liabilities + Owners Equity) the amount of equity in the calf operation will be 40% of calf-operation assets. Other costs (Table 1) involved in calf raising tend to be a smaller proportion of the overall total or are reported by the dairyman as total value for the 135-day period, and are not described in detail.

In essence, all of the total cost categories will be calculated as the total use for calf raising during the period multiplied by the average unit cost during the period. Dividing this total per-period cost by the number of days per period will result in a total cost per calf per day to own raise calves, which can be compared to the cost of custom-raising to determine which method is most cost efficient.

Formatting the partial budget is most easily done using a program such as Microsoft Office Excel, but could also be done by hand on a piece of paper. In this case, the researcher will use Excel to create the partial budget. This spreadsheet will include the specific numerical calculations required based on the basic information and the procedures described above. Additional specific descriptions for the calculations indicate some of the specific formulas (Table 1).

Table 2. Annualized Cost Calculations for Own Raising of Calves

Component of Annualized Cost	Calculation Description
Annualized Cost	$(IC - PVS) * [(1+i)^n * i / (1+i)^n - 1]$
Initial Cost	Fixed Amount
Salvage Value	$(\% \text{ remaining}) * (\text{Initial Cost})$
Present Value of Salvage Value	$\text{Salvage Value} / (1+i)^n$

Interest Rate	Fixed Amount
Years of Useful Life	Fixed Amount
Annualized Cost per year	$(IC-PVSV)*[(1+i)^n *i/ (1+i) ^n -1]$
Annualized Cost for period	$(AC \text{ per year}/365)*\text{days in period}$

Table 3. Opportunity Cost Calculation for Own Raising of Calves

Opportunity Cost Component	Calculation Description
Value of Calf Raising Assets	Cost of Land + Cost of Well + Supplies + Equipment + Feed storage + Calf Hutches
Value of Liabilities for Calf Raising	60% Calf Raising Assets
Equity Capital in Calf Raising	40% Calf Raising Assets
Interest Rate for Equity Capital	Fixed Amount
Charge for Equity Capital	Equity Capital in Calf Raising * Interest Rate for Equity Capital

Once the spreadsheet includes the complete cost information, the total cost per calf per day can then be calculated for Dairy A taking the Total Cost and dividing by the number of calves at Dairy A and dividing that number by the number of days in the selected period. This can then be compared to the amount Dairy B pays per calf per day under contracts with the current custom raiser. A simplified version of the way the spreadsheet will look for the comparison of Dairy A and Dairy B can be found below in Table 4.

Table 4. Partial Budget Lay-out Example for Comparison of Own Raising and Custom Raising Calves

Expense Item	Value, \$
Dairy A (own-raising)	
All Expenses	\$\$\$
<b>Total Expense Dairy A</b>	<b>\$\$\$</b>
Dairy B (custom-raising)	
All Expenses	\$\$\$
<b>Total Expense Dairy B</b>	<b>\$\$\$</b>
<b>Difference</b>	<b>\$\$\$</b>

First and foremost, before the total cost can be calculated for Dairy A (own-raising), the researcher requires the total number of calves raised within the 135-day period, which is 522 calves. For Dairy B, the researcher must do the same thing and find the number of calves sent to the off-site location during the selected period, which is 653. A table with this information can be found below and will be referred back to throughout the remainder of the study.

Table 5 Own-Raised and Custom-Raised Data

Information on Calf Data	Own-Raised	Custom Raised
Beginning time	5/1/2011	5/1/2011
Ending time	9/12/2011	9/12/2011
Total Days	135	135
Total calves produced	522	653
Total Calf-days	70,470	88,155

After the partial budget is created, the researcher will be able to determine which option is more cost effective based on the difference between the two methods. The information found about the costs will facilitate a broader discussion of the pros and cons for both methods.

### SUPPORTING/REJECTING THE HYPOTHESIS

Support for the hypothesis means that the costs of custom raising will be lower than those for own raising. If the costs of own raising are less than those for custom raising, the hypothesis would be rejected

### ASSUMPTIONS/LIMITATIONS

This study assumes that no drastic changes in prices occurred the period of data collection. For this study it is also assumed that for Dairy A and Dairy B, they both have the adequate of room to raise the calves on the home farm if that option is chosen. This study also assumes that the time period is a relatively short 135 days, and that the calves reach an equivalent state of growth and maturity in that time period as owned raised or custom raised. A limitation to this study is that this study cannot be generalized to other dairies because the costs of both options are specific to this one dairy. Another limitation is that the study examines only a relatively short time period. If costs for own raising or custom raising vary over time, the results of this study could differ for other time periods. Finally, this study does not consider any other management changes, such as the use of existing calf-raising resources for other purposes.

## CHAPTER IV

### DEVELOPMENT OF THE STUDY

#### INTRODUCTION

In the development of the study, the researcher was able to obtain all of the information necessary to fulfill the study's main objectives through phone interviews. The data collected will make the researcher come to a decision on which alternative is more cost effective.

#### ANALYSIS

The completed spreadsheet contains the total amounts required to compare the two calf-raising methods considered in this study. The numerical results use the formulas and reported values discussed in Chapter 3.

A set of calculations needed to be done to calculate the costs for the 135-day period of equipment and opportunity costs. The researcher was given the initial cost of \$175,000.00, a salvage value of 60% of the initial value, the interest rate amount of 3.75% and the number of remaining years of useful life equal 11 (Table 6). With these data, the annualized equipment costs for the period were \$3,281.88, which accounts for roughly 2% of the total costs. The opportunity costs of equity invested in calf raising equaled \$3,927.95 (Table 7). This calculation used the value of calf-raising assets of \$708,000, and liabilities equal to 60% of the value of calf-raising assets. The resulting equity value of \$283,200 was multiplied by the interest rate of 3.75% to get the annualized opportunity cost of \$10,620. Adjusted for the 135-day period, the opportunity cost was 3,927.95, which was roughly 2% of total costs. The proportion of total costs for annualized cost of the buildings and equipment from this study is similar to those from previous studies (Benson, 2002, Karszes et al, 2007). However, previous studies show higher opportunity costs of 8% of the total rather than 2% for this study

Table 6 Annualized Costa Calculation for Buildings and Equipment

Annualized Cost <sup>a</sup> Item	Value
Initial Cost, \$	175,000
Salvage Value <sup>b</sup> , \$	105,000
Interest Rate, %/year	3.75%
Useful life, years	11
Present Value of Salvage Value <sup>c</sup> , \$	70,000
Annualized Cost per year, \$/year	8,873
Annualized Cost for period <sup>d</sup> , \$/period	3,282

<sup>a</sup> The Annualized Cost is calculated as  $AC = (IC - PVSV) * (((1+i)^n * i) / ((1+i)^n - 1))$  based on Monke and Pearson (1989).

<sup>b</sup> The Salvage Value is assumed to be 60% of the Initial Cost based on information provided by Dairyman X.

<sup>c</sup> The Present Value of Salvage value is calculated as  $PVSV = SV / (1+i)^n$  based on Monke and Pearson (1989)

<sup>d</sup> The Annualized cost for the period multiplies the annual cost by 135 divided by 365.

Table 7 Opportunity Cost Calculation for Equity Capital Used in Calf Raising

Opportunity Cost Item	Value
Value of calf-raising assets, \$	708,000
Value of liabilities for calf-raising, \$	424,800
Equity capital in calf-raising, \$	283,200
Interest rate for equity capital, %/year	3.75%
Charge for equity capital <sup>a</sup> , \$/year	10,620
Charge for equity capital for period <sup>b</sup> , \$/period	3,928

<sup>a</sup> Charge for equity capital equals equity capital times interest rate.

<sup>b</sup> The charge for equity capital for the period multiplies the charge for equity capital by 135 and divides by 365.

Similar to previous studies, feed expenses account for the largest proportion of own calf-raising expenses (41%; Table 8). Powdered milk accounted for 22% of total costs, alfalfa 4% and grain 16%. Compared with the study by Karszes, Wickswat and Vokey (2007), labor amounts to

31% of total expenses for own raising, with paid employees (30%) by far the most important component. The proportion of costs in this study is much higher than that for Karszes, Wickswat and Vokey, who reported labor costs equal to only 13% of the total. A reason for this difference is that their study considered smaller dairies whereas the current study examined one larger dairy. Another reason is that the dairies examined in their study have more expenses in other categories.

The total cost for powdered milk is \$37,458.72, which equals \$0.53 per calf per day (Table 8). The total cost for alfalfa is \$6,167.22 (\$0.09 per calf per day). The last component of feed is grain, which is a pre-mix. The total cost for grain is \$27,659.04 (\$0.39 per calf per day). The total cost for the employees is \$52,380 and the total cost for the manger is \$385.71. Overall, labor costs are \$0.75 per calf per day. Other total costs equaled \$20,214.00 (\$0.21 per calf per day) for equipment operation, \$35.00 per head (\$0.26 per calf per day for health) \$38.05 (\$0.00 per calf per day) for water, \$945.00 (\$0.01 per calf per day) for bedding, \$864.98 (\$0.00 per calf per day) for insurance on the employees and buildings, \$582.25 (\$0.00 per calf per day) for the transportation of moving calves into different corrals on the same dairy, and \$497.43 (\$0.00 per calf per day) for interest charges on borrowing for calf assets.

Table 8 Own-Raised and Custom Raised Partial Budget

	Total Use During Period	Unit Cost	Total Cost	Percent of Total	Cost per calf	Cost per calf per Day
<i>Own-Raised (Dairy A)</i>						
Feed, lbs						
Powdered Milk (bags)	501.12	\$74.75	\$37,458.72	29%	\$71.76	\$ 0.53
Alfalfa (Ton)	22.03	\$280.00	\$6,168.40	5%	\$11.82	\$ 0.09

Grain (Tons)	94.88	\$291.52	\$27,659.42	22%	\$52.99	\$ 0.39
				<b>41%</b>		
Labor, hrs						
Hired (5 men @ 388 day)	6,075.00	\$8.62	\$52,380.00	41%	\$100.34	\$ 0.74
Owner-operator (1 @.71 hours a day)	19.29	\$20.00	\$385.70	0.30%	\$0.74	\$ 0.01
				<b>31%</b>		
Opportunity Cost			\$3,927.95	<b>3%</b>	\$7.52	\$ 0.06
Other Costs:						
Water, gallons	281,880.00	\$0.00	\$38.05	<b>0%</b>	\$0.07	\$ -
Bedding (tons)	27.00	\$35.00	\$945.00	<b>1%</b>	\$1.81	\$ 0.01
Health (\$35 a head for 135 days)	522.00	\$35.00	\$18,270.00	<b>14%</b>	\$35.00	\$ 0.26
Buildings (Operation)			\$3,281.88	<b>3%</b>	\$6.29	\$ 0.05
Equipment Operation						
Feed Truck, hrs	270.00	\$45.00	\$12,150.00	9%	\$23.28	\$ 0.17
Small Tractor, hrs	288.00	\$28.00	\$8,064.00	6%	\$15.45	\$ 0.11
				<b>12%</b>		
Insurance						
Facility (fixed per month)		\$184.75	\$184.75	0%	\$0.35	\$ -
Employee (fixed per month)		\$680.23	\$680.23	1%	\$1.30	\$ 0.01
				<b>1%</b>		
Transportation (hours)	6.85	\$85.00	\$582.25	<b>0%</b>	\$1.12	\$ 0.01
Interest charges on borrowing for calf assets		\$497.43	\$497.43	<b>0%</b>	\$0.95	\$ 0.01
Total			\$127,980.19	100%	\$330.79	\$ 2.45
<i>Custom Raised (Dairy B)</i>						
			Total Cost	Percent of Total	Cost per calf	Cost per calf per Day
Cost based on contract			\$ 196,585.65	100%	\$301.05	\$ 2.23
Difference of Dairy A and Dairy B			\$ (68,605.46)		\$29.74	<b>\$ 0.22</b>

Total costs for the 135-day period are \$172,672.24 (Table 8). Based on the analysis of relevant cost components, the total cost for Dairyman X to raise calves on-site is \$2.45 per calf per day. The per calf-day cost for Dairy B was obtained from contract information provided by Dairyman X. The total amount is \$2.23 per calf-day, which includes \$2.15 per calf-day for actual raising and \$0.08 per calf-day for transportation from the custom-raising operation back to

Dairy B. In Chapter 2, the researcher gave a \$2.25 per calf per day value for the Southern California area, based on information provided by dairyman in that area about what they are currently paying for custom. The values in this study and those reported by southern California dairymen are all very similar. The study done by Karszes, Wickswat and Vokey shows the cost per calf per day to be \$1.45 and the study done by Benson shows a very close number of \$1.48. Some of these differences may be due to the different time periods, but others are likely due to different cost structures in the eastern and western US. Although the per calf-day value is the most relevant to compare custom to own raising, it is also of interest to calculate the total custom-raising expenses. To calculate this, the cost per calf-day was multiplied by the number of days. This yields a total of nearly \$200,000 during the 135-day period (Table 9)

Table 9 Total Cost Calculation for Custom Raising Dairy Calves

Custom Raising Cost Item	Value
Cost per calf-day, \$/day	2.23
Number of Days	135
Number of Calves	653
Total Cost for Period, \$	196,585

Finally, determining the difference between the cost for the two calf-raising methods is a key objective of this study. The difference between Dairy A to own-raise (\$2.45) and for Dairy B to custom-raise (\$2.23) is \$0.22. Thus, during the period for which data were collected Dairy A paid more to own-raise dairy calves than Dairy B did to custom-raise them. If Dairy A switched to custom raising, their total cost would be \$157,148.10 (Table 10) which when compared to what their current total cost is comes out to being \$172,673.78 giving a total savings of \$15,525.68.

Table 10 Total Cost Calculation if Dairy A were to switch to Custom Raising Dairy Calves

Cost Item	Value
Cost per calf-day, \$/day	2.23
Number of Days	135
Number of Calves	522
Total cost for Period, \$/period	157,148
Total cost for Period own-raising, \$/period	

## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### SUMMARY

A partial budget was developed to determine the cost differences between own-raising dairy calves and custom-raising dairy calves for a Dairyman X who lives in West Texas. The researcher collected the data necessary to analyze the two options in interviews with the dairyman. The total costs and costs per calf-day were calculated and compared for the two options. The costs included were feed, labor, water, bedding, building operation, health, equipment operation, interest charges and opportunity costs. Two cost categories (feed and labor) contributed over 70% of the total costs of own raising calves on Dairy A. Feed consisted of 41% and labor consisted of 31%. The key result from this study is that own-raising calves on Dairy A is roughly \$0.22 more expensive per calf-day than custom-raising dairy calves. If Dairy A had custom raised the same number of calves during the 135-day period examined in this study, total could savings would have been \$15,525.68. Although this is a small proportion of the total overall costs for the dairy, switching to custom raising could lower costs by more than \$40,000 on an annual basis, assuming that the relative costs here remain the same in the future.

### CONCLUSIONS

It was found that Dairy A raises their calves at higher cost than does Dairy B by sending their calves to an off-site location. In agreement with the hypothesis, Dairy A can incur less cost per calf per day by custom raising their dairy calves as Dairy B currently does. Also largely in agreement with the hypothesis, difference in cost per calf-day is about 10% (9.86%) of the current cost-per calf-day of \$2.23.

## RECOMMENDATIONS

An appropriate recommendation would be to evaluate the costs over a longer time period. Sudden or unexpected costs could be an issue for own raising as no one ever knows when a dramatic price spike will happen. A longer time period (like a year or two) would improve the accuracy the analysis. Also, the study was done from May to September. It might be helpful to take data from a different time period to see if it is more or less costly depending on the time of year.

Another recommendation is to have a larger sample size, if the objective is to make more general recommendations to a broader audience of dairymen. This study only considers one dairyman with two dairies, so it is not possible to generalize from the results and provide information that may helpful to other dairymen. A study of perhaps 20 or more dairies in West Texas would provide information that could encourage other dairymen to evaluate alternatives more specifically.

## REFERENCES CITED

- Alimi, T., and V.M. Manyong. 2000. "Partial Budget Analysis for On-Farm Research." *Nigeria: International Institution of Tropical Agriculture*. Print.
- Amaral-Phillips, Donna. 2009. "Raising Healthy Dairy Calves." *University of Kentucky*.  
October.  
(<http://www.uky.edu/Ag/AnimalSciences/dairy/newsletters/2009jan/2009jan.pdf>)
- APHIS. 2007. *Off-Site Heifer Raising on U.S. Dairy Operations 2007*. United States Department of Agriculture. pp 1-4.
- Benson, Geoff. Nov. 2002. "Contract Raising Heifers." *Department of Agriculture and Resource Economics Factsheet #21*. North Carolina State University. October. (<http://www.ag-econ.ncsu.edu/faculty/benson/factsheet21.PDF>).
- Dairy Farming Today. "Facts and Figures." *Dairy Farmers - Dairy Farming Today*. 2011. Web. 28 Nov. 2011.
- De Passille, A.M., J. Rushen, J. Ladewig and C. Petherick. 1996. "Dairy Calves' Discrimination of People Based on Previous Handling." *Journal of Animal Science*. (74: 5) pp. 969-974.
- Goodger, William J., and Eileen M. Theodore. "Calf Management Practices and Health Management Decisions on Large Dairies." *Journal of Dairy Science* 69.2 (1986): 580-90. Print.
- Goodger, W. 1989. "A Computer Spreadsheet Program to Estimate the Cost of Raising Dairy Replacements." *Preventive Veterinary Medicine* 7.4 pp. 239-54. Print
- Heinrichs, A.J. 1993. "Raising Dairy Replacements to meet the needs of the 21st Century." *Journal of Dairy Science*. (76) pp. 3179-3187.

Hibma, John. "No Calf Left Behind." *Progressive Dairyman* 21 Nov. 2011: 61-62.

IBISWorld. "Dairy Farms in the US Market Research | IBISWorld." *Market Research Reports & Analysis / IBISWorld US*. 2011. Web. 28 Nov. 2011.

<<http://www.ibisworld.com/industry/default.aspx?indid=49>>.

Ibrahim, H., and E. Olaloku. "Partial Budgeting as a Tool for Economic Analysis in Livestock Production." *Improving Cattle for Milk, Meat and Traction*. Nairobi, Kenya: International Livestock Research Institute, 2000. 49-56. Print.

Karszes, Jason, Kathy Wickswat, and Frans Vokey. *Dairy Replacement Programs: Cost Analysis*. Diss. Cornell University, 2007. Ithaca, New York: Department of Applied Economics and Management, 2007. Print.

Kay, Ronald D., William M. Edwards, and Patricia Ann Duffy. *Farm Management*. Sixth ed. Boston, MA: McGraw-Hill, 2008. Print.

Monke, Eric A., and Scott R. Pearson. *The Policy Analysis Matrix for Agricultural Development*. Ithaca: Cornell UP, 1989. Print.

Moore, Dale A. 2002. "Influence of Arrival Weight, Season and Calf Supplier on Survival in Holstein Beef Calves on a Calf Ranch in California, USA." *Preventive Veterinary Medicine* (53:1-2) pp. 103-15. Print.

Pennington, Jodie A. 2001. "The Economics of Raising Dairy Heifers." University of Arkansas-Division of Agriculture, October.

([http://www.uaex.edu/Other\\_Areas/publications/PDF/FSA-4016.pdf](http://www.uaex.edu/Other_Areas/publications/PDF/FSA-4016.pdf))

Tozer, P.R., and A.J. Heinrichs. 2001. "What Affects the Costs of Raising Replacement Dairy Heifers: A Multiple-Component Analysis." *Journal of Dairy Science* (84:8) pp. 1836-844. Print.