

## **BEEF CATTLE PRODUCTION AND MANAGEMENT PRACTICES AND IMPLICATIONS FOR EDUCATORS**

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## **Beef Cattle Production and Management Practices and Implications for Educators**

### **Abstract**

*Beef producers need to continually incorporate new information and adopt new technology to effectively manage production costs. Oklahoma State University began a Master Cattleman program with this need in mind. Understanding technology adoption by producers requires identifying current management practices. Data from a survey developed as part of the Master Cattleman program document current practices. Management practices were examined for two groups; producers with smaller herds who are less dependent on the beef enterprise for family income, and producers with larger herds who are more dependent on beef. Results clearly show that size and dependence on the beef enterprise matters when considering a broad spectrum of beef management practices.*

### **Keywords**

Cattle, Cows, Extension, Management, Production

### **Introduction**

The 2002 Census of Agriculture noted that 40 percent of U.S. farms had sales of cattle and calves, making it the single most prevalent enterprise on farms nationwide (USDA/NASS). Approximately 80 percent of the farms with beef cows had fewer than 50 cows. The National Animal Health Monitoring System (NAHMS) Beef '97 report established a variety of benchmarks for the nation's cow-calf industry in areas such as information and management practices, breeding and calving management, production management and disease control, health and health management (USDA/APHIS). No subsequent analysis of the data was conducted to determine factors affecting technology adoption and correlations between adopting best management practices in one area relative to adoption in another area. Although the NAHMS report notes that the beef herd was the primary source of income on only 14 percent of all operations included in its study, no analysis of data by herd size or relative importance of income from the cow-calf enterprise was done.

The objective of this paper is to identify current management practices for selected areas of the cow-calf enterprise in Oklahoma and determine the importance (if any) of management adoption related to herd size and dependence on the beef enterprise. Note results in this paper should be considered preliminary as this is an early step in a larger research effort.

### **Data and Procedure**

Sixteen lead authors from six academic disciplines wrote a new Oklahoma Beef Cattle Manual consisting of forty chapters (Doye and Lalman 2005). The manual was distributed through local Extension offices, producer meetings, and by e-mail request from an Oklahoma State University (OSU) website (<http://agecon.okstate.edu/cattleman/>). Producers who received a copy of the manual were asked to complete a survey documenting beef production and management practices. For this paper, 335 producer surveys were used.

The survey instrument asks a variety of questions on a broad array of production and management areas of the cowherd enterprise. For this analysis, selected questions from each of several management areas were chosen. A frequency distribution was developed to view the number of observations in two categories; herd size and percentage dependence on the beef enterprise for household income. From this distribution, two groups were formed. The first group (referred to as Group 1) consisted of smaller producers (herd sizes of 1-99 breeding females) whose percentage of household income from the beef enterprise in 2003 was between 1 and 40%. The second group (referred to as Group 2) consisted of larger producers (herd sizes of 100 or more breeding females) whose percentage of household income from the beef enterprise in 2003 was greater than 40%. Producers in these two groups totaled 335 and accounted for 77.8% of all producers in this first stage of the project. Group 1 consisted of 252 producers; and Group 2, 83 producers.

Initially, t-tests of mean responses (where appropriate) and chi-square tests of frequency distributions comprise the statistical analysis. Some questions had two response categories, some questions asked for responses on a 1-7, Likert scale, and some questions could have multiple responses. Means were not meaningful in all cases. In other instances, response alternatives were grouped so as to approach an ordering for which a mean and chi-square test would be more meaningful.

Management practices selected for examination were categorized into five areas: business management, cowherd management, forage and nutrition management, calf management and health, and marketing. This paper addresses each of these managerial areas following a limited review of relevant literature. Note that many other management practices in the survey instrument were not used for this paper.

### **Literature Review**

Two main areas of technology adoption have been outlined (Dorfman 1996). The first area is associated with building economic decision models linked to factors such as farm size, risk attitudes, and liquidity. The second area consists of empirical studies which identify factors related to adoption decisions. Just and Zilberman (1983) showed the relationship between economies of size and technology adoption and found a possible quadratic effect, as large firms were more prone to adopt earlier than smaller firms.

The role of firm size and its relationship to adoption has been of long-term interest to researchers. In 2001, a USDA report found economies of scale were related to low-cost vs. high-cost beef cattle producers (Short 2001). Low-cost operations had significantly larger cowherds than high-cost operations. Cow-calf production was the primary production enterprise on low-cost firms, but was more likely to be a secondary activity for high-cost firms (Short 2001). Since

a majority of cowherd enterprises are small, family based enterprises, many firms may lack the ability to appropriate either time or resources toward finding, evaluating, and adopting technology.

Income also plays a key role in the adoption of best management practices. A range-management study in Louisiana used income generated from agriculture as an explanatory variable. Results showed that the household income generated from agricultural production had a positive relationship on the probability of adopting specific range-management practices (Kim, Gillespie, and Paudel 2004).

Ramsey et al. (2005) studied factors that influenced beef cowherd costs, production, and profits and found, among other things, that profitability of cow-calf operations varies greatly. Although numerous factors can be related to high-cost enterprises, one of the most prominent is feed costs. Even though grazing is the most cost effective feed source, many producers still meet cows' nutritional needs with harvested forage and feed for 120 days or more.

Preconditioning is not a new concept but is increasing in importance and popularity because of its benefits to cowherd owners as well as buyers (Avent, Ward, and Lalman 2004). Calf producers benefit by marketing heavier, healthier calves with a stronger immune system. Buyers benefit from getting healthier calves already on a higher nutritional plane for the growing or feeding stage. Research has shown that healthier calves perform better in the feedlot and in carcass characteristics compared with calves with a history of sickness. Therefore, preconditioning calves is cost-effective for most producers (Lalman and Smith 2002). Preconditioning calves on the ranch has the potential of increasing returns over costs by \$56-60 per head (Cravey 1996).

Improving growth rates and feed efficiency is a common goal among producers as increasing pay-weight typically increases profitability of the cowherd operation. Growth promoting implants have been used for over 40 years, and have been shown to increase both feed efficiency and improve growth rate (Preston 1999). When properly used, few management practices are more cost effective than growth promoting implants (Lalman et al. 2002). These hormone releasing pellets have been shown to improve daily gain 7 to 17% and increase feed efficiency 4 to 12%.

While research has been conducted on both factors affecting technology adoption and factors influencing cow-calf profitability, little research has been directly conducted regarding the relationship between cow-calf operations and technology adoption. Popp, Faminow, and Parsch (1999) used a logit model to analyze the adoption of value-added cattle production. However, the authors' indicated the need for further investigation due to data limitations of effects from off-farm labor.

Specific management practices such as preconditioning, a limited-period breeding season, and limited use of harvested forages are generally regarded as being cost-effective and enhancing profitability. However, adoption of these practices has been unpredictable and inconsistent. Examining the combined effect of firm size and income generated by the firm on adoption of specific practices can assist educators in understanding the lag in implementation. In an effort to increase the probability of adoption, educational programs like the OSU Master Cattleman program have been implemented in at least six states (Doye 2004).

### **Business Management**

A series of questions regarding planning, recordkeeping, and general management were included in the survey instrument. When asked about long-term planning, 61% of Group 1 did

not have a long term plan in which they consider where they want their firm to be in five or more years (Table 1). In contrast, 57% of Group 2 had a clear, set plan in regards to the development and growth of their production firm. Thus, there was a significant difference in long-term planning between the two groups. As anticipated, Group 1 producers with a smaller herd size and lower dependency on income from the beef enterprise had a lower probability of having a long-term plan. Economies of size should have minimal effect on a producer's likelihood of establishing a direction and path for the future. Therefore, the difference between the two groups may be related to the overall goals of the beef cattle enterprise as it relates to total household income.

Whether or not producers had a short-term plan was also considered. In the case of short-term plans, no significant difference was found between Groups 1 and 2.

Financial recordkeeping is one effective way in which producers can both improve for the future and reflect on the past. Financial recordkeeping systems were grouped into three categories. First was simply keeping store receipts and bills in a box or file only, considered to be the minimal amount of recordkeeping. The second category included summarizing income and expenses using a notebook or ledger. This category entailed a slightly more formal system of recordkeeping, but does not include any computerized accounting or business program. The third category incorporated all responses involving a computerized recordkeeping system, such as Quicken, QuickBooks, Redwing, Farmworks, or a customized spreadsheet or database created by the producer.

Group 2's recordkeeping system was significantly different than Group 1. Group 2 employed computerized technology for recordkeeping more than Group 1, as half of the producers in this group (49%) used a computerized method. However, 32% still used the

minimal recordkeeping system. Group 1 was a mirror image of Group 2, as 42% use a box or file only, and nearly a third (31%) use computer technology. This distribution is expected. As hypothesized, producers with greater dependency on beef production would be more likely to incorporate a technology such as computerized recordkeeping. Past research has shown the same result. Both education and farm-size have a positive influence on adoption while age had a negative effect (Doye 2004). Computers and the benefits they provide continue to double and triple with time. Computer skills have made the transition from a benefit to a necessity in every business entity. As technology progresses, it is expected that business-oriented beef producers will increasingly incorporate these practices into their beef-production firm.

### **Forage and Nutrition Management**

Forage and nutrition management questions included use of forage nutrient testing and calculations to determine supplemental feed needs. Producers have numerous options in determining how much and what type of supplement to feed during winter months. Forage testing of hay and silage may be used to determine quality. This information can then be used in order to determine how herd nutritional requirements will be met by the forage supplied. When producers were asked how often they used forage tests and animal requirements to calculate the supplementation required during winter months, a significant difference was noted between Group 1 and 2. Within Group 1, 42% never used forage tests and estimated animal requirements to calculate supplemental feed needs and 19% almost always did (Table 2). In contrast, Group 2 consisted of 14% who rarely used forage tests with estimated nutritional requirements and 25% who almost always did.

Responses followed this same pattern for forage testing of ranch produced silage or harvested forage. While a statistically significant difference was found between Groups 1 and 2,



the difference was less obvious (Table 2). A large percentage of Group 1 rarely tested their forage (43%) and a relatively small percentage (9%) tested nearly always. Within Group 2, 16% of producers nearly always test, however nearly a third (32%) rarely use this technology.

Forage testing was less common for purchased silage or harvested forage than ranch-produced forage. Again a significant difference was found between Groups 1 and 2 (Table 2). Forage testing for purchased hay was rarely employed by either Group 1 (56%) or Group 2 (51%), but more in Group 2 tested nearly always (14%) than did those in Group 1 (8%). These results may be related to knowledge, costs, and availability about forage testing. Some may not know how to utilize test results. Whatever the reason, many producers are not taking advantage of technology available to evaluate the value of the hay or silage in which they are investing.

Producers were asked to specify the typical length of their hay-feeding season. Forage specialists and economists have clearly stated that minimizing harvested forages fed relative to grazing forages is generally more cost effective. A majority of producers in both Groups 1 and 2 have a hay feeding season more than 90 days, as approximately 70% of each group reported feeding hay for that period annually (Table 2). Feeding hay is extensive for most Oklahoma cattlemen, but they are also not fully evaluating the nutrition content of the hay they are producing or purchasing.

### **Calf Management**

Two management practices typically associated with preconditioning were examined, castrating bull calves and vaccinating calves, along with another calf management practice, implanting calves. Results for each practice differed between Groups 1 and 2. Group 2 producers more frequently castrated bull calves than did Group 1 producers. Of Group 2 producers, 76% reported nearly always castrating bull calves, compared with 56% for Group 1

(Table 3). About 11-12% of each group rarely castrated bull calves. Research clearly shows that buyers pay a premium for steers compared with bulls, typically more than enough to pay the cost of castrating.

A key feature of preconditioning programs is a specified vaccination and health management program. Responses to a question regarding the frequency of vaccinating were grouped into three categories; do not vaccinate, single vaccination, and multiple vaccinations. Group 1 producers were more likely not to vaccinate calves before marketing them (34%) or use a single vaccination (41%) compared with Group 2 (23% and 36%, respectively) (Table 3). Multiple vaccinations were the common practice of Group 2 producers (41%). The lower incidence of vaccinations may be related to time and cost of working calves for smaller producers whose household income is less dependent on the beef operation than for the Group 2 producers. Given the lower incidence of vaccinations among Group 1 producers, the greater propensity to incur diseases in put-together groups of calves from smaller cow-calf producers is understandable. Similarly, the reason buyers pay a premium for preconditioned calves is understandable.

A large percentage of Group 1 producers are not capitalizing on the benefits of growth promoting implants, given that 63% reported rarely using implants on steer calves prior to weaning (Table 3). Group 2 was distinctly and significantly different. Of Group 2 producers, 45% nearly always used implants vs. 29% who rarely used them. Note that some producers may choose not to implant calves in order to meet natural beef production criteria.

### **Cowherd Management**

Cost-effective management and maintenance of a cowherd incorporates a variety of strategies regarding nutrition, health, reproduction, etc. For this research, a few questions were

selected to provide an indication of management intensity of cowherds. These questions dealt with cow identification, breeding season, pregnancy examinations, and prices paid for herd bulls. These, too, were assessed to determine if economies of size and dependency on the beef enterprise affected cowherd management.

Although the primary motive for a national animal identification and tracking system is animal disease containment and control, many economists would argue that best management practices require linking costs and returns to individual cows rather than simply with entire herds. This may become even more important as the industry moves toward process verified, quality assurance program to best meet demands of beef consumers. Thus, individual animal identification is essential and may become mandatory nationally. If or when a mandatory system is required, producers will encounter additional costs associated with the identification process (Disney et al. 2001). Producers who are currently identifying cows will have an advantage as the transition period should be easier and perhaps less costly.

As a whole, over 90% of all producers completing our survey are using at least one method of individual cow identification. Between the two groups, results differed. The majority of Group 1 producers (53%) use one method of identification, which could be visible ear tags, tattoos, electronic identification, freeze branding, or hot branding (Table 4). Group 2 producers are more likely to use multiple methods of identification (52% of Group 2 producers).

Nothing is more important to cow-calf profitability than getting a live calf born. Proper reproduction management is an essential part of maintaining a cow-herd which produces a high percentage of marketable calves each year. Performing pregnancy examinations on owned mature cows as well as raised replacement heifers is part of recommended cowherd management. The two groups differed regarding checking the pregnancy of their cows and heifers.

Group 2 producers were much more likely to pregnancy check owned mature cows than Group 1 producers (Table 4). Of Group 1 producers, 14% nearly always did a pregnancy exam and 48% rarely did. For Group 2 producers, the distribution of responses was bimodal, where 33% nearly always did and 31% rarely did. Smaller producers who are not as dependent on the beef enterprise do not have the same incentives as larger producers whose household income is more dependent on the cow-calf operation. As discussed earlier, Group 1 producers invest less in recordkeeping and other management practices that either manage costs or increase returns. This group likely devotes less time to managing the cowherd also. To conduct a pregnancy examination, cows need to be penned and palpated. This can cause stress on the cows, and could potentially discourage producers from implementing such a procedure. Thus the perceived cost of palpation could outweigh the benefits received. Larger producers may have better facilities, more available labor, and a stronger incentive to reduce costs of maintaining open cows.

Producers in both groups are more likely to pregnancy check raised heifers (Table 4). Over half of Group 2 producers (53%) almost always perform pregnancy examinations on raised heifers compared with 24% for Group 1 producers. This result is likely related to culling strategies as producers may more often plan to cull first-calf heifers that are open than cows in the herd which have a breeding and calving history.

The frequency of pregnancy examinations conducted on purchased females was also examined. Results were not statistically significant between Groups 1 and 2.

Another potential indicator of how the cowherd enterprise is managed is how much is being paid for herd bulls. A significant difference was anticipated, and found, between the two groups. However, one producer in Group 1 reported a purchase price of \$50,000. This observation was considered an outlier, as the next highest value was \$5,000. Since this

observation severely skewed the results, it was deleted. A \$50,000 purchase price for a bull for a cowherd less than 100 head is a questionable economic decision and could only be made with household income heavily dependent on something other than the cow-calf enterprise.

The mean purchase price of producers in Group 1 was \$1,600.88, while the mean price for Group 2 was \$1,955.06. This resulted in a significant difference of \$354.18 per bull. This verifies the assumption that producers with larger herds and a greater dependence on the income generated from beef production will invest more on bulls intended for use with commercial cows. Of equal or more importance may be where herd bulls are purchased, from reputable seedstock producers or from local livestock markets.

How those bulls are used differs significantly in terms of the length of breeding season. Regulating the time bulls are left with cows can affect the uniformity of the calf crop. A relatively high percentage of producers in Group 2 have established a limited time period bulls are left with cows and therefore have a set calving season (70%). For Group 1 producers, 47% leave bulls with cows year round. Of producers who indicated a set breeding season, over half of both groups targeted a 60-90 day breeding season, both for fall and spring calving (fall calving – 58% for Group 1 and 51% for Group 2; spring calving – 50% and 58%, respectively).

### **Marketing**

When marketing calves, sale lot size is important. Research shows consistently that buyers pay a premium for larger sale lots (Avent, Ward, and Lalman 2004). Buyers can reduce transaction costs by purchasing larger lots of uniform calves than purchasing several smaller lots and pooling them into larger groups for stocker and feedlot operations.

The distribution of the two groups was significantly different for lot sizes marketed. Almost 50% of both groups (44% for Group 1 and 49% for Group 2) reported marketing in lots

of 10 to 50 head (Table 5). The drastic difference is with the remaining 50% of each group. Almost half of Group 2 producers (46%) reported marketing calves in lots greater than 50 head, while 52% of Group 1 producers market the majority of their calf crop in lots of 1 to 9 head. A potential factor for Group 1 producers' small lot sizes at marketing is the fact that the majority of Group 1 producers did not have a limited breeding season. A set breeding period is a key part of establishing a uniform calf crop, and therefore larger sale lots. Smaller producers might tend to use more local livestock markets, some of which still sell calves one head at a time. Larger producers may market more calves in regional markets, satellite auctions, and direct to buyers, all of which typically have larger sale lots.

Timing of marketing (seasonally, regularly through the year, or sporadically through the year) was examined; however the results were not statistically significant between the two groups of producers.

### **Implications and Conclusions**

Most land grant institutions have one or more faculty with interest in beef production economics and marketing. Similarly, most state extension services offer a variety of timely beef educational programs addressing both production and economic issues and decisions. In recent years, several states (Alabama, Georgia, Kentucky, Louisiana, Oklahoma, and Tennessee) have initiated "master cattleman" or similarly named educational programs for producers to provide in-depth training in multidisciplinary areas. Typically, producers are required to complete 20 or more hours of coursework covering an array of topics.

Understanding more about the relationship between adoption of different sets of production and management practices and about adoption rates relative to farm size, and importance of off-farm work relative to income from the beef cattle operation might suggest

ways that educational information could be better packaged or targeted. Analyses reported here showed a clear difference in an array of management practices spanning several aspects of cow-calf production between two groups of producers in Oklahoma. Group 1 was smaller cowherd owners who are less dependent on cow-calf production as a source of household income. Group 2 consisted of larger cowherd owners who are more dependent on cow-calf production as a source of household income. Management areas examined included business management, forage and nutrition management, calf management, cowherd management, and marketing. Significant differences were found between the two groups for all but a few management practices of those examined here.

Clearly, as an educator preparing materials for and speaking to a group of producers consisting of some producers from Group 1 and some from Group 2, the educational needs differ. For instance, material that should be emphasized for small producers with limited dependence on the beef enterprise might focus on why large producers have adopted technology such as implants and established calving periods. Different topics would likely be of more interest to larger producers who receive a higher proportion of their household income from beef. Knowing our audience better should increase our teaching effectiveness and enhance learning for our audience. It may also suggest more programs should be targeted to specific groups wherever possible or that interaction among the groups be a planned component of the educational program to allow participants to learn from the experiences of each other and to better understand the industry as a whole.

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**Table 1. Business Management Frequencies and Percentage Distribution<sup>1</sup>**

	<u>Group 1</u>		<u>Group 2</u>			
	<u>1-No</u>	<u>2-Yes</u>	<u>1-No</u>	<u>2-Yes</u>		
Long-Term Business Plan***	146	92	33	44		
	31.34	38.66	42.86	57.14		
	<u>1-Minimal</u>	<u>2-Ledger</u>	<u>3-Computer Usage</u>	<u>1-Minimal</u>	<u>2-Ledger</u>	<u>3-Computer Usage</u>
Financial Record System	101	64	76	26	15	40
	41.91	26.56	31.54	32.1	18.52	49.38

<sup>1</sup> top number = frequency, and bottom number = percent of total

\*\*\* Significant difference in chi-square at 0.01 significance level

\*\* Significant difference in chi-square at 0.05 significance level

**Table 2. Forage and Nutrition Management<sup>1</sup>**

	<u>Group 1</u>							<u>Group 2</u>						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Nutrition Requirements <sup>2</sup> ***	36 19.05	20 10.58	16 8.47	16 8.47	8 4.23	14 7.41	79 41.8	13 25.49	8 15.69	9 17.65	3 5.88	5 9.8	6 11.76	7 13.73
Test Produced hay/silage <sup>2</sup> *	23 9.24	13 5.22	28 11.24	37 14.86	15 6.02	26 10.44	107 42.97	13 15.85	9 10.98	11 13.41	14 17.07	6 7.32	3 3.66	26 31.71
Test Purchased hay/silage <sup>2</sup> **	19 7.85	13 5.37	16 6.61	18 7.44	14 5.79	26 10.74	136 56.2	10 13.51	6 8.11	11 14.86	5 6.76	3 4.05	1 1.35	38 51.35
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>			<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>		
Length of hay feeding <sup>3</sup> ***	4 1.6	9 3.6	60 24	121 48.4	56 22.4			6 7.32	8 9.76	11 13.41	39 47.56	18 21.95		

<sup>1</sup> top number = frequency, and bottom number = percent of total

<sup>2</sup> measured on a Likert scale, 1-7, where 1= nearly always, 7= rarely if ever

<sup>3</sup> where 1=less than 30 days, 2=31-60 days, 3=61-90 days, 4=91-120 days, 5=more than 121 days

\*\*\* Significant difference in chi-square at 0.01 significance level

\*\* Significant difference in chi-square at 0.05 significance level

\* Significant difference in chi-square at 0.10 significance level

**Table 3. Calf Management and Health<sup>1</sup>**

	<u>Group 1</u>							<u>Group 2</u>						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Castration <sup>2**</sup>	137 56.38	25 10.29	16 6.58	23 9.47	4 1.65	9 3.7	29 11.93	62 76.54	2 2.47	1 1.23	4 4.94	1 1.23	2 2.47	9 11.11
Vaccination <sup>3**</sup>	81 33.61	99 41.08	61 25.31					19 23.46	29 35.8	33 40.74				
Implant <sup>2***</sup>	34 13.65	11 4.42	15 6.02	16 6.43	9 3.61	8 3.21	156 62.65	37 45.12	4 4.88	3 3.66	7 8.54	3 3.66	4 4.88	24 29.27

<sup>1</sup> top number = frequency, and bottom number = percent of total  
<sup>2</sup> measured on a Likert scale, 1-7, where 1= nearly always, 7= rarely if ever  
<sup>3</sup> where 1=do not vaccinate, 2=single vaccination, 3=multiple vaccination  
\*\*\* Significant difference in chi-square at 0.01 significance level  
\*\* Significant difference in chi-square at 0.05 significance level

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**Table 4. Cow-Herd Management<sup>1</sup>**

	<u>Group 1</u>							<u>Group 2</u>								
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>		
Pregnancy exam <sup>2 ***</sup> Owned cows	34	18	16	21	11	24	115	27	1	6	5	8	9	25		
	14.23	7.53	6.69	8.79	4.6	10.04	48.12	33.33	1.23	7.41	6.17	9.88	11.11	30.86		
Pregnancy exam <sup>2 ***</sup> Raised heifers	58	16	16	25	9	12	101	42	4	4	3	0	6	20		
	24.47	6.75	6.75	10.55	3.8	5.06	42.62	53.16	5.06	5.06	3.8	0	7.59	25.32		
	<u>1</u>	<u>2</u>	<u>3</u>								<u>1</u>	<u>2</u>	<u>3</u>			
Identification-cows <sup>3 **</sup>	24	133	93								4	35	43			
	9.6	53.2	37.2								4.88	42.68	52.44			
	<u>1</u>	<u>2</u>								<u>1</u>	<u>2</u>					
Breeding Season <sup>4 **</sup>	110	122								21	49					
	47.41	52.59								30	70					

<sup>1</sup> top number = frequency, and bottom number = percent of total

<sup>2</sup> measured on a Likert scale, 1-7, where 1= nearly always, 7= rarely if ever

<sup>3</sup> where 1=do not identify cows, 2=one method of identification, 3=multiple methods of identification

<sup>4</sup> where 1=bulls are left with cows year round, 2=limited time period bulls are with cows (fall/spring breeding season)

\*\*\* Significant difference in chi-square at 0.01 significance level

\*\* Significant difference in chi-square at 0.05 significance level

**Table 5. Marketing**<sup>1</sup>

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	<u>Group 1</u>			<u>Group 2</u>		
	<u>1-Small Lots</u>	<u>2-Medium Lots</u>	<u>3-Truckload Lots</u>	<u>1-Small Lots</u>	<u>2-Medium Lots</u>	<u>3-Truckload Lots</u>
Method of Marketing Calves <sup>2</sup>	131	111	10	4	41	38
***	51.98	44.05	3.97	4.82	49.4	45.78

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<sup>1</sup> top number = frequency and bottom number = percent of total

<sup>2</sup> where 1-Small Lots=1-9 head, 2-Medium Lots=10-50 head, 3-Truckload Lots= >50 head

\*\*\* Significant difference in chi-square at 0.01 significance level