Survey & Analysis of Wyoming Livestock Producers

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1.0 Introduction

Wyoming is a unique state, covering approximately 97,100 square miles, with a population of only about 500,000 (US Census, 2002). Farming and ranching utilize much of Wyoming's land base.

Wyoming's largest industries in terms of total cash receipts are minerals, tourism, and agriculture (respectively). Wyoming agriculture alone is responsible for nearly $1 billion in cash receipts and a total economic impact of nearly $1.5 billion on the economy (USDA Census, 2002). The United States Department of Agriculture (USDA) defines a farm as any operation that produced and sold $1,000 or more in value of agricultural products (USDA Census, 2002).

Cattle are Wyoming's predominant agricultural commodity, accounting for nearly 70 percent of all cash receipts from all agricultural commodities (USDA Census, 2002). Cattle and calves alone accounted for approximately $634 million in value of receipts in 2003 (ERS, 2004). More than 9,400 farms and ranches, are located within Wyoming, which ranks eighth nationally in the area of land devoted to farming and ranching. Wyoming is home to the largest farms and ranches in the nation, the average size is 3,761, acres (USDA Census, 2002). The open spaces and rangelands which comprise nearly 80 percent of Wyoming's total area are ideal for producing some of the highest quality beef cattle in the nation as well as providing many additional co-benefits such as wildlife habitat and recreational opportunities.

In 2001 cattle and calves generated $758.2 million in cash receipts and in 2003 that amount had decreased by $124.6 million (WASS, 2004). The decrease in 2003 may be the result of a severe state wide drought that began around 2000.

Events such as the recent drought and changes in agricultural markets and national policies have had significant impacts on the way Wyoming farmers and ranchers conduct their businesses. Significant market changes include: consumer demand for organic goods, which rose throughout the 1990's by more than 20 percent (Greene and Dimitri, 2003), consumer's increased concern towards food safety, their health, lifestyles and values, e-coli bacteria and Bovine Spongiform Encephalopathy (BSE) threats within the food supply, development of rural land into residential areas as well as drought and environmental concerns. It is increasingly more common for ranching families to have secondary incomes from off ranch sources to support their families.

Wyoming agricultural producers are challenged by a changing industry. Ranchers must be competitive to remain profitable. There are many possible production changes that ranchers could adopt to improve their profitability, for example: producing organic beef; feeding different feed sources; changing the timing of the calving season or diversifying the existing operation among others. The production changes ranchers are willing to adopt depends in part on their attitudes, perceptions, structural factors, and the economic potential of new practices in comparison to existing practices.

Ranchers are likely to adopt new practices or change the management of existing enterprises if they are confident that these changes will increase the profitability and long term economic sustainability of their business. Variability in the size of individual operations, management ability and other factors will influence the ability of ranchers to change their management. New enterprises that could be profitable for some ranchers might not be profitable for others.

2.0 Problem Statement & Objectives

There is a wealth of data available through the US census of agriculture that describes agricultural production within all areas of the country. For example, the census of agriculture provides information about producer demographics, farm size, commodities produced, commodity prices, and basic financial data among other things. However, although these data provide excellent information about general industry characteristics, they do not provide enough detail about individual management styles and production practices to facilitate economic analyses of alternative means of production. In addition, there is very little information about the attitudes and perceptions of ranchers, which can affect their willingness to adopt new management and production practices.

Some ranchers within the state of Wyoming have been experimenting with new methods of production; one example of such a modification is a change in calving season from early spring to late spring. This management change has not been widely adopted throughout the state, but is thought to reduce input costs (particularly feed), and increase profits. At the present time, there is not enough detailed information about the different input costs and production choices between early and late spring calvers to provide a detailed economic analysis of this new practice so that all producers in the state could benefit from examining the merits of this opportunity.

Rancher attitudes are an important factor influencing the adoption of new practices, for example, the organic and natural foods industry is experiencing tremendous growth and popularity among growers and consumers, but research through the US Department of Agriculture (USDA) (USDA Census, 2002) shows that the state of

Wyoming has very few organic food producers. In 2002, only 13 Wyoming farms were certified as organic. The organic food industry appears to be more prominent in neighboring states such as Colorado, with 268 organic farms, and Montana with 137 organic farms (USDA Census, 2002). An understanding of the attitudes and perceptions of agricultural producers could help to provide insight into why there are adoption differences between states.

This paper aims to increase our knowledge of ranching practices within the state and examine the economic costs and benefits of changing from an early spring to a late spring calving season. In addition to a detailed characterization of ranching practices this work will also consider the conditions, trends, attitudes, and perceptions of Wyoming's beef cattle operations and their influence of rancher willingness to adopt new production practices in general.

The specific objectives of this paper are to:

1. Identify management, structural and organizational attributes of Wyoming beef cattle operations in addition to their attitudes and perceptions regarding alternative production practices.
2. Analyze the economic costs and benefits of adopting a late spring calving management system and compare this with the economic costs and benefits associated with a traditional an early spring calving system in Wyoming.

3.0 Literature Review

Previous studies that have been used to collect primary data about production practices as well as producer attitudes and beliefs are reviewed in this section. Special attention is paid to study characteristics, techniques and results that could benefit this study.

Several survey methods have been employed to collect detailed production data from agricultural producers. Mail surveys are commonly used (Dillman, 2000) for two reasons: first, they are less expensive than other survey methods (for example, personal interviews), and second, procedures for mail surveys are often simple enough for individuals and organizations to conduct on their own reducing their reliance upon survey research organizations (Dillman, 2000).

Pennings *et al.* (2002) examined why surveys sent to farmers typically have a low response rate. They used personal interviews with fifteen farmers to develop their initial survey instrument, which was then sent to 100 farmers. Non respondents to the survey were contacted by telephone to discover why they did not respond to the survey. The initial survey instrument was then revised and sent to an additional 3,990 US farmers. They found that several factors affected the willingness of farmers to respond to surveys, for example: the time of the year the survey is received, the survey design, the amount of compensation for completing the survey, its perceived length, and the group administering the survey. Producers in this study indicated they were more likely to answer surveys sponsored by Government and Universities than private organizations possibly because the farmers may feel obligated to complete the surveys sponsored by the

Government or Universities, or farmers may feel they will get more direct benefit from completing the surveys.

Several projects have used surveys to identify the attitudes and perceptions of farmers and ranchers. Hall *et al.* (2002) used a survey to elicit beef cattle producer's perceptions of sources of risk, the effectiveness of risk management strategies, and interest in further risk management education. Their survey was sent to 4,000 beef cattle operations in Nebraska and Texas. The National Agriculture Statistics Service (NASS) selected operations to receive the survey using a stratified random sampling process. Producers were classified into one of three strata based on the number of cattle owned by their operation.

Little *et al*. (2000) used a mail survey to examine Mississippi producers' understanding of, attitudes toward, and willingness to employ alternative production and marketing practices. They found that most producers would be willing to change production practices, such as the length and timing of their calving seasons if they thought they could increase the profitability of their cattle operations. Larger producers were more willing to use marketing practices other than the traditional practice of selling at a conventional auction market. In general producers were more open to changing production practices than marketing practices.

Illinois organic farmer's views of political, economic, social, and ecological factors were the subject of research conducted by Duram (1997). Personal interviews were conducted with twenty certified organic farmers in Illinois to understand how individual farmers' characteristics influence decisions that have long-term ecological and economic impacts on society (Duram, 1997). Characteristics that may have a long-term

ecological and economic impact on society include for example, farmers who are not concerned about chemical crop usage, runoff and pollution of local streams may create large costs on society by affecting the local water supply and necessitating extensive environmental clean up efforts. Respondents noted that they tailor their production designs to market demands, farmers indicated that there was a lack of information on organic farming, and that the majority of the things they learned they learn by their own trial and error.

The Iowa Agricultural Statistics Service conducted a telephone survey of 1,036 farm operators in Iowa asking them about their attitudes and knowledge of sustainable agriculture (Miller and Duffy, 1999). The survey revealed that farmers who are concerned about protecting the environment practice sustainable, environmentally friendly farming practices.

Barriers preventing Utah farmers from adopting more sustainable management practices were studied by Drost *et al.* (1996) using a mail survey sent to 964 farmers. They found that the lack of product market availability, premium prices for their products, and information about sustainable management practices were barriers to adoption.

In summary, many of these studies have successfully used mail surveys to gather information about producer production practices. It is clear that both attitudes and information availability influence producer willingness to adopt new practices and that although farmers typically have a low response rate to mail surveys their response is increased for University and Government surveys.

Identifying new profitable production practices for ranchers has been the focus of much research. One production practice that has been examined is a change in the calving season. For cow/calf producers the calving season is on of their most labor intensive periods during the year. The choice of calving season will influence many production expenses such as feeding costs. Delaying the calving season from late winter to late spring has been suggested as a way for producers in the high elevation areas of the West to reduce feeding costs (May *et al.,* 1998). The most common method used to examine the economic consequences of a change in calving season is budgeting; the second most common method of analysis is linear programming.

For a cow/calf operation, located in the western or mid-western states, feed costs are the largest production expense (May *et al.,* 1999). May *et al.* (1999) hypothesized that shifting the calving season (from late winter to late spring) would reduce feed costs by providing a closer match between the nutritional requirements of the cow and the nutritional quality of forage. The objectives of May *et al.* (1999) were to develop a mixed integer programming models for five calving periods (February through June) with the objective of minimizing the cost of providing energy and protein to a mature cow. May *et al.* (1999) found that under average weather conditions, June calving reduced feed costs by $43 per cow in comparison to calving in February. February through April is the traditional calving time for the majority of cattle producers, so this information was important for producers that were considering adopting this practice.

Hawkins *et al.* (2002) examined the optimal calving season for livestock-crop operations in North Dakota. Cattle production coincides with crop production on many North Dakota ranches and thus there are labor constraints during critical times of the

production process. A representative, ranch, linear programming model was developed by Hawkins *et al.* (2002) using data representing 200 beef cattle and 1,800 acres of cropland. The model has three different calving seasons: early spring (March 1 - April 30), late spring (May 1 – June 30), and fall (August 1 – September 30). Sale prices and labor requirements by season were included in the model which showed that late spring calving had the highest economic returns. Next, they included nine crop choices including: durum wheat, alfalfa, spring wheat, canola, hay, barley, oats, corn, and sunflowers. Labor requirements were included as were with the mean economic return from each crop. Durum wheat had the highest mean return while sunflowers had the lowest, and corn had the highest labor requirement per acre while other hay had the lowest labor requirement per acre. The model also includes three labor scenarios: the operator alone, the operator plus a seasonal employee, and the operator plus a full-time employee. Results showed that late spring calving with an operator plus seasonal labor for growing alfalfa, canola, and durum wheat had the highest returns to operator labor, management, and fixed costs.

Budgeting techniques have been employed by numerous researchers analyzing the economic costs and benefits of possible production changes. Several studies addressed the economic costs and benefits of changing from an early spring (approximately March) to late spring (mostly June) calving season in the Nebraska Sandhills. Numerous production factors were examined such as calf weights at birth, calf weights at weaning, cattle weights as yearlings, the amount of labor, and the amount of feed both stored and grazeable forage. Carriker *et al.* (2001) identified feed as well as labor as the primary binding production costs to cow/calf operations. In 1993, 75 cows from the University of

Nebraska's cow herd were bred to calve March 15 and 120 cows were bred to calve June 15. The June calvers were split into two groups. One group was fed on sub-irrigated meadow re-growth and the other on upland range. Data on birth weights and weaning weights were collected and compared. Costs of producing the two separate calving groups along with the market price they would receive at the time of sale were analyzed using cost and net return budgets (enterprise budgets) for the two calving periods. The results showed that feeding and calving labor inputs for mature cows were 61 percent lower for the June calving compared to the March calving system. Weaning weight rates (lbs per day) were comparable between March and June calving systems, while weaning weights for June-born calves were 70 lbs lighter than March-born calves. Costs of the June system were lowest, due primarily to lower production costs. Post-weaning financial costs at each phase were nearly identical. Carriker *et al.* (2001) found that selling June-born steer calves at January weaning doubled net returns compared to selling March-born steer calves at October weaning due to lower production costs and higher market prices. In addition, their study suggested that net returns for June-born steer calves retained beyond weaning were highest if calves are retained as yearlings and then finished. Calves finished as feeder calves provided the highest net returns for the March calving system.

Carriker *et al*. (2001) revealed a significant amount of valuable information for producers considering a change in their calving season. The most profitable calving period depends on the production practices of each producer.

Nelson (1988) used an enterprise budgeting technique to address the same question of what is the most profitable calving season. The analysis focused on feed

costs identified as the largest single production cost, and calf prices identified as the major source of revenue. Eight different calving season management options were examined, including fall calving dates which were not included in the previously mentioned study of Carriker *et al*. (2001). Data for this study were collected for the years 1975 through 1984. The 10 year average feed costs were lowest between the April and May calving period (June was not analyzed as a calving month in this research). In relation to calf prices, it was discovered that a typical spring-calving producer who wished to wean and sell calves at 7 months of age would encounter the lowest average seasonal prices of the year. Early spring calving (February-March) was the most profitable calving period. However, the authors indicated that if a producer felt that the combination of poor early spring weather (or poor facilities for calving in inclement weather) and labor needs would cause him to have a 6 percent or better calving percent between September-October than between February-March, he should consider early fall calving.

Nelson (1988) found that the choice of calving season depends much on how the producer wants to operate his own business. Much depends also on the performance of the cows and calves on range conditions and the calving month.

Gaertner *et al.* (1992) examined birth weights and weaning weights from 1,909 Simmental-sired calves born to Brahman-Hereford cows between 1975 and 1990 in Texas. The birth weights and weaning weights were analyzed independently to estimate the influence of year, season of birth, dam age, weaning age, and sex of the calf. In addition the influence of stocking rate, as represented by levels of forage availability, was also measured. Year, sex of calf, age of dam, stocking rate, season of birth, age at

weaning, and birth weight were found to be significant factors affecting weaning weight. Birth weights were higher for spring-born calves than for either fall or winter-born Simmental–sired calves. These results may not be applicable to Wyoming because of the differences in climate, forage and cattle breed.

An economically constraining input in a cow/calf production that has been identified by previous research is feed costs. Feed costs are different for early season calving operations and late calving season operations, thus it is important to determine the differences in costs between the two calving seasons. Several analyses above used budgeting techniques to examine the economic changes faced by producers as a result of a change in production technology. In addition the analyses suggest that a later calving season has been shown to be economically profitable in other areas of the country.

The literature discussed above suggests that a mail survey is a low cost reliable means of gathering information from ranchers and is a suitable means of data collection for this proposed research. In addition while non-traditional calving dates such as June may be beneficial to producers, there is not a rule of thumb that suggests the most profitable period to calf which all producers can follow. It is likely that no such rule exists because of the spatial variability in climate and forage conditions across different regions of the country. Thus a study specific to the conditions present in Wyoming is needed to provide decision making information for Wyoming producers.

4.0 Conceptual Framework

Economic theory suggests that a producer will change his current technology if the profit with the proposed change is greater than the profit without the proposed change ($\pi_{withchange} > \pi_{withoutchange}$). A change in technology within a production process may involve any number of things from changing the amount of hired labor, to changing the amount of a certain input like purchased off farm feed, or changing the existing calving season to a new date.

Profit is calculated as the price of the output (*p)* multiplied by the output quantity (*y*) minus variable costs (*vc*) and fixed costs (*fc*). In the short run fixed costs are constant, and changes in technology are reflected by changes in variable costs assuming output remains constant. If the proposed change decreases variable costs, profits will increase and a rational producer will choose to produce using the proposed technology that is if $\pi_{withchange} = py - vc_1 \quad > \quad \pi_{withoutchange} = py - vc_0$, then the new proposed technology will be chosen.

The production process chosen by the producer will influence the combination of variable inputs used to produce output and thus variable costs. Assume, for purposes of illustration, the stylized case of a Leontief production function where inputs are combined in fixed proportions. Figure 1 shows two families of isoquants that illustrate the relationship between two inputs, on-farm feed and off-farm feed and cattle production. The isoquants represent cattle production and possible feed use using two different production technologies, early and late calving. The technologies differ in their required input level, but are assumed to produce the same level of output. An isoquant

shows all input combinations that produce a given quantity of output. To maximize profits at any given level of output the producer must select cost minimizing combinations of inputs at that output level. Of course, not all levels of output are profit maximizing; there is only one input/output combination that truly maximizes profit. The least cost input combination for a given output level is found at the point where the isoquant is tangent to the isocost. An isocost line depicts all input combinations that can be purchased for a constant cost. The locus of all points of tangency between the isoquants and isocosts is called the expansion path and gives the least-cost combination of inputs for all given levels of output, figure 1 (Beattie and Taylor,1985).

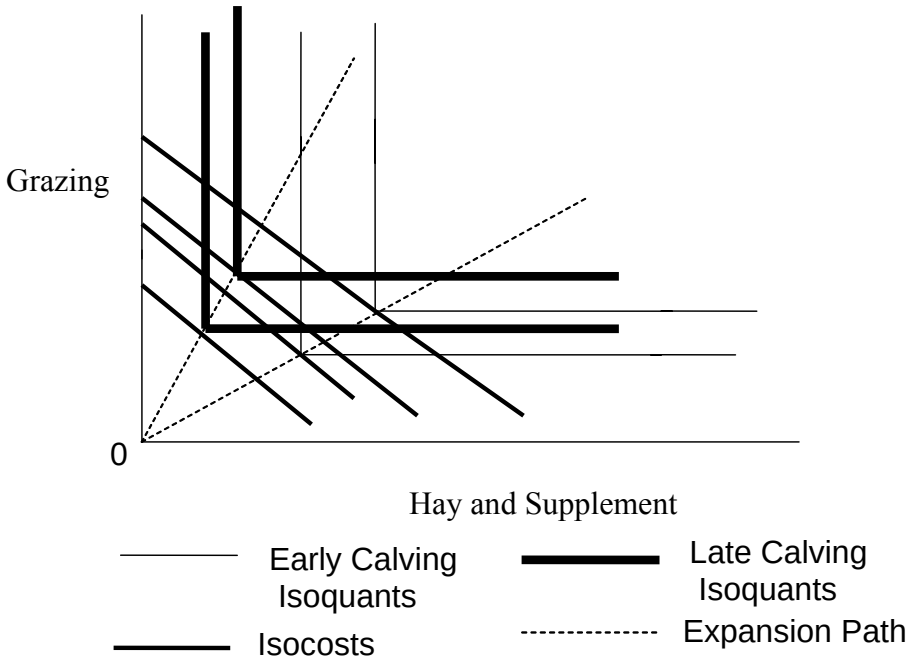

Figure 1: Grazing, Hay and Supplement Feed Input Combinations

The two expansion paths show that different amounts of grazing and hay and supplement are used by each technology to produce the same level of output and can be used to calculate the variable cost function. In the case of perfect competition in the factor markets, *vc* will be a function of factor prices and output quantity, that is $vc = \tilde{c}(r_1, r_2, y)$.

As an example, assume that hay and supplement is more costly than grazing. The ratio of hay and supplement to grazing is then greater for early calving than late calving. Early calving requires a larger initial amount of hay and supplement (Figure 2) then late calving. In terms of variable costs, this translates into a larger amount of hay and supplement at a greater cost, and thus higher variable costs.

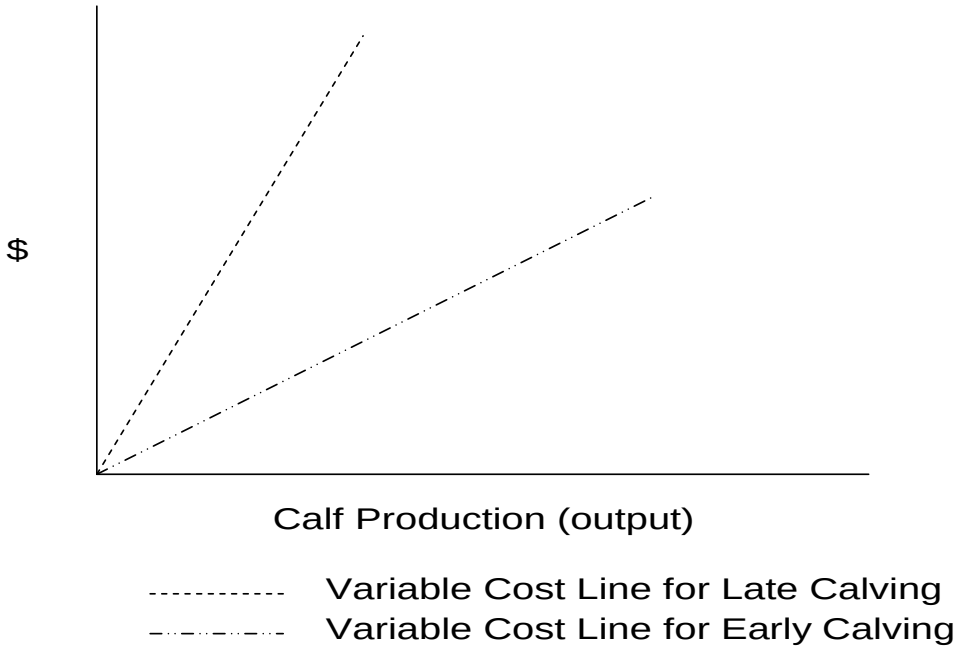

Figure 2: Variable Cost Lines

If the cost of hay and supplement were greater than the cost of grazing, then $vc_{withoutchange} > vc_{withchange}$, the lower expansion path representing the conventional early

calving season (without change) would have the greatest variable costs. If the $vc_{withoutchange} > vc_{withchange}$, then $\pi_{withoutchange} < \pi_{withchange}$. The rational producer will choose the production function that has lower variable costs and a greater profit at each level of output. Assuming prices and output remain the same and profit is still at the maximizing level, then changes in variable cost are the factors of primary importance in an examination of the relative economic efficiency of early and late calving. However, normally prices and output do not remain the same. Prices tend to fluctuate according to the market, and output will fluctuate due to a number of factors such as drought, feed costs, disease, and consumer demand. For simplistic purposes, in this paper prices and output are assumed fixed. The rational producer will choose to produce using the technology with the lowest variable costs and a greatest profits at all output levels.

5.0 Methods and Procedures

Sampling Methods and Survey

A mail survey was chosen to collect primary data for this study from Wyoming cattle ranchers for several reasons: 1) mail surveys are an economical means of gathering primary data, 2) they are relatively easy to implement, 3) a mail survey could be formulated by the research team and 4) mail surveys have a relatively fast response period.

A survey instrument was developed for this study to elicit three types of information from Wyoming cattle producers: 1) general ranch description such as the number of acres leased and owned, number of cattle owned, and the number of

employees, 2) other production and marketing practices such as the calving date, weaning date, sale date of cattle, input use, and attitudes and perceptions towards certain production practices and industry trends, and 3) demographic information such as age, gender, and education. The full survey instrument is presented in appendix A.

There are many sampling techniques that may be used to select a sample from a population for example, random, systematic, cluster, and stratified sampling. Stratified sampling was chosen for this research project because the population of ranchers could be divided into discrete subgroups or strata, and thus the sample size could be reduced. Stratified random sampling is a technique of sampling that draws simple random samples from each of several subgroups or strata into which the population has been divided (McCall, 1982). Reasons for using stratification include:

1. When separate sub-population sampling frames require that sub-samples be drawn independently.
2. When some characteristics must be treated in a slightly different way for different subgroups.
3. When a larger sample is not possible, and the sampling error must be reduced.
4. When simple random sampling would not yield enough members of certain subgroups to perform a planned subgroup analysis in addition to the total group analysis.
5. When one or more subgroups are scheduled for more intensive analysis bringing in additional variables or other variations.

6. When total sample size or cost restrictions must be made, and some subgroups within the population are much more costly than others to survey (McCall, 1982).

There are several ways to stratify data dependent on statistical and non- statistical considerations such as available finances, time, personnel, data processing equipment, and population listings (sampling frames). When finances are constraining, one means of sampling is to identify the maximum number of samples that can be achieved for a given budget and then distribute this total number among the strata groups. If *N* is the number of individuals in the population and *n* is the number of samples that can be taken the overall sampling ratio is *n/N*. There are several ways to distribute *n* between the strata, for example the percentage of the population, *N,* contained within each strata can be determined and then that percentage used to distribute the total number of samples, *n,* between the strata. That is $n_j = N_j / N$ where n_j is the number of samples taken from the j^{th} stratum, and N_j is the number of individuals in the population from the j^{th} stratum (McCall 1982). The sampling ratio for the j^{th} stratum is n_j / N_j. The sum of all of all samples in every stratum equals the sample size *n,* $\sum_{j=1}^{n} n_j = n.$

Budget Methods and Procedures

Livestock managers should collect and analyze information relating to production, marketing, and finance as an aid to financial management. However, simply keeping records has little to do with improving profits unless the information is used to make management decisions. Budgeting serves as a guide for ranchers to use in decision making. By analyzing an operation's original budget and then analyzing the budget after

a change(s) in an operation has been implemented, producers and researchers can identify areas where costs may be reduced or where returns may be increased.

There are several forms of budgeting, whole farm budgeting, enterprise budgets and partial budgets. An enterprise budget is an estimate of all costs and returns associated with the production of some product or products; all variable and fixed costs are included in an enterprise budget. An example of an enterprise budget is a budget done on just the production of one output such as a 500 pound calf. Other outputs produced on the operation such as horses or corn and alfalfa are not considered. Only the costs and returns associated with the production of the 500 pound calf is used in the enterprise budget. In contrast, a total or whole farm budget identifies the costs and returns for all the operations on the ranch; not just those involved with the production of one output like in an enterprise budget. A partial budget is different from an enterprise budget in that it examines the effects of a single proposed change in the production process on revenues and costs.

A partial budgeting analysis was chosen for this study. The effect of the proposed change (in this case a change in calving season) on costs and returns is compared to the previous budget that does not include the change. Two outcomes are possible. First, the production change could have positive economic effects, eliminating or reducing some costs, or increasing returns. Second, the new change could have negative economic effects, such as increasing costs or eliminating or reducing returns.

The steps in constructing a partial budget are to:

1) State the proposed alternative or change that will be analyzed.

2) Collect data on all aspects of the business that will be affected by the change.

3) Classify or group the types of impacts that will occur according to the categories specified that include expenses both increased and reduced and receipts both increased and reduced. (Jobes, 2002)

A positive net change indicates a potential increase in income and a negative net change indicates a potential reduction in income due to the proposed change.

6.0 Empirical Application

This paper used a mail survey to gather primary data about production, demographic and other characteristics of cattle producers within Wyoming. The data obtained through the survey was then used in a partial budgeting analysis to compare the economics of 'early calving' to 'late calving' operations, and small sized operations to medium sized operations.

Survey/Sampling

The survey instrument was distributed by the Wyoming Agriculture Statistics Service (WASS) by mail to three size classes of cattle operations, aiming for good geographic coverage state wide. WASS estimated that in 2003 there were 6,050 beef cattle producers in the state grouped into eight size class categories, table 1. The group with less than 100 head of cattle was the largest group with 2,400 operations; 100 to 300 head of cattle group was the second largest group with 1,700 operations, and the smallest group was the 5,000 plus head of cattle which only had 15 operations.

Table 1. WASS Groupings of Cattle Operations

Size of Operation by Number of Cattle	**Number of Operations in Wyoming**
< 100	2,400
100 – 300	1,700
300 – 500	750
500 – 1000	800
1000 – 1500	240
1500 – 3000	120
3000 – 5000	25
5000 +	15

The eight groups were then combined into 3 larger sized groups or strata to form grouping of small, medium and large operations, table 2

Table 2. Number of small medium and large operations within Wyoming

Size of Operation by Number of Cattle	**Number of Operations in Wyoming**
Small < 300	4,100
Medium 300 – 1000	1,550
Large 1000 +	400

A sample of 400 producers was chosen at random to receive the survey. The sample size was chosen based upon financial and resource constraints, and will serve as a

pilot for a larger survey to be conducted in the near future. The number of surveys sent to each size of operation was proportional to the number of operations in each size class as a percentage of total operations listed above. Small cattle producers make up 68 percent of all the states beef cattle operations, medium cattle producers represent 26 percent of beef cattle operations, and large producers are 6 percent of the total number of beef cattle operations in the state, table 3. These percentages were used to allocate the total sample between the three strata resulting in a sample of 272 operations in the small group, 104 operations in the medium group, and 24 operations in the large group, table 3.

Disproportional allocation was chosen so that each operation size class would be sampled in proportion to their representation n the population of cattle producers in Wyoming. Table 3 displays how the total sample was split between each of the three size classifications.

Table 3. - Disproportional Allocation of Sample Size to Stratified Simple Random Sample with Three Strata.

Stratum	**Strata Size** N_j	N_j / N	**Sample Size** n_j	**Sampling Ratio** n_j / N_j
Small	N1 = 4100	0.68	n1 = 272	272/4100 = 0.0663
Medium	N2 = 1550	0.26	n2 = 104	104/1550 = 0.067
Large	N3 = 400	0.06	n3 = 24	24/400 = 0.06
Total	N = 6050	1	n = 400	400/6050 = 0.066

The 'Total Design Method' (Dillman, 1978) was used to carry out the mail survey. Included with the first survey was a cover letter explaining the research project, the importance of the project, a statement of confidentiality, and a message thanking the

recipients of the survey for taking the time to fill out the survey. A self addressed and stamped envelope was also included with the survey. One week later, a reminder post card was sent to those recipients who had not returned the first survey. Finally, two weeks after the first survey was mailed, a second copy of the same survey and a new follow up cover letter was sent to survey recipients who had not yet responded. The first survey mailing was conducted in May, 2004.

Budgeting

The base budget used in this analysis is an unpublished budget constructed by Hewlett and Foulke, (1999). The budget is a whole farm budget based upon production data gathered from producers in north central Wyoming. The budget represents a 365 cow ranch with ownership of creek bottom land valued at $400 per acre, cropland valued at $725 per acre, owned range land valued at $50 per acre, and grazing permits on BLM and Forest Service land. The total annual fixed land costs are $59.74 per cow. Other fixed costs included machinery and equipment at $56.44 per cow annually, and fixed livestock which cost $47.54 per cow annually. Variable costs included alfalfa, corn, oat hay, salt/mineral, vaccines, labor, and equipment repairs among other inputs. Total annual variable costs are $348.48 per cow, and annual net projected returns for the operation are negative $174.60 per cow.

The budget constructed by Hewlett and Foulke, (1999) was altered to create the budgets used in the economic analysis of early and late calving undertaken in this paper. Before construction of the partial budgets, the data from the surveys was sorted by two criteria. The first criteria was calving season, the entire dataset was divided into two groups representing early and late calving operations respectively. Operations with

greater than 75 percent of their calving complete between January and end of April were classified as 'early calvers'. Operations with greater than 75 percent of their calving complete between May and December were classified as 'late calvers'. The second criterion examined was the size (number of cows) of the operation. The data was sorted into three size classes: 'small' operations with less than 300 head, 'medium' operations with 300 – 1000 head, and 'large' operations with 1,000 plus head of cattle. There were no survey responses from the 24 large operators surveyed and thus there are no operations in the 'large' classification.

A two-sample t-test [1] was used to determine whether there were statistically significant differences between the mean values of all continuous variables between 'early calvers' and 'late calvers', and then between 'small' and 'medium' operations.

$$t = \frac{\left|\bar{x}_0 - \bar{x}_1\right|}{s \Big/ \sqrt{1/n_1 + 1/n_2}} \qquad [1]$$

$\bar{x}_0$ = mean value of variable in subsample '0'
$\bar{x}_1$ = mean value of variable in subsample '1'
n_1 = number of observations in subsample '1'
n_2 = number of observations in subsample '2'
s = standard deviation
t = calculated t

The null hypothesis for this analysis is $\bar{x}_0 = \bar{x}_1$, or that the means between the groups tested are the same. The alpha level (rejection level) is $\alpha = 0.05$. The calculated value of t [1] is then compared to the associated critical t distribution table value with $n - 1$ degrees of freedom. If the calculated value of t is less than the critical t distribution table value then we cannot reject the null hypothesis. If the calculated value of t is

greater than the critical t distribution table value we reject the null hypothesis that the two means are not statistically different.

The p-value tells us the entire range of α levels for which the null hypothesis would be rejected. The p-value is sometimes referred to as the "achieved significance level." "The p-value for a test statistic is the probability of obtaining a test statistic of that magnitude or greater if the null hypothesis is true" (Anderson and Finn, 1996). For a two tailed test at $\alpha = 0.05$, when the p-value ≤ 0.05, the null hypothesis is rejected, and the alternative hypothesis that the two means are not equal is accepted.

Tables 4 and 5 show the results for this analysis. The number of acres of pasture, was the most statistically different variable at the 5 percent level between 'early' and 'late calvers' while the number of acres in pasture, irrigated hay, and the number of bred cows owned were the most statistically different variables at the 5 percent level for 'small' and 'medium' operations. Variables that were found to be statistically different from each other were the variables used in the budget analysis to alter input costs and examine the economics of early and late calving.

Table 4. Continuous variables whose means are statistically different.

Early vs. Late Calving						
Variables (alpha = 0.05)	**Total Survey Mean**	**Early Calving Mean**	**Percent Difference from Total Mean**	**Late Calving Mean**	**Percent Difference from Total Mean**	**Pr > |t|**
Acres of Pasture	4048	3012	74	15827	391	0.0009
Total Private Acres	2998	2855	95	14983	500	0.0017
Acres of Irrigated Hay	335	253	76	1346	402	0.0138
Aums of Pasture	755	535	71	2058	273	0.014
Percentage of Pasture Owned	89	79	89	82	92	0.0376
Small vs. Medium Sized Operation						
Variables (alpha = 0.05)	**Total Survey Mean**	**Small Operation's Mean**	**Percent Difference from Total Mean**	**Medium Operation's Mean**	**Percent Difference from Total Mean**	**Pr > |t|**
Acres of Pasture	4048	1950	48	17304	827	<0.0001
Acres of Irrigated Hay	335	150	45	543	162	<0.0001
Bred Cows	131	116	89	450	344	<0.0001
Percent of Irrigated Hay Acres Owned	83	73	88	100	120	0.0059
Acres of Dry Land Hay	286	115	40	1033	361	0.0061
Total Private Acres	2998	1856	62	18134	605	0.0152
Sold by Sale Barn	100	72	72	35	35	0.0274
Acres of Forest Service Land	3074	1500	49	5000	163	0.0432

Categorical variables that were in the survey included a list of management techniques that were vaccinate, use an animal ID system, deworm, engage in body condition scoring, insect control, pregnancy check, use of implants, use a breeding soundness exam, dehorn young animals, artificial insemination of cows, castration, and veterinarian consultations. A Chi squared-test is the appropriate test to use for categorical data. All 12 of the management practices were tested to see if they were statistically different between early and late calving operations, table 5, and between small and medium sized operations, table 6.

Table 5. Chi-Square Test on Categorical Variables - Early vs. Late Calving Season

Variables Tested	**Early Calving (# of responses)**	**Late Calving (# of responses)**	**Total**	**Chi Squared Test Result**	**Chi Squared Table Value for alpha = 0.05, 1 d.f.**
Vaccinate	74	7	81	54.74	3.841
Animal ID System	40	4	44	29.46	3.841
Deworm	49	5	54	35.86	3.841
Body Condition Scoring	13	4	17	total < 20	3.841
Insect Control	56	6	62	40.32	3.841
Pregnancy Check	47	4	51	35.58	3.841
Implant	17	0		total < 20	3.841
Breeding Soundness Exam	15	2	17	total < 20	3.841
Dehorn	43	5	48	30.08	3.841
A.I.	15	2	17	total < 20	3.841
Castrate	69	9	78	46.16	3.841
Vet Consultation	41	5	46	28.16	3.841

The formula for a Chi-square test is $\chi^2 = \sum_{i=1}^{last} (O_i - E_i)^2 / E_i$. Where '*O*' represents the observed value, and '*E*' represents the expected value or the total of the values tested divided by the total number of variables which was 2 in these tests (early and late, small

and medium). The Chi-squared test is not valid when the total number of responses is less then 20. Once the Chi-squared statistic is calculated, the Figure is compared to the critical value in the Chi-squared table at the appropriate degrees of freedom and chosen significance level. If the tabulated value of the statistic is less then the calculated value the null hypothesis that the proportion of 'early calvers' or 'small operation' is equal to the proportion of 'late calvers' or 'medium operation' using each practice is rejected.

Table 6. Chi-Square test on Categorical variables - Small vs. Medium sized Operation

Variables Tested	**Small Operation (# of responses)**	**Medium Operation (# of responses)**	**Total**	**Chi Squared Test Result**	**Chi Squared Table Value for alpha = 0.05, 1 d.f.**
Vaccinate	71	9	80	48.05	3.841
Animal ID System	38	5	43	24.78	3.841
Deworm	45	7	52	27.76	3.841
Body Condition Scoring	13	2	15	total < 20	3.841
Insect Control	49	8	57	29	3.841
Pregnancy Check	44	7	51	26.34	3.841
Implant	13	3	16	total < 20	3.841
Breeding Soundness Exam	14	1	15	total < 20	3.841
Dehorn	40	7	47	22.71	3.841
A.I.	12	1	13	total < 20	3.841
Castrate	66	9	75	42.76	3.841
Vet Consultation	39	7	46	22.26	3.841

As table 6 indicates, all of the management practices were statistically different from each other between the groups tested. The strength of the test may be compromised due to the fact that the range in the number of responses between the two groups was so large. For example, the average number of responses for early calving was 40, but the average number of responses was only 4 in the case of late calving. The same situation

occurs with the range in the number of responses between the small and medium sized operations. The average number of responses in the small operation category was 37, where as the average number of responses for the medium category was only 6. Due to the large differences in responses between the groups, the budgets constructed later do not included these costs. However, the aggregate cost of using all of the management techniques listed in tables 5 and 6 will be noted at the end of each budget, appendix C.

'Acres of pasture' was an input that was varied within the budget analysis because it was the most significantly different variable in the 'early' vs. 'late' comparison. In the 'small vs. 'medium' comparison, 'acres of pasture' and 'bred cows' were chosen for the analysis because they were significantly different between the two groups. 'Acres of irrigated hay' was not included in the analysis because the base budget was for a cow/calf enterprise and did not include a hay enterprise. If a whole farm budget had been undertaken, 'acres of irrigated hay' would have been included. Such an analysis is beyond the scope of this paper but should be considered for future work.

Four separate budgets were constructed from a base budget, an early calving season budget (appendix D), a late calving season budget (appendix E), a small sized operation budget (appendix G), and a medium sized operation budget (appendix H). The base budget was constructed for a 365 cow operation. Adjustments to the base budget were made by first calculating the mean of each variable from all survey returns. Second, the means of the variables for each group ('early', 'late', 'small', 'medium') was calculated. Third, the percentage difference was found for each group variable mean from the overall survey mean. The percent difference was used to adjust the base budget to represent each alternative budget. Table 4 shows the percentage difference calculation

for each variable. For example, the base budget was estimated for 365 cows while the 'small' operation budget was estimated for only 325 cows or 89 percent of the base budget cow herd, table 4. The budget was then recalculated for 325 cows resulting in a change in total costs and net projected returns per cow. The same procedure was used for each of the other three budget alternatives considered.

7.0 Results

Survey Responses

Of the 400 surveys mailed, 145 were returned resulting in a 36 percent response rate which is lower then the desired response rate chosen by the authors of about 50 percent. The desired response rate may vary among survey studies depending upon how much sampling error can be tolerated, how varied the population is with respect to the characteristic of interest (50/50 or 80/20 split), and the amount of confidence one wishes to have in the estimates made from the sample for the entire population (ex. 90, 95, or 99 percent) (Dillman, 2000). As noted by Pennings *et al*. (2002) producer surveys do tend to have a lower response rate than surveys directed at other groups in society. One reason for the low response could be the mailing date during March, many producers were still busy with calving at this time. One of the purposes of this survey was to serve as a pilot for a larger survey to be completed in the near future. Even though there was a low response rate, the results of the survey are useful for refining the survey instrument, and providing a preliminary picture of production activities within the state. A complete summary of survey responses is presented in appendix C.

Demographics, Internet connectivity and Succession plans of Respondents

The experience of survey respondents ranged from 3 to 74 years in the beef cattle industry with an average of 36 years experience. The majority of producers surveyed had gained between 40 to 49 years of experience within the beef cattle industry. Eighty seven percent of producers surveyed were male while 13 percent were female. Twenty percent of respondents were over 70 years old while producers between 45 to 49 years old, 55 to 59 years old, and 65 to 69 years old accounted for 16 percent of respondents respectively. Producers between 25 to 34 years old account for only 0.9 percent of respondents. Producers have lived in the state of Wyoming with a range of 99 to 3 years with an average of 48 years. Thirty-five percent of respondents indicated they had some college education with the average being 4 years.

Fifty-one percent of respondents had access to the internet at their home, 29 percent had no access to the internet, 13 percent had access at work, and 3 percent had access at the local school. When asked about intergenerational succession of the operation 39 percent of respondents planned to use a trust, 14 percent planned to use a corporation, and 11 percent a partnership.

Operation Type and Input Use

The majority of the cattle producers that responded to the survey are cow/calf operations. Over 60 percent of respondents indicated that 75 to 100 percent of their farm income came from cow/calf production. Cow/yearling and horse production were the next largest means of generating ranch income accounting for 12 and 10 percent of income generation respectively. Most calving occurred between February and April, 79 percent of producers were finished with calving by the end of April. The three most

widely used herd management practices were vaccination, used by 70 percent of respondents, followed by castration which was used by 66 percent of respondents, and insect control used by 51 percent of respondents. Body condition scoring, breeding soundness exams and artificial insemination were the management practices that were least used, with only 11.7 percent, 12 percent, and 13 percent or respondents indicating that they used them. On average the largest expenses were purchasing livestock (23 percent of farm expenses) and purchasing hay (22 percent of farm expenses).

Full-time family labor is used on 53 percent of the ranches surveyed, while 34 percent of ranches employed part-time labor, and 13 percent employed seasonal labor. Family labor is used in the months of April through August. Labor that was non-family and part-time accounted for 43 percent of all responses, 35 percent was seasonal, and 22 percent was full-time non-family labor of all responses to the question. April through August is again the largest period of employment for non-family labor similar to family labor.

Thirty-seven percent of respondents produced grass hay on the farm, and 24 percent of respondents grew alfalfa on the farm. Grass hay was purchased off-farm by 19 percent of respondents and alfalfa was purchased off-farm by 16 percent of respondents.

The average number of bred cows owned in a typical year was 131 head, the average number of steer calves owned was 83 head, the average number of heifer calves owned was 77 head, the average number of replacement heifers owned was 60 head and the average number of retained yearlings was 188head (relatively high due to some of the respondents who ran feedlot operations). Producers kept 20 fattened/cull cows on

average, and seven bulls. Cattle were on feed other than pasture grass for an average of between five to six months.

Marketing Practices

When marketing their cattle 59 percent of respondents used the sale barn and 32 percent sold them privately. There was a difference in marketing preferences depending on whether the producer was buying or selling cattle. In contrast to the marketing preferences above, approximately 60 percent of respondents purchased cattle by private sale, and 39 percent used the sale barn. Only 1 percent of respondents indicated they used a different method for purchasing cattle.

The average sale weight of steer calves was 588 lbs, heifer calves were 535 lbs, retained steer calves were 925 lbs, retained heifer calves were 764 lbs, replacement heifers were 733 lbs, bred cows were 1,206 lbs, fattened/cull cows were 1,271 lbs, and herd bulls were 1,790 lbs. All cattle were sold between October and December.

Producer Perceptions and Attitudes

Producers were asked several questions about their perceptions and attitudes towards different production practices and possible trends affecting the cattle industry. The first set of questions began with, "Have you considered or are you currently doing any of the following practices?" followed by a list of different practices. For each practice there were four possible responses: currently doing, have considered doing, have not considered, or will not do, table 7.

Table 7. Summary of Responses to Survey Question 17.

Practice	Currently Doing (percent)	Have Considered (percent)	Have Not Considered (percent)	Will Not Do (percent)
Organic Beef	3	36	38	23
Grass 'Fed' Beef	27	27	32	14
Direct Customer Marketing	24	28	36	13
Joining a Beef Cooperative	3	28	48	20
Cattle Identification System	4	34	17	9
Changing Calving Season	22	24	26	30
Starting an Additional Enterprise	15	40	21	24
Selling Recreation (fishing, hunting, camping, etc.)	30	24	16	31

The second group of questions asked producers about their attitudes towards 17 statements. Responses were graded using a Likert scale ranging between 1 and 5 with 1 being strongly disagree and 5 being strongly agree (table 8).

Table 8. Summary of Survey Responses to Survey Question 18.

Questions	Strongly Disagree - Strongly Agree (1) (5) (Percent of Total Responses)				
A government mandated cattle identification system is needed. (Total Number of Responses = 101)	1 (21.8)	2 (18.8)	3 (32.7)	4 (13.9)	5 (12.9)
Government restrictions on the use of antibiotics, growth implants, and vaccinations are necessary. (Total Number of Responses = 103)	1 (24.3)	2 (23.3)	3 (26.2)	4 (18.4)	5 (7.8)
Beef consumption will increase in the future. (Total Number of Responses = 107)	1 (0)	2 (2.8)	3 (38.3)	4 (41)	5 (17.8)

Table 8. (continued)

Beef Consumers are willing to pay a price premium for organic, grass fed, and origin identified beef. (Total Number of Responses = 101)	1 (2)	2 (10.9)	3 (29.7)	4 (38.6)	5 (18.8)
A drought contingency plan is important for beef producers in Wyoming. (Total Number of Responses = 108)	1 (2.8)	2 (0.9)	3 (17.6)	4 (32.4)	5 (46.3)
BSE will have a big impact on the meat industry in the future. (Total Number of Responses = 107)	1 (0)	2 (21.5)	3 (39.3)	4 (25.2)	5 (14)
High petroleum prices will impact the beef industry in the future. (Total Number of Responses = 107)	1 (0.9)	2 (0.9)	3 (15)	4 (33.6)	5 (45.8)
Climate change will impact the beef industry in the future. (Total Number of Responses = 106)	1 (1.9)	2 (11.3)	3 (27.4)	4 (32.1)	5 (27.4)
Brucellosis will have a big impact on the beef industry in the future. (Total Number of Responses = 107)	1 (2.8)	2 (14)	3 (34.6)	4 (30)	5 (18.7)
I need to consider alternative enterprises to stay in business. (Total Number of Responses = 105)	1 (7.6)	2 (14.3)	3 (25.7)	4 (29.5)	5 (22.9)
I need to learn more about marketing alternatives to stay in business. (Total Number of Responses = 100)	1 (6)	2 (16)	3 (38)	4 (29)	5 (11)
I need to learn more about alternative production practices for my current enterprise to stay in business. (Total Number of Responses = 100)	1 (5)	2 (25)	3 (36)	4 (26)	5 (8)
I need to learn about alternative risk management strategies. (Total Number of Responses = 100)	1 (4)	2 (23)	3 (40)	4 (22)	5 (11)
High interest rates in the future will affect the way I do business. (Total Number of Responses = 104)	1 (5.8)	2 (15.4)	3 (25)	4 (26)	5 (27.9)
Government subsidies to ranchers/farmers will be eliminated in the future. (Total Number of Responses = 100)	1 (7)	2 (15)	3 (38)	4 (26)	5 (14)
Livestock grazing on federal land will be reduced or eliminated in the future. (Total Number of Responses = 103)	1 (8.7)	2 (12.6)	3 (26.2)	4 (39.8)	5 (12.6)
The cattle market and the price of cattle will remain strong in the future. (Total Number of Responses = 104)	1 (0)	2 (13.5)	3 (52)	4 (29.8)	5 (4.8)

(Note: percentages may not sum to 100% due to rounding)

Budget Results

Early vs. Late Calving

Table 9 shows the costs and other budget parameters for the base budget that were changed to estimate budgets for early and late season calving. Appendix D displays the Early Calving Season Budget, and appendix E displays the Late Calving Season Budget.

The budgets contain expense items that may need further explanation in order to better understand why certain expenses changed after the base budget was adjusted. Short-term (ST) refers to a time period of less then 1 year. Long-term (LT) refers to a time period of more then 1 year. Equity may be referred to as risk capital, and is the ownership right in a property; it is the portion of land, buildings, machinery, livestock or other that is wholly or partially owned by the ranch. Capital is defined as cash and all other assets used in operating a business or net worth.

'Acres of pasture' was the only variable that was changed for the two calving seasons because it was the most statistically different variable between the groups of survey results.

Table 9. Results of Partial Budgeting for Early and Late Season Calvers (See Appendix C, D, and E for more detail)

	Base Budget	**Early Calving**	**Late Calving**
Acres of Pasture	3,024	2,238	11,824
Interest on ST Borrowed Capital (per cow)	$10.81	$10.69	$12.08
Interest on ST Equity (per cow)	[1]$0.01	[2]$0.01	[3]$0.01
Land Interest on LT Borrowed Capital (per cow)	$6.96	$5.15	$27.21
Land Interest on LT Equity Capital (per cow)	$14.79	$10.94	$57.82
Owned Range Land Annual Taxes (per cow)	$0.66	$0.49	$2.59
Gross Income (per cow)	$333.59	$333.59	$333.59
Total Costs (per cow)	$508.19	$502.35	$574.67
Net Projected Returns (per cow)	($174.60)	($168.66)	($241.10)

[1] The number is rounded to the nearest cent. Actual amount is $0.011.
[2] The number is rounded to the nearest cent. Actual amount is $0.0097.
[3] The number is rounded to the nearest cent. Actual amount is $0.011.

'Early calvers' reported a smaller number of 'acres of pasture', averaging 3,012 acres. Thus, short term (ST) interest on borrowed capital, short term (ST) interest on capital equity, land long term (LT) borrowed capital interest, land long term (LT) interest on equity, 'owned range land' taxes, and total costs were reduced in comparison to the base budget. Producers reporting 'late calving' had more 'acres of pasture', than found in the base budget, averaging 15,827 acres, and consequently had higher short term interest on borrowed capital, short term (ST) interest on capital equity, long term (LT) borrowed capital interest costs, higher long term (LT) borrowed interest on equity, and higher total costs. The gross income per cow remained the same for the 'early' and 'late calvers'

because the two calving seasons were assumed to receive the same market price per head. This is a simplifying assumption used for this analysis and may not hold in reality. 'Early calvers' net projected returns increased by $5.94 from the base, and 'late calvers' net projected returns decreased by $66.50 from the base using the data collected from the pilot survey

The reader should note that other changes in the budgets would be expected when comparing 'early' and 'late' calving systems such as stored feed costs, labor costs, and market prices received which would change gross income. It has been suggested that 'late calving' may have reduced stored feed costs, labor costs, and may receive a higher market price due to the timing of sale and the seasonal market price fluctuations. These changes were not included in the budget because the data from the pilot survey did not show them to be statistically different between 'early' vs. 'late' calving.

Small vs. Medium Sized Operations

The same base budget was used in analysis of the 'small' vs. 'medium' sized operations. 'Acres of pasture' and number of 'bred cows' were adjusted in the base budget as they were statistically significantly different when comparing the 'small' and 'medium' sized operation data collected from the survey. The base budget was estimated for 3,024 'acres of pasture' while the 'small' operation budget was estimated for only 1,452 acres or 48 percent of the base budget acres (Table 4). The budget was then recalculated with the new number of cattle which resulted in a change in total costs and net projected returns per cow. Table 10 displays the results of the partial budget analysis of the small and medium sized operations.

Table 10. Results of Partial Budgeting for the Small & Medium Sized Operations (See Appendix F, G, and H for more detail)

	Base Budget	**Small Operation**	**Medium Operation**
Acres of Pasture	3,024	1,452	25,008
Number of Bred Cows	365	325	1,255
Interest on ST Borrowed Capital (per cow)	$10.81	$10.60	$11.42
Interest on ST Equity (per cow)	[1]$0.01	[2]$0.01	[3]$0.01
Land Interest on LT Borrowed Capital (per cow)	$6.96	$3.75	$16.74
Land Interest on LT Borrow Equity Capital (per cow)	$14.79	$7.97	$35.57
Owned Range Land Annual Taxes (per cow)	$0.66	$0.36	$1.59
Gross Income (per cow)	$333.59	$333.59	$333.59
Total Costs (per cow)	$508.19	$497.90	$539.67
Net Projected Returns (per cow)	($174.60)	($164.08)	($206.71)

[1] The number is rounded to the nearest cent. Actual amount is $0.0098.
[2] The number is rounded to the nearest cent. Actual amount is $0.0096.
[3] The number is rounded to the nearest cent. Actual amount is $0.0104.

Interest on long term (LT) borrowed capital, interest on long term (LT) equity, interest on short term (ST) borrowed capital, interest on short term (ST) equity, 'acres of pasture' taxes, and total costs all decreased with the small operation in comparison to the base budget. Conversely, these costs all increased with the 'medium' operation in comparison to the base budget as a result of the change in 'acres of pasture' and the number of 'bred cows'. Gross income per cow remained the same as the analysis assumed each operation type received the same market price per head. The net projected income for the 'small'

operation increased $10.52 per cow from the base, and net projected income for the 'medium' operation decreased $32.11 per cow from the base budget.

The reader should note that common sense would suggest that other changes in the budgets would be expected when comparing 'small' and 'medium' sized operations such as stored feed costs, labor costs, machinery costs, and possibly different market prices. 'Medium' operations may receive a higher market price for their cattle because some buyers give a price premium for larger lots of cattle. Other changes suggested above were not included in the budget because the data from the pilot survey did not show the other changes to be statistically different between 'small' vs. 'medium'. The pilot survey did not provide enough response data to include these other changes. A more comprehensive larger survey will be completed in the near future and should provide additional data.

When including all management practices (categorical variables in the survey): vaccination, animal ID, deworm, body condition scoring, insect control, pregnancy check, implant, breeding soundness exam, dehorn, artificial insemination, castration, and veterinarian consultation, costs increase by $943.73 per head. Costs are not allocated on a per cow basis for the 365 cow herd base budget because the management practices may be applied to different numbers of cattle depending on the operation. Appendix I shows the estimated costs of these management practices. The costs and quantities presented are one possible estimate, in practice, rancher costs will vary depending upon the practices followed and the location of the operation. For example, if a veterinarian is required and must travel a long distance to reach the ranch, charges will be greater then if the veterinarian did not have to travel so far. In addition, different veterinarians may

charge different amounts for the same procedures. Additionally, many operations do not dehorn their cattle, artificially inseminate, use body conditioning scores, or breeding soundness exams which would reduce the $943.73/head costs by $125.16/head.

8.0 Discussion

This paper is a pilot study examining economic and attitudinal factors that influence rancher production decisions within Wyoming. Results are preliminary and should be interpreted as such. An additional study is planned in 2005 to collect more data to support these analyses.

The partial budget analysis indicates that 'early calving' is less costly than 'late calving', but both demonstrated negative projected returns of $168.66 and $241.10 respectively. The negative returns may be because all possible costs both cash and non cash, short-term and long-term were included in the budgets. For example, items such as owner operator labor cost and interest on long term equity were included to give the most accurate representation of a ranching operation's long term return. These costs are not always included in other published budgets. 'Early calvers' experienced a return of $72.44 more per cow than 'late calvers'. Based upon these findings it appears that 'early calving' would be the most profitable choice for cattle producers. 'Early calving' is currently widely used within Wyoming. There are several caveats to the partial budgeting analysis, for example, possible differences in the seasonal market price of cattle (cattle sold in the spring vs. in the summer or winter may receive a higher market price because of the seasonal market price fluctuations) and differences in sale weights between early and late calving herds are not accounted for and could influence gross income. Previous

studies have suggested that feed and labor costs are two of the most binding input costs in cattle production.

Labor costs may be reduced in a 'late calving' operation because the cows and new born calves would require less assistance due to the warmer weather, so less labor would be required to help during calving. 'Late calving' may also result in lower feed costs where the cows would require less feed during the winter given their nutritional requirements are lower earlier in their pregnancy. 'Late calving' cows have nutritional requirements which are the highest in May and June when they calve. The pasture grasses are greening up by May and June, so less stored feed may be required which could reduce production costs.

There are also factors that could lower labor and feed costs for an 'early calving' operation. Factors such as the geographic location of the operation, climate, local feed availability, management practices, and the resources available to the operation may make feed and labor cost less in an 'early calving' operation. For example, if a cow/calf operation also grows some crops such as alfalfa and corn, 'early calving' may be the most cost effective calving season because during the months of May and June 'late calvers' would be calving, but that is also the time when the fields need to be prepared and planted. An operation with this situation may find the 'early calving' the most cost effective season because in the 'late spring' labor and management resources would be directed towards the crop enterprise.

Data collected for this analysis did not show significant differences in labor and feed across producers choosing 'early' or 'late calving' production systems, or between 'small' or 'medium' sized operations. Thus, these differences were not addressed in the

budgets. Feed costs and labor costs are important considerations that should be included in future research for a more thorough analysis. Results of the budget comparison of 'small' versus 'medium' sized operations revealed that the 'small' operation had a higher net projected return. The 'small' operation had a negative net projected return of $164.08, $32.11 greater per cow than the 'medium' sized operation which had a negative net projected return of $206.71 per cow. The fact that the net projected returns were negative may be due to the fact that all costs both cash and non cash, short term and long term were included in the budgets. Such detail is not included in many other published budgets. The 'small' scale operation is the most economically efficient choice for operators to consider based on the data collected for this study. However, there are several limitations to the data that in turn limit the power of this conclusion. For example, different sized operations may receive different market price for their cattle (premiums are some times given to large lots of cattle), and cattle weights at sale time may be different between producer size classes which would influence gross incomes. It is possible that a 'medium' or 'large' operation would be more economically efficient (economies of size) because 'larger' operations are able to allocate their expenses across a greater number of cattle, thus expenses per cow or calf could be lower.

Results of the survey reveal many interesting facts that may encourage further work in researching Wyoming cattle producers. For example: 20 percent of respondents were 70 years or older and only about 1 percent of respondents were in the youngest age group of 25 to 34 years of age. A large percent of the Wyoming beef cattle producers are older, and would be retired in many other professions. There are few young producers taking their place. This is important because without a young generation of ranchers

replacing the older generation, what is the future of agriculture in Wyoming? Fifty-two percent of the survey respondents were from the small sized operations, and about 6 percent were from medium sized operations; no one responded from the group of larger operators surveyed.

Agriculture's importance to the state was identified in Chapter 1. There may be opportunities for younger cattle producers in Wyoming due in part to the large percentage of the population that are 70 years of age or older, and the possibility of organic and/or natural beef production in the state. Surrounding states including Montana, Colorado, and Nebraska have numerous organic cattle production operations while Wyoming has very few. The proximity to the organic markets may be the cause of the small number of organic producers in the state, but it is an opportunity that may be worth exploring in more detail.

Many respondents did not feel they needed additional knowledge or help with developing alternative production practices to diversify their operation, and many had strong opinions against starting such alternative production practices such as selling recreational services, or switching to raising organic beef. If such practices were demonstrated to be profitable, producers might reconsider their views. Producers need extensive knowledge about changing production practices before they would be willing to adopt them.

Constructing partial budgets is a means by conveying information to producers who might consider applying change to their operation. Results of partial budgeting can also help support educational programs directed at assisting ranchers. For example, if a production practice such as implanting calves was found to bring positive returns to an

operation, then educators, such as the cooperative extension, could convey this information to producers and help show them how they can implement the practice of implanting their calves into their existing operation. While a partial budget was used in this paper, an enterprise budget may be more appropriate in further research efforts. An enterprise budget includes all expenses and revenues involved in the production of one output such as a weaned calf in a cow/calf production operation.

This paper is the result of a pilot study used to examine several characteristics of Wyoming cattle producers, and possible production changes that could increase producer incomes in the state. However, the scope of the paper is limited and many issues examined require additional research. A larger survey has been developed from the pilot survey and was sent to 3000 producers in February 2005. The larger survey will gather enough data to make more accurate statements and will better represent the Wyoming cattle industry. It appears that the cattle producers are getting older while there are very few young cattle producers, so further research should be conducted to determine how educators and policy makers can better assist producers to ensure the future existence of farms and ranches in Wyoming.

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Appendix A
Survey Instrument with Results

Wyoming Beef Cattle Producers Survey

We would prefer the primary ranch operator complete this survey. Your voluntary and confidential participation in this survey is much appreciated. Please answer the following questions to the best of your ability. If you do not feel comfortable answering a question, please omit it and continue with the rest of the survey. No individual information will be released. Thank you.

Part A. General Ranch Description - The first part of this survey asks questions about your operation. Each farm/ranch has its own unique characteristics and production practices. We want to know the characteristics and production practices that are used on your operation.

1. What is your mailing zip code? Laramie, Wheatland, Douglas, Sheridan (cities with the most survey responses).

2. How many years of experience do you have raising beef cattle? Ave. 36 years.

3. How much land in your ranch fits into the following categories, and is the land owned or leased?

Types of Land	AUMs	Acres	Percent Owned	Percent Leased
Pastureland, Rangeland	755 (ave)	4048 (ave)	89% (ave)	98% (ave)
Harvested Grain Cropland	510 (ave)	357 (ave)	83% (ave)	44% (ave)
Irrigated & Sub Irrigated Hay	1780 (ave)	335 (ave)	83% (ave)	69% (ave)
Dry Land Hay	50 (ave)	286 (ave)	88% (ave)	99% (ave)
Other (specify)	50 (ave)	7509 (ave)	96% (ave)	73% (ave)
Forest Service	331 (ave)	3074 (ave)		
BLM	477 (ave)	3433 (ave)		
State Lands	293 (ave)	1174 (ave)		

4. What percentage of your total farm income comes from each type of ranch enterprise/practice?

	Percent		Percent		Percent		Percent
Cow/Calf	74% (ave)	Back-grounding	28% (ave)	Feedlot	75% (ave)	Dairy	5% (ave)
Cow-Yearling	74% (ave)	Club-calves	10% (ave)	Replacement Heifers	28% (ave)	Horses	14% (ave)
Purebred	71% (ave)	Commercial	81% (ave)	Stockers	54% (ave)	Sheep	
Other (specify)							20% (ave)

5. What breed(s) of cattle do you raise and/or feed? (please mark all that apply)

Angus	44%	Angus-cross	50%	Hereford	13%
Other (specify) 15%					

Percentages do not total to 100% as respondents checked more than 1 category, and the question was not answered about 2% of the time.

6. What percentage of calving occurs during each month? (should total 100%)

	Percent		Percent		Percent		Percent
Jan.	23% (ave)	April	45% (ave)	July	24% (ave)	Oct.	
Feb.	47% (ave)	May	30% (ave)	Aug.	30% (ave)	Nov.	
March	43% (ave)	June	21% (ave)	Sept.		Dec.	

7. What percentage of weaning occurs during each month? (should total 100%)

	Percent		Percent		Percent		Percent
Jan.	55% (ave)	April	20% (ave)	July		Oct.	88% (ave)
Feb.		May		Aug.	38% (ave)	Nov.	83% (ave)
March	90% (ave)	June		Sept.	80% (ave)	Dec.	100% (ave)

8. Which herd management techniques do you practice each year (check all that apply)?

Practice		Practice	
Vaccinate	1 (rank)	Animal ID System	8 (rank)
Deworm	4 (rank)	Body Condition Scoring	12 (rank)
Insect Control	3 (rank)	Pregnancy Check	6 (rank)
Implant	9 (rank)	Breeding Soundness Exam	11 (rank)
Dehorn	5 (rank)	Artificial Insemination	10 (rank)
Castrate	2 (rank)	Veterinarian Consultation	7 (rank)
Other (specify) 13 (rank)			

9. In a typical year what percentage of the total farm and ranch expenses are due to the following?

Expenses	Percent	Expenses	Percent
Livestock Purchased	23% (ave)	Veterinarian/Health Supplies	6% (ave)
Alfalfa, Hay	22% (ave)	Labor-hired/Contract labor	10% (ave)
Grain (corn, barley, oats)	13% (ave)	Diesel, Gasoline, Natural Gas Fuels	17% (ave)
Feed Concentrates	8% (ave)	Interest Expense	11% (ave)
Salt & Mineral	4% (ave)	Professional Services	5% (ave)
Fertilizer, Chemicals, Seeds	9% (ave)	Machinery Repair Services	12% (ave)
Other (specify)	3.36% (ave)	Other (specify)	

10. In a typical year how many of the following workers does this operation employ and in which months? (please include both paid and non-paid employees)

Family	Number Employed	Circle the Months Employed (most indicated months in bold)
Full-Time	53% (ave)	Jan. Feb. Mar. **Apr. May Jun. Jul. Aug.** Sept. Oct. Nov. Dec.
Part-Time	34% (ave)	Jan. Feb. Mar. Apr. May **Jun. Jul. Aug. Sept**. Oct. Nov. Dec.
Seasonal	13% (ave)	Jan. Feb. Mar. Apr. May Jun. **Jul. Aug**. Sept. Oct. Nov. Dec.

Non-Family	Number Employed	Circle the Months Employed (most indicated months in bold)
Full-Time	22% (ave)	Jan. Feb. **Mar. Apr. May Jun. Jul. Aug. Sept. Oct. Nov.** Dec.
Part-Time	43% (ave)	Jan. Feb. Mar. Apr. May **Jun. Jul.** Aug. Sept. Oct. Nov. Dec.
Seasonal	35% (ave)	Jan. Feb. Mar. Apr. May **Jun. Jul. Aug.** Sept. Oct. Nov. Dec.

11. How much of the following feed sources come from on-farm, how much from off-farm, and how long do you feed them in a typical year?

Feed Sources	On-Farm Sources	Off-Farm Sources	Date Generally Start Feeding	Date Generally Finish Feeding
Grass Hay, Other Hay (tons)	189 (ave)	64 (ave)	Nov (mode)	May (mode)
Alfalfa (tons)	381 (ave)	139 (ave)	January (mode)	May (mode)
Protein Supplement (pounds)	2800 (ave)	45,958 (ave)	January (mode)	April (mode)
Concentrates (pounds)	817 (ave)	17,025 (ave)	January (mode)	December (mode)
Grain (bushels) Circle all grain type(s)	corn, barley oats, wheat	corn, barley oats, wheat	October (mode)	May (mode)
Other (specify)				

12. Please indicate the peak number of livestock owned, and the months they were on feed other than pasture grass during the year.

Classes	Owned	# Months Owned	# Months on Feed (hay, alfalfa, grain)
Bred Cows	131 (ave)	12 (ave)	6 (ave)
Steer Calves	83 (ave)	9 (ave)	5 (ave)
Heifer Calves	77 (ave)	9 (ave)	5 (ave)
Replacement Heifers	60 (ave)	12 (ave)	6 (ave)
Retained Yearlings	5 (ave)	11 (ave)	5 (ave)
Fattened Cows	20 (ave)	10 (ave)	3 (ave)
Herd Bulls	7 (ave)	12 (ave)	6 (ave)
Other (specify)			

13. What percentage of cattle are sold using the following methods?

Methods	Percent	Methods	Percent
Sale Barn	59% (ave)	Futures & Options	1% (ave)
Video Auction	4% (ave)	Internet	1% (ave)
Private Sale	32% (ave)	Other (specify)	1% (ave)
Forward Cash Contracts	2% (ave)		

14. What percentage of cattle are purchased using the following methods?

Methods	Percent	Methods	Percent
Sale Barn	39% (ave)	Futures & Options	
Video Auction		Internet	
Private Sale	60% (ave)	Other (specify)	
Forward Cash Contracts			

15. What are the typical sale weights/maintenance weights of the cattle on your operation, and what date do you typically sell them?

Classes	Weights (lbs)	Date Typically Sold
Stocker Steer Calves	588 (ave)	September (ave)
Stocker Heifer Calves	535 (ave)	September (ave)
Retained Steer Calves	925 (ave)	September (ave)
Retained Heifer Calves	764 (ave)	November (ave)
Replacement Heifers	733 (ave)	August (ave)
Bred Cows	1206 (ave)	November (ave)
Fattened Cows	1271 (ave)	August (ave)
Herd Bulls	1790 (ave)	August (ave)

16. What are your plans for the intergenerational succession of your operation? (check all that apply)

Trust	39 %	Partnership	11 %	Tenancy in Common	2%
Life Estate	9% (ave)	Community Property		Bequest of Land	6%
Joint Tenancy	10 %	Corporation	14 %		
Other (describe)					

Part B. Other Production and Marketing Practices - The following questions are designed to understand your opinions about a number of different practices. We want to know if you have considered the following.

17. Have you considered or are you currently doing any of the following practices? (mark all that apply)

Practice	Currently Doing	Have Considered	Have Not Considered	Will Not Do
Organic Beef (USDA Certified)	3%	36%	38%	23%
Grass 'Fed' Beef	27%	27%	32%	14%
Direct Customer Marketing	24%	28%	36%	12%
Joining a Beef Cooperative	3%	28%	49%	20%
Cattle Identification System	40%	34%	17%	9%
Changing Calving Season	22%	24%	26%	28%
Starting an Additional Enterprise	15%	40%	21%	24%
Selling Recreation (fishing, hunting, camping, etc.)	29%	24%	16%	31%
Other (describe)				

18. Please circle the answer that best indicates your response to the following statements about future changes and/or trends that may occur in the beef industry.

Questions	Strongly Disagree - Strongly Agree (1) (5) (Percent of Responses for each number)				
A government mandated cattle identification system is needed. (Total Response of 101)	1 (21.8)	2 (18.8)	3 (32.7)	4 (13.9)	5 (12.9)
Government restrictions on the use of antibiotics, growth implants, and vaccinations are necessary. (Total Response of 103)	1 (24.3)	2 (23.3)	3 (26.2)	4 (18.4)	5 (7.8)
Beef consumption will increase in the future. (Total Response of 107)	1 (0)	2 (2.8)	3 (38.3)	4 (41)	5 (17.8)
Beef Consumers are willing to pay a price premium for organic, grass fed, and origin identified beef. (Total Response of 101)	1 (2)	2 (10.9)	3 (29.7)	4 (38.6)	5 (18.8)
A drought contingency plan is important for beef producers in Wyoming. (Total Response of 108)	1 (2.8)	2 (0.9)	3 (17.6)	4 (32.4)	5 (46.3)

BSE will have a big impact on the meat industry in the future. (Total Response of 107)	1 (0)	2 (21.5)	3 (39.3)	4 (25.2)	5 (14)
High petroleum prices will impact the beef industry in the future. (Total Response of 107)	1 (0.9)	2 (0.9)	3 (15)	4 (33.6)	5 (45.8)
Climate change will impact the beef industry in the future. (Total Response of 106)	1 (1.9)	2 (11.3)	3 (27.4)	4 (32.1)	5 (27.4)
Brucellosis will have a big impact on the beef industry in the future. (Total Response of 107)	1 (2.8)	2 (14)	3 (34.6)	4 (30)	5 (18.7)
I need to consider alternative enterprises to stay in business. (Total Response of 105)	1 (7.6)	2 (14.3)	3 (25.7)	4 (29.5)	5 (22.9)
I need to learn more about marketing alternatives to stay in business. (Total Response of 100)	1 (6)	2 (16)	3 (38)	4 (29)	5 (11)
I need to learn more about alternative production practices for my current enterprise to stay in business. (Total Response of 100)	1 (5)	2 (25)	3 (36)	4 (26)	5 (8)
I need to learn about alternative risk management strategies. (Total Response of 100)	1 (4)	2 (23)	3 (40)	4 (22)	5 (11)
High interest rates in the future will affect the way I do business. (Total Response of 104)	1 (5.8)	2 (15.4)	3 (25)	4 (26)	5 (27.9)
Government subsidies to ranchers/farmers will be eliminated in the future. (Total Response of 100)	1 (7)	2 (15)	3 (38)	4 (26)	5 (14)
Livestock grazing on federal land will be reduced or eliminated in the future. (Total Response of 103)	1 (8.7)	2 (12.6)	3 (26.2)	4 (39.8)	5 (12.6)
The cattle market and the price of cattle will remain strong in the future. (Total Response of 104)	1 (0)	2 (13.5)	3 (52)	4 (29.8)	5 (4.8)

(Note: percentages may not sum to 100% due to rounding)

Part C. Demographic Information - For the final part of the survey we would like to ask some questions about you. These questions help to ensure that our sample survey is representative of the population. All the information you provide is completely confidential.

19. Please indicate the (primary operator's) gender. Male 87% Female 13%

20. How many years have you lived in Wyoming? 48 years (ave).

21. Please indicate your current age (primary operator):

25-34	0.9%	45-49	15.9%	55-59	14.2%	65-69	15.9%
35-44	9.7%	50-54	16%	60-64	7.1%	70 or older	20.4%

22. Please circle/write-in the responses below to indicate your level of formal education.

	Number of years completed	**Degree Obtained**
High School	1, 2, 3, over 4 (ave 4)	GED, H.S. Diploma
Vocational	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, over 10 (ave 3)	Describe:
College	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, over 10 (ave 4)	A.A., B.S., M.S., PhD Other (list):
Other	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, over 10 (ave 6)	Describe:

23. Do you have access to the internet? (please mark all that apply)

No Access	29%	Home Access	51%	Other (specify) 2%
Work Access	15%	Local School	3%	

24. Are you and/or your spouse employed off farm? Please indicate the percentage of your total household income that is from off farm employment and whether this employment is full-time or part- time.

	Full-Time Percent	**Part-Time Percent**
You	71% (ave)	24% (ave)
Spouse	59% (ave)	24% (ave)

25.

Producer input is crucial to interpreting the data from this survey. Would you be willing to be contacted by the University of Wyoming Department of Agriculture and Applied Economics? To verify the findings of the survey.

If so, USDA-NASS will provide them your name and contact information when you sign and date below. **Thank You.**

Signature 50.4% No, 49.6% Yes Date_____

26. Are there any other comments or suggestions you would like to share with us for this survey? (please write your comments below)

Appendix B
Summary of Survey Results

Summary of Survey Results

A total of 400 surveys were mailed. Of the 400 surveys, 145 were returned with a response rate of 36%.

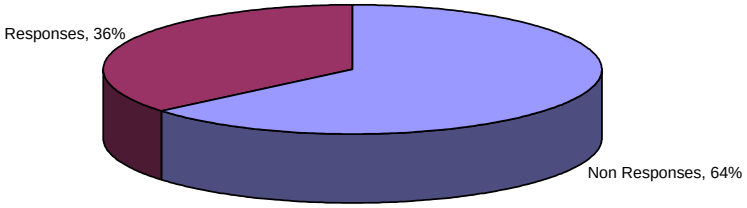

Figure B.1. Survey Response Rate

Question 1. **What is your zip code?**

Table B.1 Zip Code Frequencies of Responses to the Question (total responses = 124)

Zip Code	City	Frequency
82070	Laramie	5
82201	Wheatland	5
82633	Douglas	5
82801	Sheridan	5
82435	Powell	4
82604	Casper	4
82729	Sundance	4
83110	Afton	4
82225	Lusk	3
82410	Basin	3
82514	Fort Washakie	3
82716	Gillette	3
82835	Clearmont	3

(Note: zip codes of only those with 3 or more frequencies)

Question B.2. **How many years of experience do you have raising beef cattle?**

	Years
Average	36
Max	74
Min	3
Standard Deviation	16.4
# of Responses	108

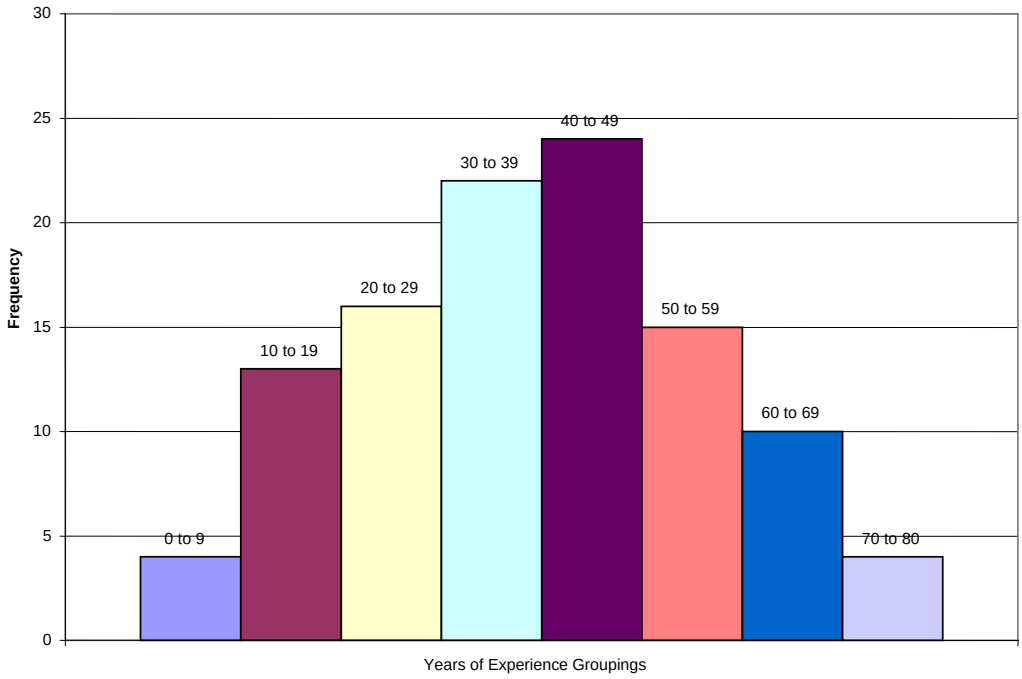

Figure B.2. Years of Experience Raising Beef Cattle

Question 4. **What percentage of your total farm income comes from each type of ranch enterprise/practice?**

	Cow/Calf	Back-grounding	Feedlot	Dairy	Cow-Yearling	Club-calves	Replacement Heifers
Average (%)	74	28	75	5	74	10	28
Max (%)	100	50	96	5	100	10	100
Min (%)	0	12	25	5	3	10	5
Standard Deviation	33	16	29		31		41
# of Responses	83	4	5	1	17	1	5
	Horses	**Purebred**	**Commercial**	**Stockers**	**Sheep**	**Other**	
Average (%)	14	71	81	54		20	
Max (%)	50	100	100	100		40	
Min (%)	0	16	25	5		5	
Standard Deviation	15	38	38	39		18	
# of Responses	14	7	4	6		3	

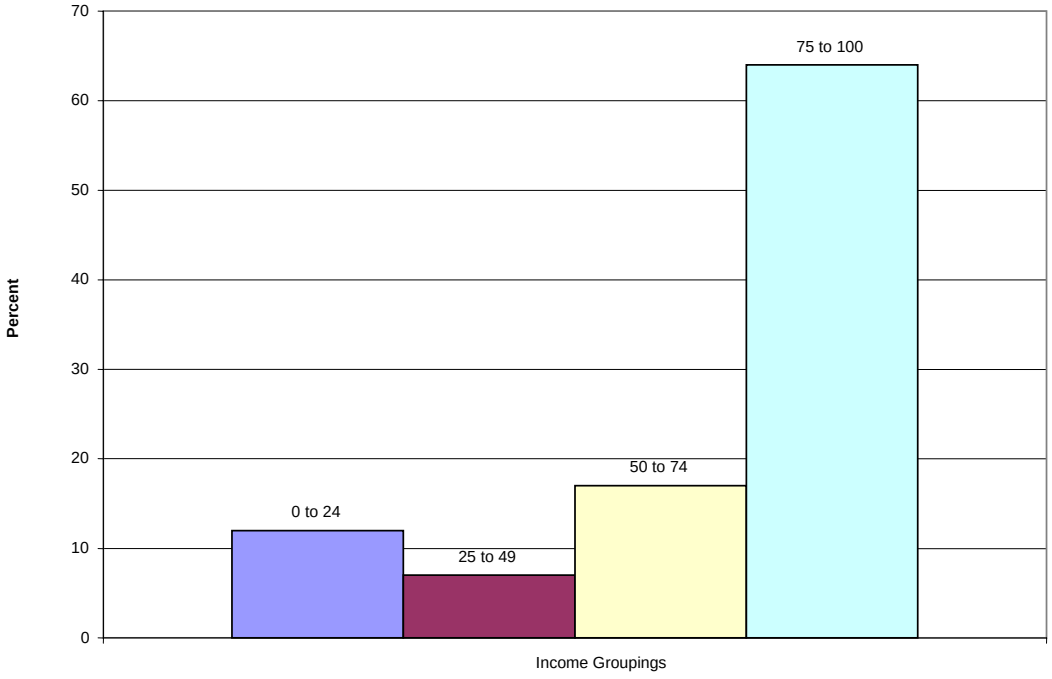

Figure B.3a. Percent of Income from Cow/Calf Production

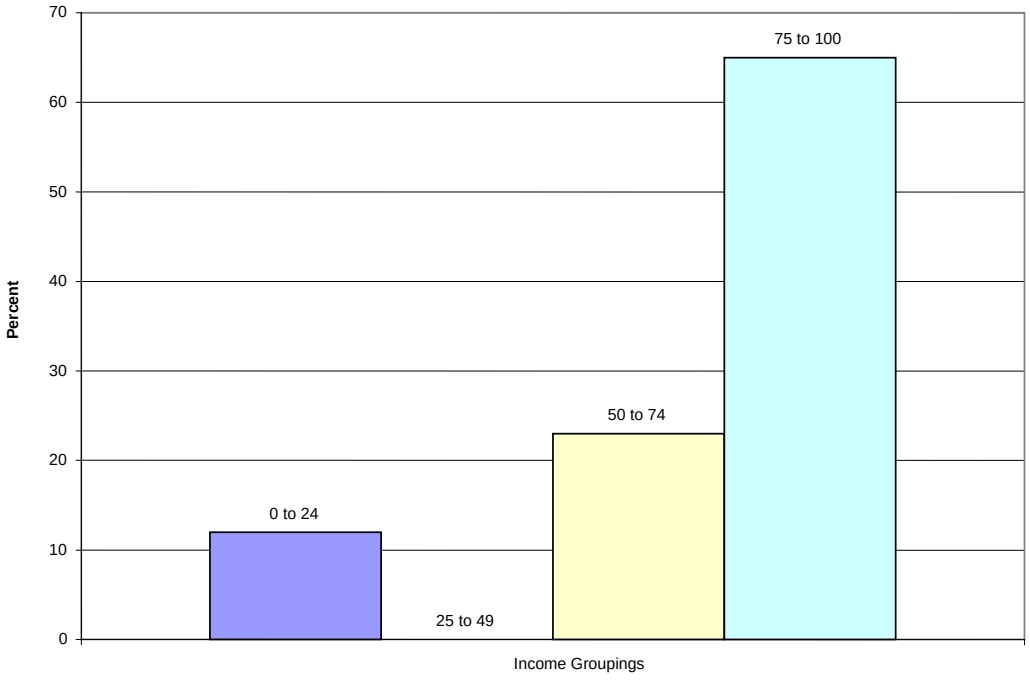

Figure B.3b. Percent of Income from Cow-Yearling Production

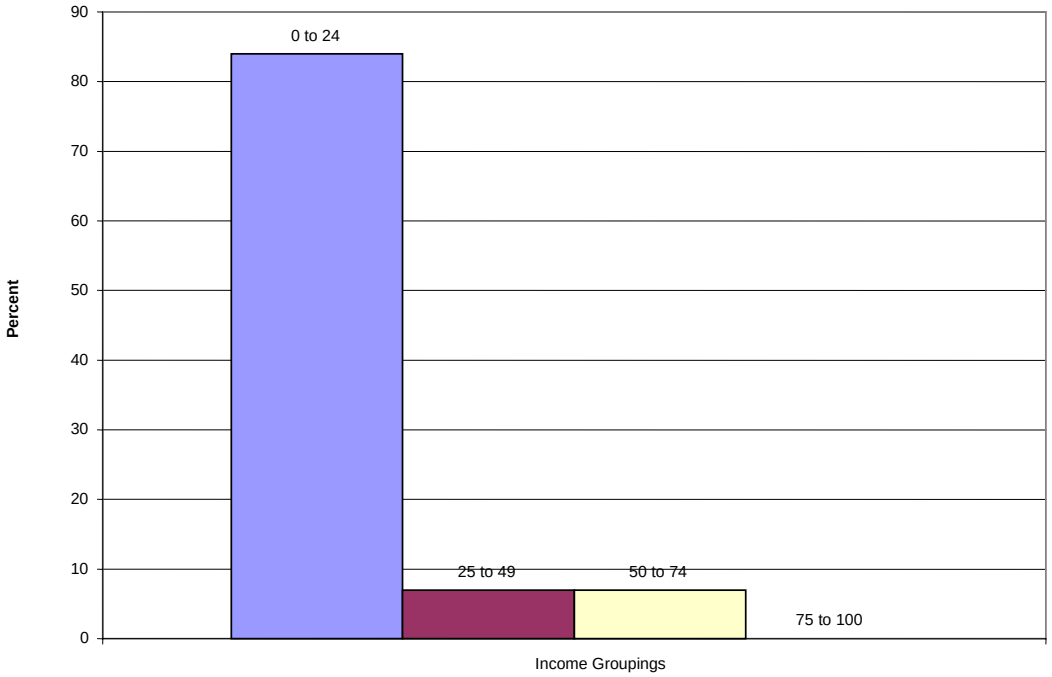

Figure B.3c. Percent of Income from Horse Production

Question 6. **What percentage of calving occurs during each month? (should total 100%)**

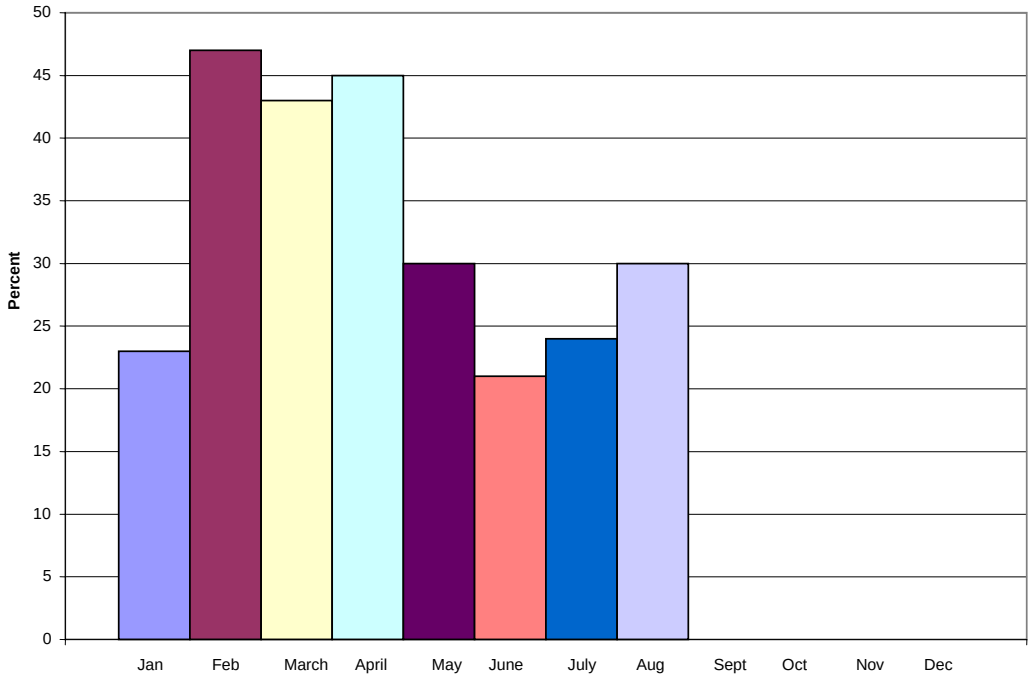

Figure B.4a. Average Percent of Calving Occurring in Each Month

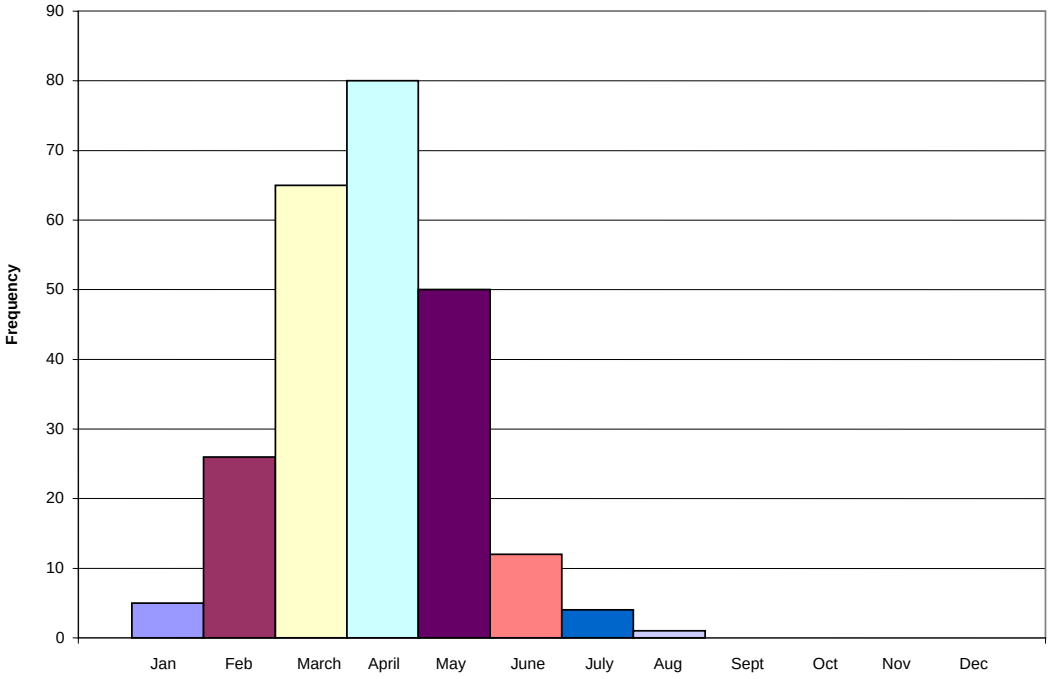

Figure B.4b. Number of Respondents Calving in Each Month

Question 8. **Which herd management techniques do you practice each year? (check all that apply)**

Table B.2. Number of Respondents Who Indicated Using the Following Practices

Practice	Number of Responses	Rank
Vaccinate	101	1
Animal ID System	53	8
Deworm	65	4
Body Condition Scoring	17	12
Insect Control	74	3
Pregnancy Check	62	6
Implant	20	9
Breeding Soundness Exam	18	11
Dehorn	63	4
Artificial Insemination	19	10
Castrate	96	2
Veterinarian Consultation	55	7
Other	3	13

Question 9. **In a typical year what percentage of the total farm and ranch expenses are due to the following?**

Table B.3. Descriptive Statistics of Question Results

	Expenses					
	Livestock Purchased	**Veterinarian/ Health Supplies**	**Alfalfa, Hay**	**Labor-hired/ Contract**	**Grain**	**Diesel, Gas**
Average	23	6	22	10	13	17
Max	90	70	80	45	35	70
Min	0	0	0	0	0	0
Standard Deviation	26	10	20	11	18	14
# of Responses	56	82	58	48	34	79
	Feed Concentrates	**Interest**	**Salt/ Mineral**	**Professional Services**	**Fertilizer, Chemicals, Seeds**	**Machinery Repair**
Average	8	11	4	5	9	12
Max	25	60	50	20	30	50
Min	0	0	0	0	0	1
Standard Deviation	6	11	13	4	8	10
# of Responses	36	48	73	31	45	75
	Other					
Average	3.36					
Max	60					
Min	0					
Standard Deviation	8.96					
# of Responses	142					

Question 10. In **a typical year how many of the following workers does this operation employ and in which months? (Please include both paid and non-paid employees)**

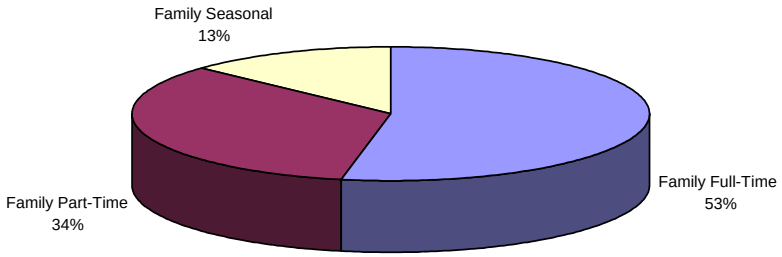

Figure B.5. Additional Family Labor Employed (total of 89 responses)

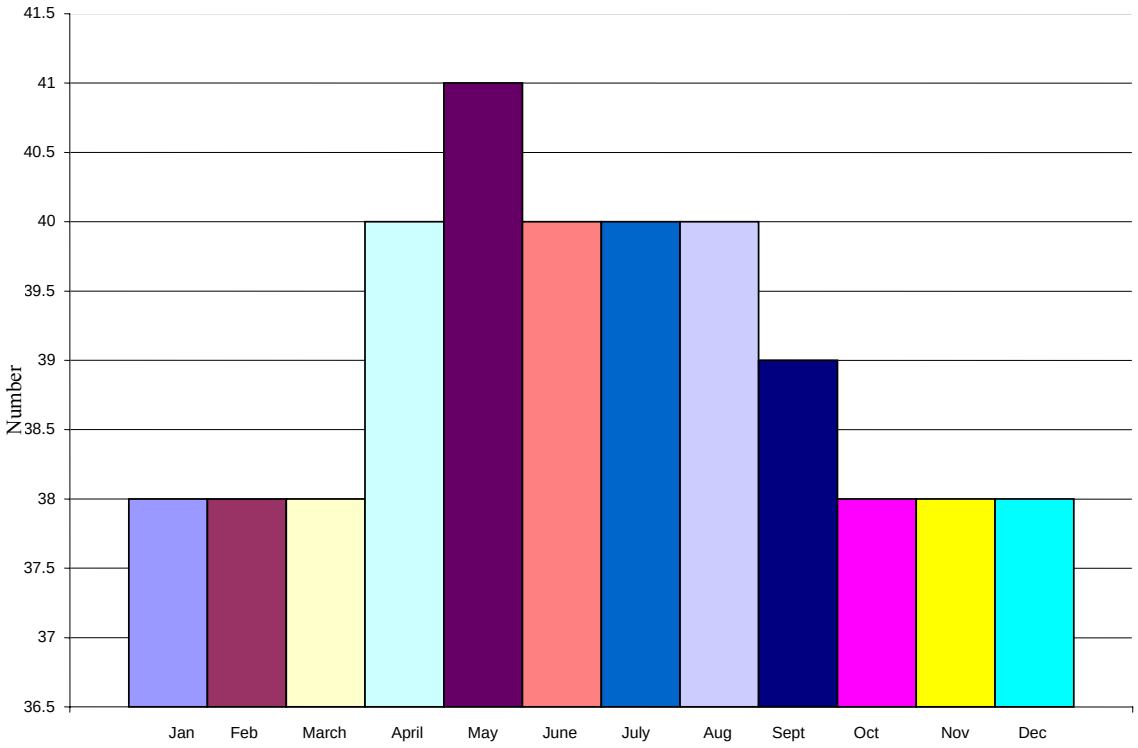

Figure B.6a. Number of Respondents Who Employ Family Full-Time in Each Month of the Year

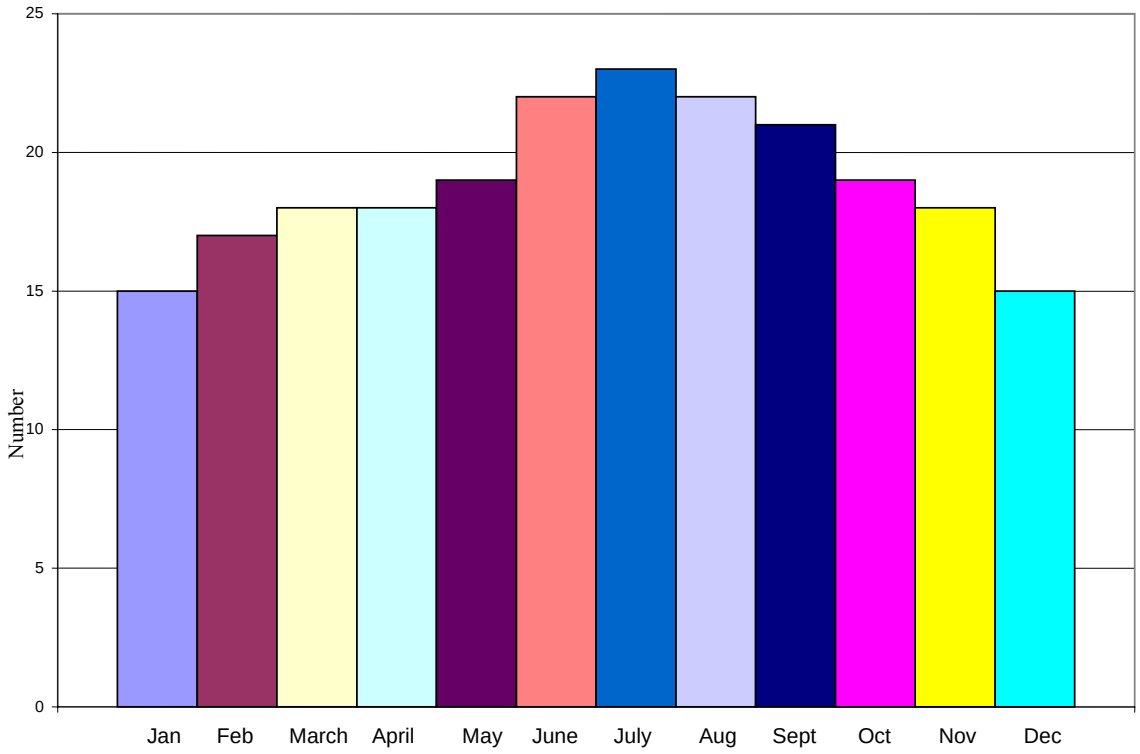

Figure B.6b. Number of Respondents Who Employ Family Part-Time in Each Month of the Year

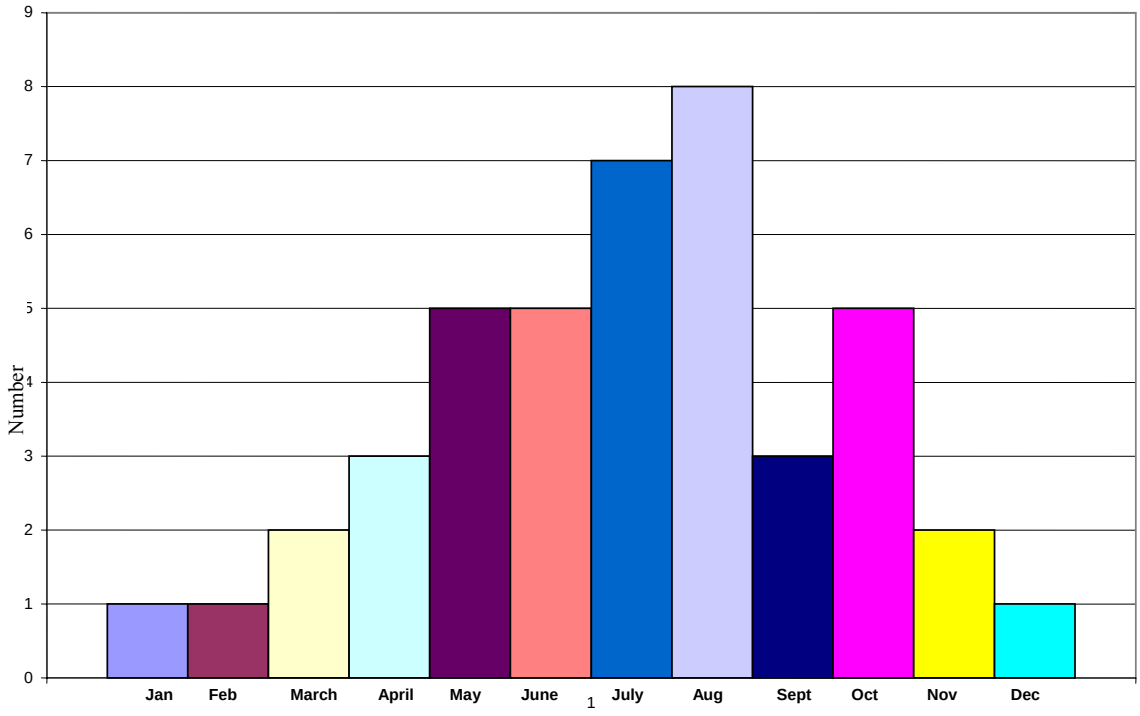

Figure B.6c. Number of Respondents Who Employ Family Seasonal in Each Month of the Year

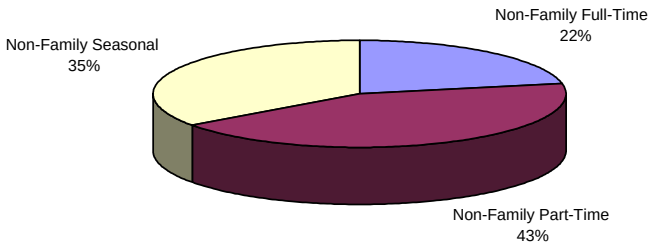

Figure B.7. Non-family Labor Employed (total of 37 responses)

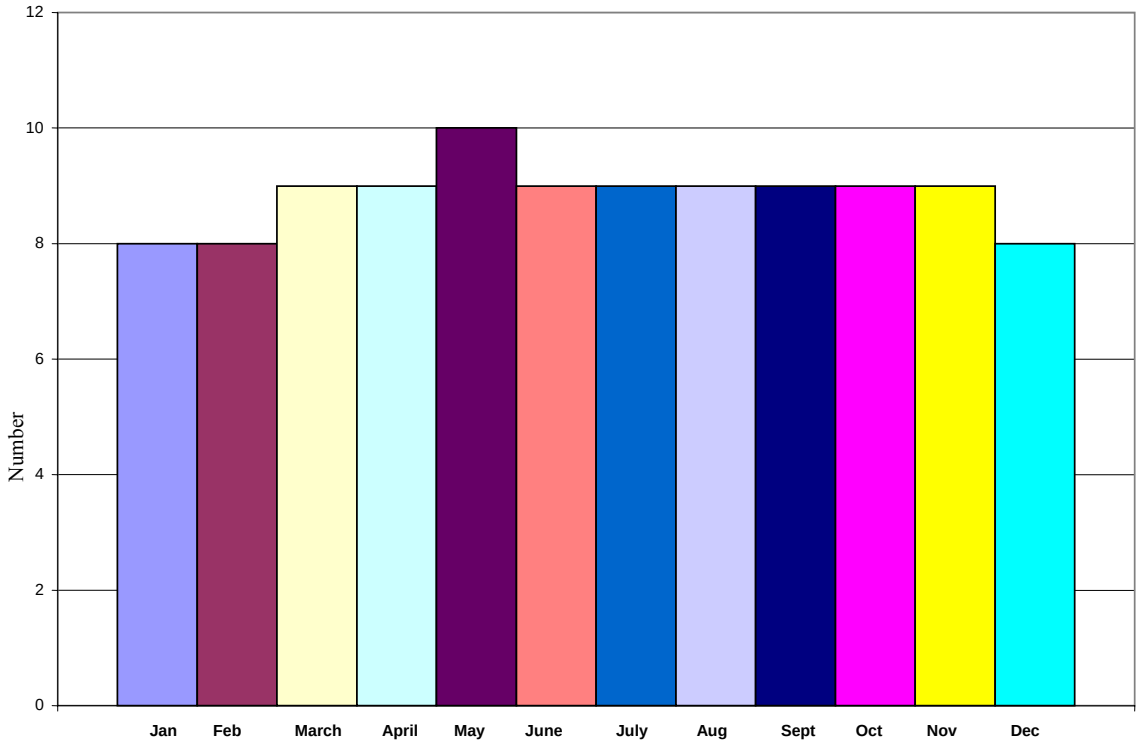

Figure B.8a. Number of Respondents Who Employ Non-Family Full-Time in Each Month of the Year

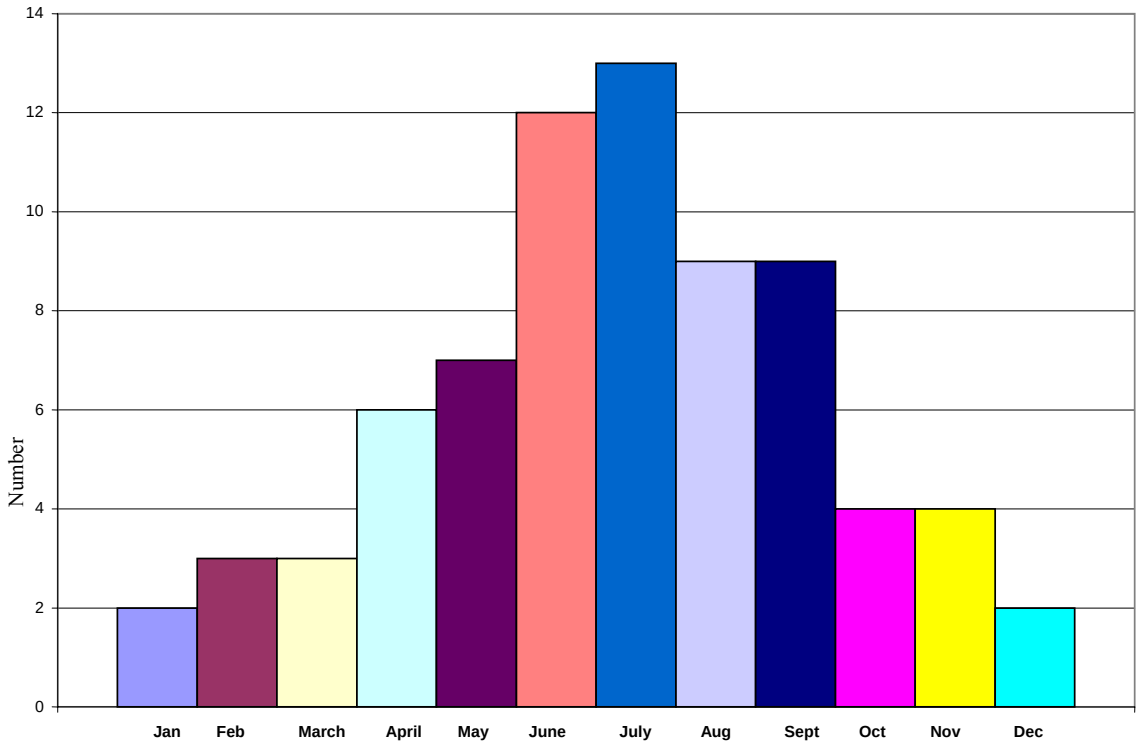

Figure B.8b. Number of Respondents Who Employ Non-Family Part-Time in Each Month of the Year

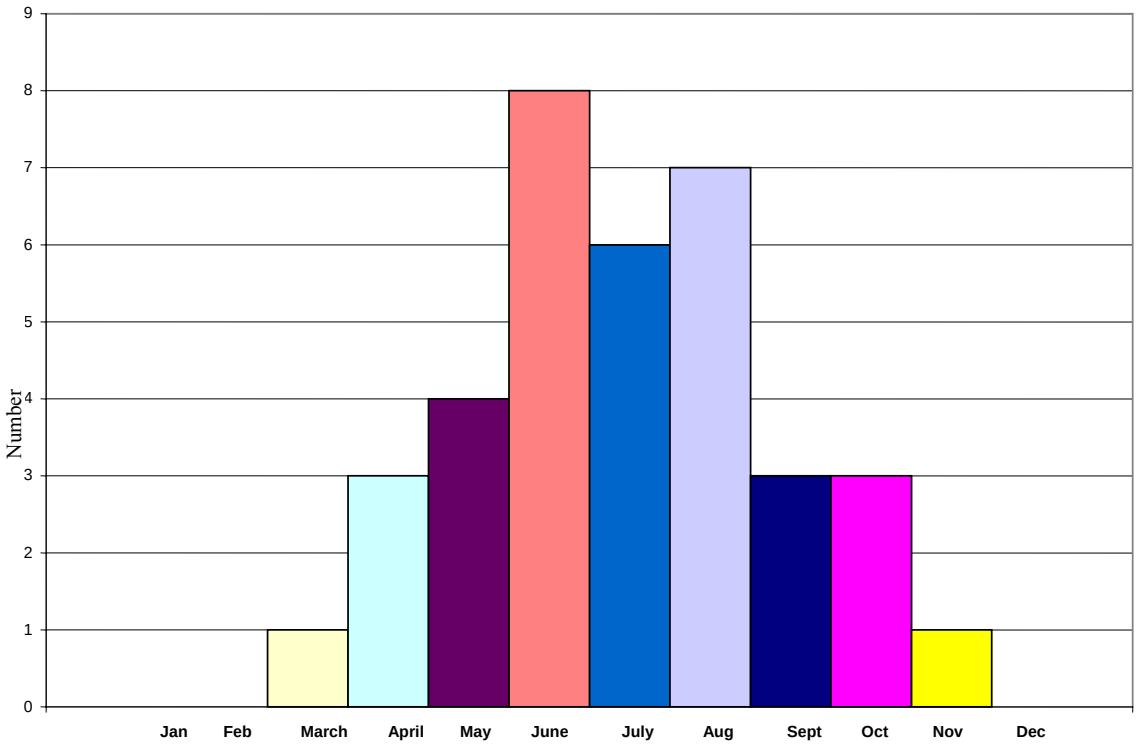

Figure B.8c. Number of Respondents Who Employ Non-Family Seasonal in Each Month of the Year

Question 11. **How much of the following feed sources come from on-farm, how much from off-farm, and how long do you feed them in a typical year?**

Table B.4 Descriptive Statistics of On-Farm and Off-Farm Feed Sources.

On-Farm Feed Sources

	Grass Hay, Other Hay (tons)	Alfalfa (tons)	Protein Supplement (lbs)	Concentrates (lbs)
Average	189	381	2800	817
Max	2625	3000	10,000	200
Min	1	5	0	50
Standard Deviation	410	669	3750	1040
# of Responses	53	35	6	3

Off-Farm Feed Sources

	Grass Hay, Other Hay (tons)	Alfalfa (tons)	Protein Supplement (lbs)	Concentrates (lbs)
Average	64	139	45,958	17,025
Max	200	423	660,000	75,000
Min	3	5	40	800
Standard Deviation	60	106	140,309	25,755
# of Responses	28	18	23	8

Question 12. **Please indicate the peak number of livestock owned, and the months they are on feed, other than pasture grass, during a typical year.**

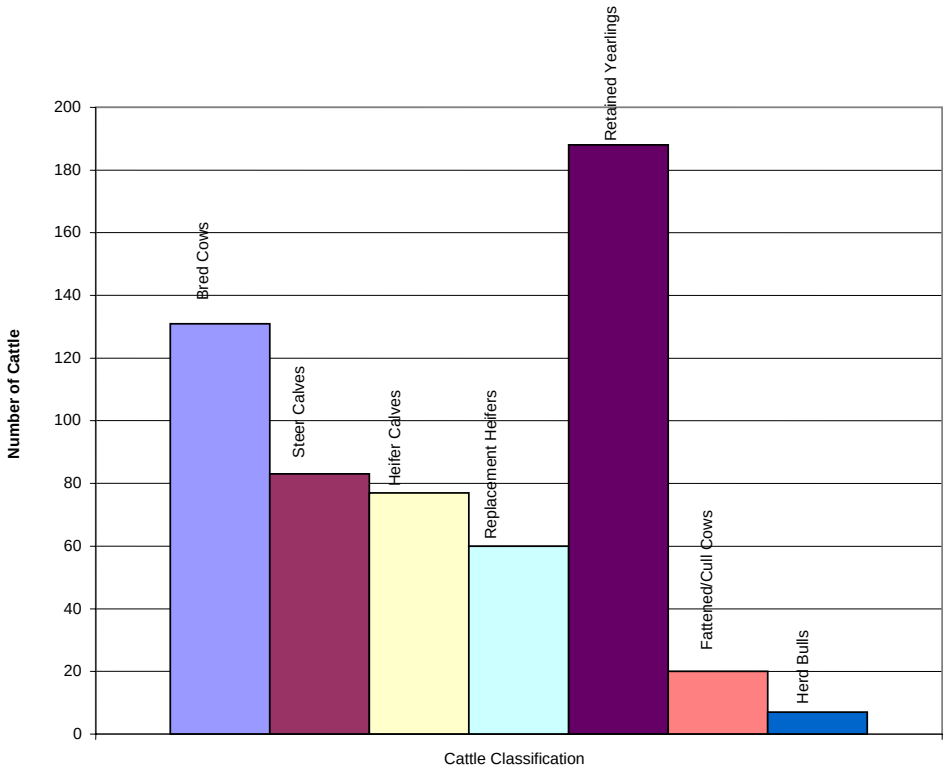

Figure B.9. Average Number of Cattle Owned

Table B.5. Descriptive Statistics of Number of Cattle Owned in each Classification

	Bred Cows (#)	**Steer Calves (#)**	**Heifer Calves (#)**	**Replacement Heifers (#)**	**Retained Yearlings (#)**	**Fattened/Cull Cows (#)**	**Herd Bulls (#)**
Average	131	83	77	60	188	20	7
Max	620	610	605	2000	700	80	35
Min	1	1	1	2	7	2	1
Standard Deviation	137	114	115	258	236	30	7
# of Responses	84	45	45	59	10	6	68

Table B.6. Descriptive Statistics of the Number of Months on Feed

	Bred Cows
Ave	6
Max	12
Min	1
Standard Deviation	2
# of Responses	70
	Steer Calves
Ave	5
Max	12
Min	1
Standard Deviation	3
# of Responses	26
	Heifer Calves
Ave	5
Max	12
Min	1
Standard Deviation	2
# of Responses	24
	Replacement Heifers
Ave	6
Max	12
Min	1
Standard Deviation	2
# of Responses	47
	Retained Yearlings
Ave	5
Max	6
Min	3
Standard Deviation	1
# of Responses	9
	Fattened/Cull Cows
Ave	3
Max	6
Min	2
Standard Deviation	2
# of Responses	4
	Herd Bulls
Ave	6
Max	9
Min	2
Standard Deviation	1
# of Responses	43

Table B.6 (continued)

	Other
Ave	5
Max	8
Min	3
Standard Deviation	2
# of Responses	8

Question 13. **What percent of cattle are sold using the following methods?**

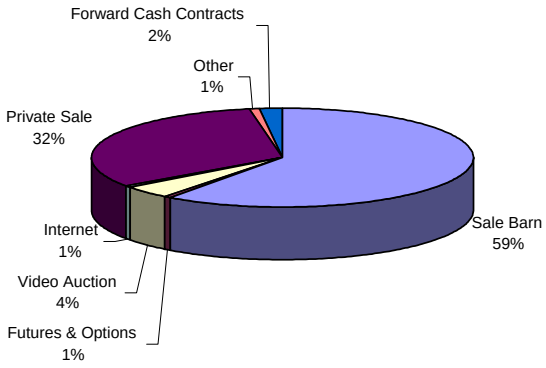

Figure B.10. Percent of Respondents Indicated Method of Sale of Cattle (total response of 149)

Question 14. **What percent of cattle are purchased using the following methods?**

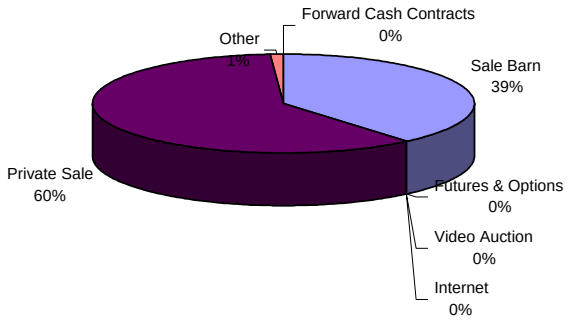

Figure B.11. Percent of the Respondents Indicated Method of Purchase of Cattle (total response of 109)

Question 15. **What are the typical sale weights/maintenance weights of the cattle on your operation, and what date do you typically sell them?**

Table B.7. Weights of Cattle and Month Typically Sold.

	Steer Calves Weight (lbs)
Ave	588
Max	1200
Min	350
Standard Deviation	133.8
# of Responses	84
Month Sold (Mode)	October
	Heifer Calves (lbs)
Ave	535
Max	1200
Min	300
Standard Deviation	120.3
# of Responses	79
Month Sold (Mode)	October
	Retained Steer Calves (lbs)
Ave	925
Max	1400
Min	300
Standard Deviation	299.6

Table B.7 (continued)	
# of Responses	15
Month Sold (Mode)	December
	Retained Heifer Calves (lbs)
Ave	764
Max	1300
Min	150
Standard Deviation	344.7
# of Responses	14
Month Sold (Mode)	November
	Replacement Heifers (lbs)
Ave	733
Max	1200
Min	100
Standard Deviation	213.1
# of Responses	31
Month Sold (Mode)	October
	Bred Cows (lbs)
Ave	1206
Max	1450
Min	1000
Standard Deviation	123.6
# of Responses	24
Month Sold (Mode)	December
	Fattened/Cull Cows (lbs)
Ave	1271
Max	1800
Min	1100
Standard Deviation	141.9
# of Responses	31
Month Sold (Mode)	November
	Herd Bulls (lbs)
Ave	1790
Max	2300
Min	650
Standard Deviation	323.5
# of Responses	40
Month Sold (Mode)	October

Question 16. **What are your plans for the intergenerational succession of your operation? (check all that apply)**

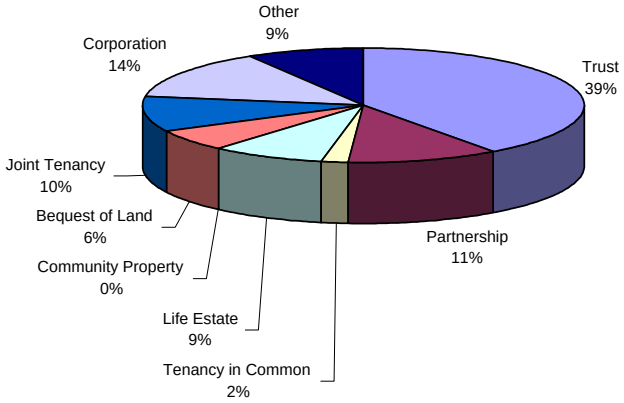

Figure B.12. Percent of Respondents Intergenerational Succession Plans (total response of 93)

Question 17. **Have you considered or are you currently doing any of the following practices? (Mark all that apply)**

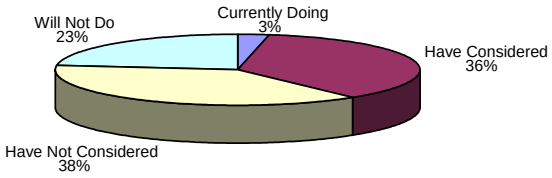

Figure B.13a. Organic Beef (total response of 74)

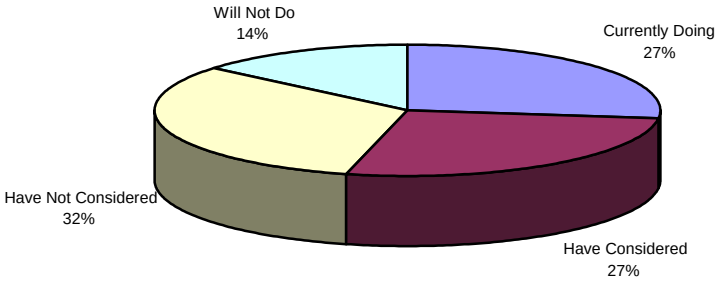

Figure B.13b. Grass Fed Beef (total response of 78)

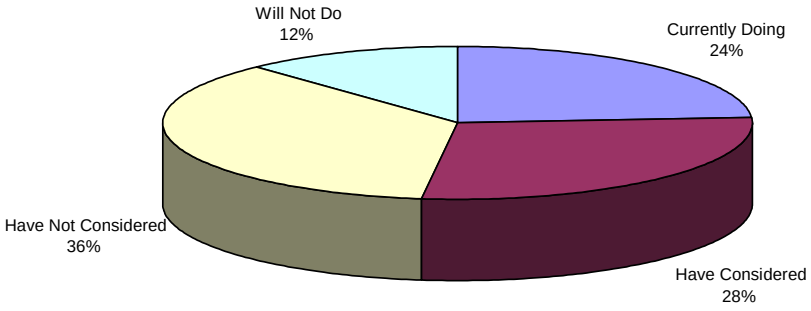

Figure B.13c. Direct Customer Marketing (total response of 72)

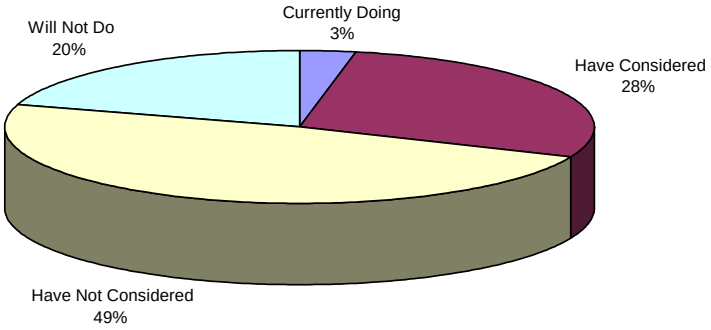

Figure B.13d. Joining a Beef Cooperative (total response of 64)

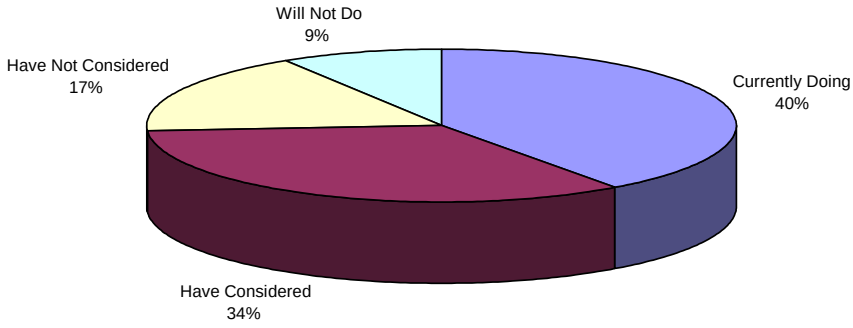

Figure B.13e. ID System (total response of 65)

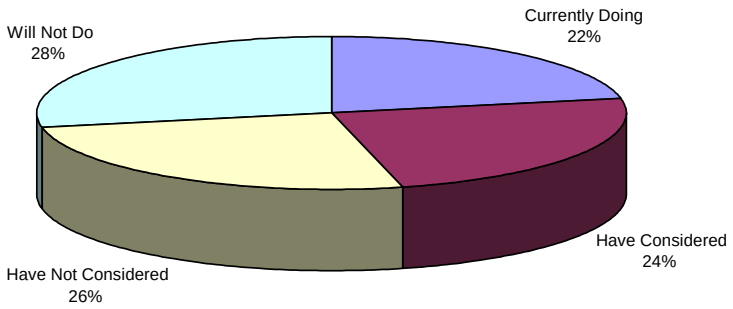

Figure B.13f. Changing Calving Season (total response of 68)

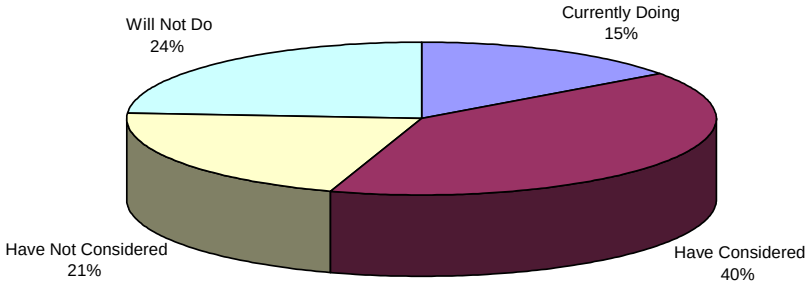

Figure B.13g. Starting an Additional Enterprise (total response of 62)

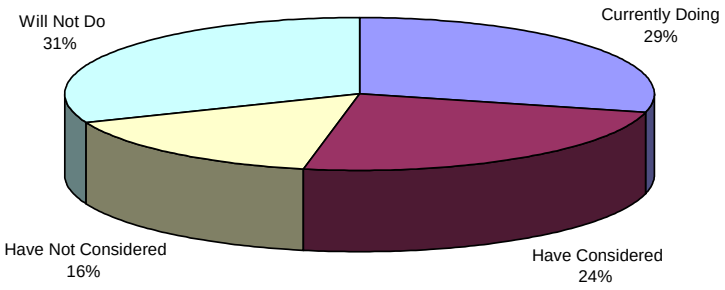

Figure B.13h. Selling Recreation (total response of 75)

Question 18. **Please circle the answer that best indicates your response to the following statements about future changes and/or trends that may occur in the beef industry**.

Questions	**Strongly Disagree - Strongly Agree (1) (5) (Percent of Responses for each number)**				
A government mandated cattle identification system is needed. (Total Response of 101)	1 (21.8)	2 (18.8)	3 (32.7)	4 (13.9)	5 (12.9)
Government restrictions on the use of antibiotics, growth implants, and vaccinations are necessary. (Total Response of 103)	1 (24.3)	2 (23.3)	3 (26.2)	4 (18.4)	5 (7.8)
Beef consumption will increase in the future. (Total Response of 107)	1 (0)	2 (2.8)	3 (38.3)	4 (41)	5 (17.8)
Beef Consumers are willing to pay a price premium for organic, grass fed, and origin identified beef. (Total Response of 101)	1 (2)	2 (10.9)	3 (29.7)	4 (38.6)	5 (18.8)

Table 8. (continued)

Beef Consumers are willing to pay a price premium for organic, grass fed, and origin identified beef. (Total Number of Responses = 101)	1 (2)	2 (10.9)	3 (29.7)	4 (38.6)	5 (18.8)
A drought contingency plan is important for beef producers in Wyoming. (Total Number of Responses = 108)	1 (2.8)	2 (0.9)	3 (17.6)	4 (32.4)	5 (46.3)
BSE will have a big impact on the meat industry in the future. (Total Number of Responses = 107)	1 (0)	2 (21.5)	3 (39.3)	4 (25.2)	5 (14)
High petroleum prices will impact the beef industry in the future. (Total Number of Responses = 107)	1 (0.9)	2 (0.9)	3 (15)	4 (33.6)	5 (45.8)
Climate change will impact the beef industry in the future. (Total Number of Responses = 106)	1 (1.9)	2 (11.3)	3 (27.4)	4 (32.1)	5 (27.4)
Brucellosis will have a big impact on the beef industry in the future. (Total Number of Responses = 107)	1 (2.8)	2 (14)	3 (34.6)	4 (30)	5 (18.7)
I need to consider alternative enterprises to stay in business. (Total Number of Responses = 105)	1 (7.6)	2 (14.3)	3 (25.7)	4 (29.5)	5 (22.9)
I need to learn more about marketing alternatives to stay in business. (Total Number of Responses = 100)	1 (6)	2 (16)	3 (38)	4 (29)	5 (11)
I need to learn more about alternative production practices for my current enterprise to stay in business. (Total Number of Responses = 100)	1 (5)	2 (25)	3 (36)	4 (26)	5 (8)
I need to learn about alternative risk management strategies. (Total Number of Responses = 100)	1 (4)	2 (23)	3 (40)	4 (22)	5 (11)
High interest rates in the future will affect the way I do business. (Total Number of Responses = 104)	1 (5.8)	2 (15.4)	3 (25)	4 (26)	5 (27.9)
Government subsidies to ranchers/farmers will be eliminated in the future. (Total Number of Responses = 100)	1 (7)	2 (15)	3 (38)	4 (26)	5 (14)
Livestock grazing on federal land will be reduced or eliminated in the future. (Total Number of Responses = 103)	1 (8.7)	2 (12.6)	3 (26.2)	4 (39.8)	5 (12.6)
The cattle market and the price of cattle will remain strong in the future. (Total Number of Responses = 104)	1 (0)	2 (13.5)	3 (52)	4 (29.8)	5 (4.8)

(Note: percentages may not sum to 100% due to rounding)

Question 19. **Please indicate the (primary operator's) gender.**

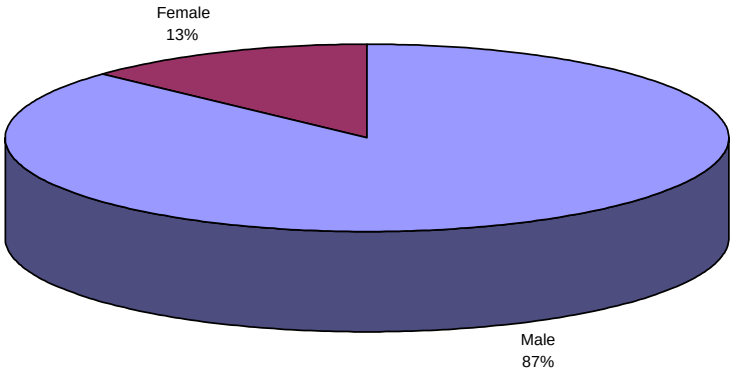

Figure B.14. Gender of Respondents (total response of 74)

Question 20. **How many years have you lived in Wyoming?**

Table B.9. Descriptive Statistics of the number of years the beef cattle producers have lived in Wyoming.

	Years
Average	48
Max	99
Min	3
Standard Deviation	20.35
# of Responses	115

Question 21. **Please indicate your current age (primary operator):**

Table B.10. Frequencies of responses in each age group. (total responses = 113)

	Percent
25-34	0.9
35-44	9.7
45-49	15.9
50-54	16
55-59	14.2
60-64	7.1
65-69	15.9
70 or older	20.4

Question 22. **Please circle/write-in the responses below to indicate your level of formal education.**

Table B.11. Frequencies of respondent's education level and average number of years completed for each.

	Frequencies	Average Number of Years Completed
High School	94	4
Vocational	9	3
College	51	4
Other	5	6

Question 23. **Do you have access to the internet? (Please mark all that apply)**

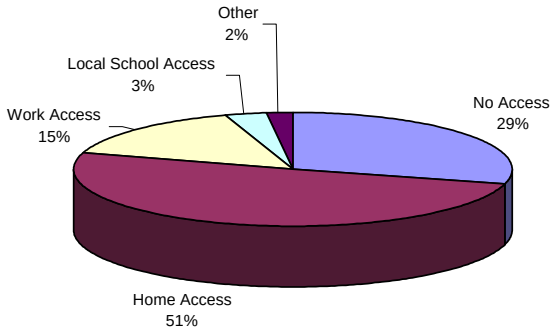

Figure B.15. Percent of Respondents Access to the Internet (total response of 125)

Contact Signature (Yes or No)

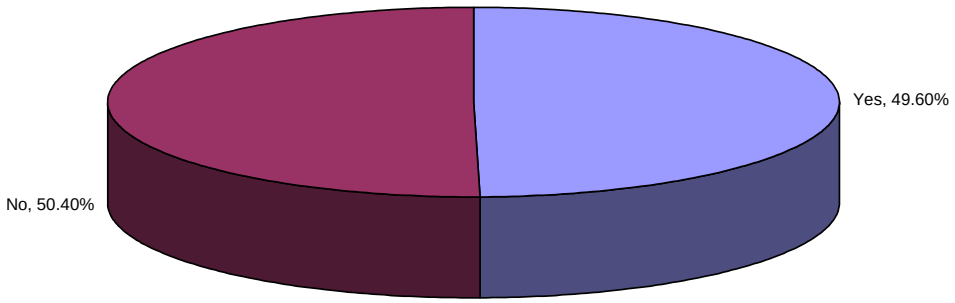

Figure B.16. Respondents Permission to be Contacted with Signature (signature = Yes or no signature = No)

Appendix C
Base Budget for Calving Season Comparison

Table C.1 Base Budget for Calving Season Comparison:

Budget Based upon 365 cow herd

Gross Income		Quantity	Unit	$/Unit	Total $ (per cow)
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86
Scour Pills		1	can	45.00	0.12

Table C.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
State Lease		160	aum	2.50	1.10
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					10.81
Management Cost					40.20
Total Cash Cost					310.85
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity					0.011
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-10.89
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		0.66
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – LT [3] Borrowed			Dol.		6.96
Insurance					3.49
Total Cash Cost					37.06
Non-Cash Cost					
Interest – LT [3] Equity			Dol.		51.16
Land Interest – LT [3] Equity					14.79
Depreciation					60.70
Total Non-Cash Cost					126.65
Net Projected Returns					-174.60

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
*Appendix I shows the total cost for the base budget if all of the management techniques were used. This budget does not include the management techniques listed.

Appendix D
Early Season Calving Budget

Table D.1 Early Calving Season Budget:

Budget Based upon 365 cow herd

Gross Income		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112.00	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86

Table D.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
Scour Pills		1	can	45.00	0.12
State Lease		160	aum	2.50	1.10
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					10.69
Management Cost					40.20
Total Cash Cost					310.85
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity [4]					0.01
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-10.77
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		0.49
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – [3] LT Borrowed			Dol.		5.15
Insurance					3.49
Total Cash Cost					35.07
Non-Cash Cost					
Interest -LT [3] Equity					51.16
Land Interest – LT [3] Equity			Dol.		10.94
Depreciation					60.7
Total Non-Cash Cost					122.80
Net Projected Returns					-168.66

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
[4] Figure is rounded to the nearest cent. The actual figure is $0.0097.
*Appendix I shows the total cost for the base budget if all of the management techniques were used.
*This budget does not include the management techniques listed.

Appendix E
Late Season Calving Budget

Table E.1 Late Calving Season Budget:

Budget Based upon 365 cow herd

Gross Income		Quantity	Unit	$/Unit	Total $ (per cow)
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112.00	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86
Scour Pills		1	can	45.00	0.12

Table E.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**		**$/Unit**	**Total $ (per cow)**
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					12.08
Management Cost					40.20
Total Cash Cost					312.13
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity [4]					0.01
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-12.17
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		2.59
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – [3] LT Borrowed			Dol.		27.21
Insurance					3.49
Total Cash Cost					59.23
Non-Cash Cost					
Interest –LT [3] Equity					51.16
Land Interest – LT [3] Equity			Dol.		57.82
Depreciation					60.70
Total Non-Cash Cost					169.68
Net Projected Returns					-241.10

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
[4] Figure is rounded to the nearest cent. The actual figure is $0.011.
*Appendix I shows the total cost for the base budget if all of the management techniques were used.
*This budget does not include the management techniques listed.

Appendix F
Base Budget for Ranch Size Comparison

Table F.1 Base Budget for Ranch Size Comparison:

Budget Based upon 365 cow herd

Gross Income		Quantity	Unit	$/Unit	Total $ (per cow)
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112.00	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86
Scour Pills		1	can	45.00	0.12

Table F.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					10.81
Management Cost					40.20
Total Cash Cost					310.85
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity [4]					0.01
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-10.89
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		0.66
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – LT [3] Borrowed			Dol.		6.96
Insurance					3.49
Total Cash Cost					37.06
Non-Cash Cost					
Interest -LT [3] Equity					65.95
Land Interest – LT [3] Equity			Dol.		14.79
Depreciation					60.70
Total Non-Cash Cost					126.65
Net Projected Returns					-174.60

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
[4] Figure is rounded to the nearest cent. The actual figure is $0.011.
*Appendix I shows the total cost for the base budget if all of the management techniques were used.
*This budget does not include the management techniques listed.

Appendix G
Small Sized Operation Budget

Table G. 1 Small Operation Budget:

Budget Based upon 325 cow herd

Gross Income		Quantity	Unit	$/Unit	Total $ (per cow)
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112.00	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86
Scour Pills		1	can	45.00	0.12

Table G.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					10.60
Management Cost					40.20
Total Cash Cost					310.90
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity [4]					0.01
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-4.94
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		0.36
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – LT [3] Borrowed			Dol.		3.75
Insurance					3.49
Total Cash Cost					33.54
Non-Cash Cost					
Interest –LT [3] Equity					51.16
Land Interest – LT [3] Equity			Dol.		7.97
Depreciation					60.70
Total Non-Cash Cost					119.83
Net Projected Returns					-164.08

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
[4] Figure is rounded to the nearest cent. The actual figure is $0.0096.
*Appendix I shows the total cost for the base budget if all of the management techniques were used.
*This budget does not include the management techniques listed.

Appendix H
Medium Sized Operation Budget

Table H.1 Medium Operation Budget:

Budget Based upon 1255 cow heard

Gross Income		Quantity	Unit	$/Unit	Total $ (per cow)
Cash Income					
Cull Bulls		2.99hd	cwt	43.33	5.33
Cull Cows		29.02hd	cwt	39.47	31.38
Cull H1 Heifers		4.01hd	cwt	69.92	5.77
Cull H2 Heifers		6.02hd	cwt	42.79	6.71
Cull Horse			head	700.00	1.89
Gas Tax Refund				300.00	0.48
Heifer Calves		115.01hd	cwt	71.61	104.47
Steer Calves		158.01hd	cwt	78.00	177.27
Wildlife Coupons				180.00	0.29
Total Cash Income					333.59
Total Gross Income					333.59
Variable Costs					
Cash Cost					
Actng, Legal & Subs		1	year	2500.00	4.00
Alfalfa Hay		328	ton	80.00	71.85
BLM Grazing Fee		585	aum	1.91	3.06
Brand Inspection Cattle		315	head	1.00	0.86
Branding Meal		1	meal	280.00	0.77
C-Section (Vet)		2	head	140.00	0.76
Check Off Program		315	head	1.00	0.86
Fence Materials BLM-Cattle		1		448.00	1.22
Fence Materials Cattle		12	mile	28.00	0.92
Fence Materials for-Cattle		1		448.00	1.21
Forest Grazing Fee		903	aum	1.91	4.73
Grazing Assoc'n Fee		295	head	2.80	2.26
Health Inspect'n Cattle		273	head	1.00	0.75
Iodine		1	bttl	4.70	0.01
Mineral		10302	lbs	0.22	6.21
Native Hay		173	ton	70.64	33.56
Oat Hay		55	ton	70.64	10.69
Predator Tax Cattle		315	head	0.20	0.17
Prolapse (Vet)		2	head	112.00	0.61
Replacement Bulls		4	head	2940.00	32.34
Replacement Horse		1	head	1400.00	3.78
Sale Commission		42	head	13.00	1.50
Salt		5251	lbs	0.06	0.86
Scour Pills		1	can	45.00	0.12

Table H.1 (continued)					
Variable Costs (continued)					
Cash Costs		**Quantity**	**Unit**	**$/Unit**	**Total $ (per cow)**
Trich Test (Vet)		15	head	28.00	1.15
Uterine Pills		3	can	16.93	0.14
Whole Corn		158	cwt	5.50	2.39
Fuel					18.05
Lube					0.69
R&M [1]					25.72
Hired Labor					14.45
Interest – ST [2] Borrowed					11.42
Management Cost					40.20
Total Cash Cost					310.85
Non-Cash Cost					
Owner Operator Labor					10.90
Interest – ST [2] Equity [4]					0.01
R&M [1] Owner Labor					0.56
Owner Other Labor					22.16
Total Non-Cash Cost					33.63
Gross Income minus Variable Cost					-10.90
Fixed Cost					
Cash Cost					
Annual Taxes					
Land Annual Taxes			acre		1.59
Other Annual Taxes					1.87
Interest – LT [3] Borrowed					24.07
Land Interest – LT [3] Borrowed			Dol.		16.74
Insurance					3.49
Total Cash Cost					47.76
Non-Cash Cost					
Interest –LT [3] Equity					51.16
Land Interest – LT [3] Equity			Dol.		35.57
Depreciation					60.70
Total Non-Cash Cost					147.43
Net Projected Returns					-206.71

[1] R&M – Repair and Maintenance
[2] ST – Short Term
[3] LT – Long Term
[4] Figure is rounded to the nearest cent. The actual figure is $0.0104.
*Appendix I shows the total cost for the base budget if all of the management techniques were used.
*This budget does not include the management techniques listed.

Appendix I
Cost of All Management Techniques (categorical variables)

Cost of All Management Techniques (categorical variables): Based Upon 365 cow herd

*Many of the figures are estimates. Costs that were not included in the base budget developed by Hewlett and Foulke, (1999) were gathered from a local veterinarian in Laramie, WY. There are different costs per unit depending on many things such as location and quantity applied to because for some instances the unit cost is less for large quantities such as for pour on insect control. All of the management techniques may not be needed or may be needed in different quantities they are merely estimates. Different ranches practice different management practices.

Management Technique	Unit	$/Unit	Labor Quantity (hour/unit)	Labor Cost ([1] $8.82/hr)/Unit	Total Cost ($)/Unit
Vaccination					
7-way/Blackleg	dose	0.29	0.03	0.26	
IBR-BVD-PI3	dose	2.00	0.03	0.26	
Lepto	dose	0.30	0.03	0.26	
Vibrio	dose	0.45	0.03	0.26	
Bangs	head	1.65	0.03	0.26	
Total		4.69	0.15	1.30	5.99
Animal ID System (tags)	tag	0.79	0.15	1.30	2.09
Deworm					
Injection calves	dose	2.65	0.03	0.26	
Injection cows	dose	1.00	0.03	0.26	
Total		3.65	0.06	0.52	4.17
Body Condition Scoring	head		0.08	0.74	0.74
Insect Control (pour on, cows and calves)	head	1.50	0.03	0.26	1.76
Pregnancy Check ([2] veterinarian mileage fee of $4.00/mile at 100 miles one way is included)	head	1.75	0.15	1.32	403.07
Implant (steers)	head	1.50	0.03	0.26	1.76
[3] Breeding Soundness Exam (Bulls)	head	100.00	0.25	2.21	102.21
Dehorn (paste)	head	0.05	0.03	0.26	0.31
Artificial Insemination (assumes operator performs without a vet)	head	20.00	0.15	1.32	21.32
Castrate (bands)	head	0.05	0.03	0.26	0.31
Veterinarian Consultation ([2] mileage fee for 100 miles one way)	mile	4.00			400.00
Total Cost Per Unit					$943.73

[1] Labor cost per hour was based upon 2004 Wyoming Agriculture Statistics Service figures for hired livestock workers.

[2] For simplicity, it is assumed the ranch is 100 miles from where the veterinarian is located. A cost of $2.00 per mile one way is assumed.

[3] A breeding soundness exam may require the bulls that are being tested to be taken to the veterinarian's office which may increase the cost. For simplicity, it is assumed the tests/samples are performed at the ranch, and a mileage fee is not included.