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ADOPTION OF BEST MANAGEMENT PRACTICES IN STOCKER CATTLE PRODUCTION

Rachel J. Johnson
Department of Agricultural Economics
Oklahoma State University
Stillwater, Ok 74078
Phone: 918-704-4555
Email: rachel.j.johnson@okstate.edu

Damona Doye
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK 74078
Phone: 405-744-9813
Email: damona.doye@okstate.edu

David L. Lalman
Department of Animal Science
Oklahoma State University
Stillwater, OK 74078
Phone: 405-744-6060
Email: david.lalman@okstate.edu

Derrell S. Peel
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK 74078
Phone: 405-744-9816
Email: dpeel@okstate.edu

Kellie Curry Raper
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK 74078
Phone: 405-744-9819
Email: kellie.raper@okstate.edu

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Adoption of Best Management Practices in Stocker Cattle Production

Rachel J. Johnson, Damona Doye, David L. Lalman, Derrell S. Peel, Kellie Curry Raper

Abstract
This study identifies current production and management practices of Oklahoma stocker cattle producers and analyzes factors affecting the adoption of best management practices (BMPs) using chi-square analysis. Results reveal that factors influencing the adoption of BMPs are operation size, dependency upon income from the operation, and specialization in stocker production.

Keywords
cattle, stockers, management, production

Introduction

The United States is the world's largest producer of beef, comprising a diverse industry that produces beef for both domestic and export use (ERS 2007). In 2007, the value of all U.S. cattle and calves totaled $89.45 billion (NASS 2007). The southern plains region, consisting of Kansas, Oklahoma, and Texas, is home to 27.5% of the beef cows in the U.S. (NASS 2007). Oklahoma is consistently ranked 4th not only in terms of cattle numbers, but also in terms of value of production. In 2007, the total value of all cattle and calves in Oklahoma was estimated to be nearly $4.2 billion (NASS 2007). Furthermore, within the state itself, the value of production of cattle and calves consistently ranks beef as the state's highest valued commodity (NASS 2007).

There are typically three stages of beef production: cow-calf, growing, and finishing. Most calves go through some sort of post-weaning growing program, although specific programs vary in structure and type. Calves that have been weaned and are intended for sale as commercial feeder cattle, but have not yet been placed in the feedlot, are commonly referred to as stockers (Peel 2003). Stocker calves represent an important segment of the beef production and marketing chain. Stockers typically range in weight from 300-600 lbs and numbers in a specific geographic

area at a point in time are not easily captured in the USDA traditional data collection systems. However, the NASS national cattle inventory reports reveal that there were 2.6 million calves grazing small grain pasture in Kansas, Oklahoma, and Texas as of January 1, 2007 (NASS 2007).

The production of stocker calves represents an economically viable enterprise characterized by the least expensive beef cattle gains (Peel 2003). Within the stocker operation, the adoption of new information and technology is key to adding value to the product and reducing production costs. Research identifies the best management practices (BMPs) for stocker production. However, thus far little research in Oklahoma and other important stocker production regions has been undertaken to identify the current production and management practices of stocker producers. The core components of stocker production include nutrition, pasture management, quality assurance and animal health, marketing and risk management, genetics, and business management. Each management area offers opportunities to add value to the product and/ or reduce the costs of production.

Determining factors affecting the producer's adoption of best management practices is of interest. Why are the recommended production and management practices not being implemented in certain cases? Is there a definable category of producers who are not adopting new information and technology? Finally, are there economic explanations for this tendency such as the costs outweighing the benefits for certain practices or for particular groups of producers?

Objectives

This research identifies current production and management practices of Oklahoma stocker producers and analyzes gaps between currently implemented management and

production practices and those practices recommended by research and extension specialists. The percentage of producers following recommended management practices will be determined. Factors affecting the adoption of best management practices in stocker production will be evaluated, including the degree to which the operation is dependent upon stocker income, the size of the operation, and specialization in stocker production. Each of these factors will be examined independently to determine whether they affect the adoption of best management practices. Findings will enable researchers and extension staff to determine how to best direct, or perhaps redirect, research and educational programs to achieve the goal of high levels of adoption of best management practices within various production systems.

Literature Review

Examining the factors affecting technology or management practice adoption has long been a focus of agricultural economics research (Griliches 1957; Rogers 1983). Griliches (1957) was one of the first economists to analyze the adoption and diffusion of technological innovations from an economic perspective. In his pioneering analysis, profitability was determined to be the largest determinant of adoption in the case with hybrid corn.

Rogers (1983) examined how various characteristics, either real or perceived, of a certain technology affected its adoption. In his analysis, profitability was determined to comprise only one component of adoption. Other attributes influencing technology adoption included relative advantage, compatibility, complexity, trialability, and observability. Trialability is explained as the potential to experiment with the practice on a smaller scale and observability relates to the degree to which the producer has the ability to see the results of the implemented practice.

Farm size is frequently identified to be a significant determining factor in the adoption of agricultural innovations (Diederen, Meijl, and Wolters 2002; Rahelizatovo and Gillespie 2004;

Popp, Faminow, and Parsch 1999; Just and Zilberman 1983). An econometric model is developed by Just and Zilberman (1983) analyzing land-use allocation and technology adoption while considering various risk preferences. The role of farm size in technology adoption is determined by the risk attitudes and stochastic relationship of land returns. When relative risk aversion was constant, the allocation of land devoted to the modern technology was proportional to farm size. If absolute risk aversion was constant, larger farms were found to devote more land to newer technology than smaller farms.

Diederen, Meijl, and Wolters (2002) use an ordered probit analysis to analyze determinants of adoption behavior where farm size is measured by labor and financial resources and market position. In this study, characteristics of the business environment, including production and market type, and farmer characteristics, such as access to information, are considered. The study concludes that farm size significantly and positively influences the adoption of innovations. Market regulation had a strong negative effect on adoption and a producer's past adoption of innovations increased the probability that the producer would adopt innovations in the current time period (Diederen, Meijl, and Wolters 2002). However, Feder, Just, and Zilberman (1985) caution that farm size may serve as a surrogate for other factors which may also be factors influencing adoption. Wealth, risk preference, access to credit, and information availability are all factors that carry a potential to substitute for farm size.

A USDA Economic Research Report (2001) examines how technology adoption can be driven by "unquantifiable" factors by examining the relationship between farm and off-farm work and farm economic performance. The study determined that small farm operators with higher off-farm income who also worked off the farm to a greater extent were more likely to adopt management-time saving technologies. Alternatively, operators of large farms, more

dependent upon on-farm revenues and pursuing off-farm work to a lesser extent, were more likely to adopt managerially intensive technologies such as precision agriculture. Thus, the study's findings corroborate the tradeoffs between operator time spent in on-farm and off-farm activities and technology adoption. Adoption is shown to be related to unquantifiable factors such as simplicity and flexibility which translate to reduced management time.

Furthermore, the adoption of technology has also been found to be contingent upon the degree to which producer income is generated from the operation. A greater concern for economic efficiency exists when the total percent of household income from the cattle operation is high. Non-adopters of BMPs tend to be less dependent upon the operation as a generator of household income (Gillespie, Kim, and Paudel 2007).

Specialization has often been found to be a significant variable affecting technology adoption in the dairy industry in particular. El-Osta and Morehart (2000) found specialization to increase the likelihood of dairy producers to have greater technical efficiency in production. Furthermore, specialization and use of management-intensive technologies were among the factors that affected the likelihood of a farmer being a top performer in the industry.

Gillespie, Kim, and Paudel (2007) examined the adoption rate of 16 BMPs related to beef production. The study focused on reasons for non-adoption and factors influencing the non-adoption of BMPs. The most frequently adopted BMPs were those that resulted in immediate economic benefits, such as grazing management practices and mortality, nutrient, and pesticide management. Non-applicability and unfamiliarity were the most commonly cited reasons for lack of BMP adoption. However, Gillespie, Kim, and Paudel (2007) consider non-applicability of certain BMPs to be untrue, reflecting a producers lack of knowledge about the BMP. Few producers had not adopted because of the BMP being cost prohibitive.

Human capital represents another frequently identified factor in regards to the adoption of innovations and best management practices with many studies identifying education level, experience, and age as adoption factors (USDA-ERS 2001; Gillespie, Kim, and Paudel 2007; Diederen, Meijl, and Wolters 2002; Traoré, Landry, and Amara 1998). Extension and education programs have also been found to impact the adoption of information-intensive technologies (USDA-ERS 2001).

Thus, a significant amount of research has been conducted concerning factors affecting the adoption of technology, specific agricultural innovations, and BMPs within certain production systems. In particular, profitability, managerial time or off-farm work and off-farm income, farm size, and specialization, and human capital are all factors that have been determined to be significantly related to the adoption of innovations. Research has been conducted pertaining to both the beef and dairy industry regarding factors for adoption. However, despite the previously conducted research, studies thus far have not investigated the implementation of specific management practices within the stocker industry.

Data Sources

The Oklahoma Beef Cattle Manual (Lalman and Doye 2005), written by sixteen lead authors from six academic disciplines, 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 Oklahoma Beef Cattle Manual were asked to complete a “Beef Cattle Management Practices Assessment.” Two surveys were distributed: one for beef producers with only stockers, a second for those also having a cow-calf herd.

The survey documented current management practices of Oklahoma stocker producers in the areas of nutrition management, forage and introduced pasture management, quality assurance and animal health management, marketing and risk management, genetics, and business management. The survey asked approximately 54 questions with the majority of the questions being presented in 1-7 Likert scale. Other questions ask respondents to fill in blanks with percentages and numerical values.

For this study, surveys from 178 producers with stockers only as a beef enterprise are the focus. All of the stocker survey respondents, totaling 178, were used for size and income dependency variable used to analyze BMP adoption. Of the total 745 cow-calf survey respondents, 431 (or 57.85%) indicated that they had stocker cattle as well. Thus, comparisons are made with the survey results from producers who solely pursued stocker production, considered as specialized beef producers, and with producers who had both cow-calf and stocker operations, considered as diversified beef producers.

Procedures

Producers were grouped according to three variables analyzed (operation size, operation income, and specialization) as factors which affection the adoption of BMPs. Based on the initial frequency distribution of producer responses, stocker operations were categorized into three size groups based on number of stocker/feeders managed each year: 1) small operations: 1-100 head, 2) medium operations: 100-500 head, and 3) large operations: 500+ head (Table 1).

Table 1. Percentage and Frequency of Producer Responses Grouped by Size

Number of stocker/feeder cattle managed each year	Percent of Responses	Frequency of Responses
Small (1-100)	38.2	68
Medium (100-500)	32.0	57
Large (500+)	28.8	63

The degree to which the operation is dependent upon income from the stocker operation is the second variable analyzed as a factor influencing adoption of BMPs. Two groups were formed based on the distribution of producer responses: 1) Producers with 0-40% of their past year's household income from their beef cattle operation were labeled less dependent on income from their stocker operation and 2) Producers with 41-100% of their past year's household income from their beef cattle operation being classified as operations what were heavily dependent on income from their stocker operation (Table 2).

Table 2. Percentage and Frequency of Producer Responses Grouped by Income

Percentage of past year's household net income from beef cattle operation	Percent of Responses	Frequency of Responses
0-40%	62.5	110
41-100%	37.5	66

The third variable analyzed was specialization in stocker production. The two producer groups were formed for this variable: 1) Specialized beef producers who only raised stocker cattle, 2) Diversified beef producers who had both a cow-calf and stocker operation (Table 3).

Table 3. Percentage and Frequency of Survey Types

Survey Type Respondents	Percent of Responses	Frequency of Responses
Stocker survey respondents	30.1	186
Cow-Calf survey respondents	69.9	432

Chi-square tests were performed to determine the degree to which these variables were influential in the adoption of stocker management practices.

Results

Operation Size

Larger operations are hypothesized to be more likely to adopt the best stocker management practices. Results conclude that the adoption of management practices does vary according to operation size, particularly in regards to marketing and risk management practices.

Highlighted results from the chi square analysis are presented in Table 4 with some additional details provided in the text that follows (Johnson 2008). The use of software in designing energy and protein supplements differed across producer size groups as did implanting and dehorning practices. Here, contrary to the hypothesis, larger operations are less likely to use a form of software when designing a supplementation or feeding plan. Larger operations are more likely to implant calves, excluding heifers intended for replacements. 77.55% of larger producers implant steers as compared to 38.24% of small producers. 94% of large producers either dehorn or tip stocker cattle compared with 70.58% of small producers.

Larger operations demonstrate an increased rate of adoption concerning forage production management practices as they are more likely to conduct soil and forage tests as well as know how to properly set stocking rates. 48.08% of large producers conduct soil tests at least every 3-4 years while 52.42% of small producers indicate never conducting soil tests. 64.15% of large producers indicated that they know how to set a proper stocking rate, while 36.36% of small producers indicated likewise.

Operation size is relatively less influential upon the producer's quality assurance and animal health management practices as compared with other sections of the survey. Larger operations are more likely to use modified live fever complex vaccines, hot brand, and administer intramuscular injections in the neck.

Larger operators were found to take a more seasonal approach towards stocker production with smaller operators tending to pursue stocker production year round. Receiving period and forage base varies according to operation size with larger producers more likely to receive cattle from September to November, utilize small grain pasture, and grazeout winter wheat. The use of Bermuda grass as a forage base is used more consistently by smaller producers

with 66.67% of small producers indicating that they nearly always graze their cattle on Bermuda grass. Furthermore, 53.06% of small producers compared to 83.33% of large producers nearly always use small grain pasture as a primary forage base.

Operation size was found to be a significant variable in the adoption of many savvy marketing and risk management practices. Larger producers buy and sell cattle through brokers and via video/ satellite auctions more frequently than do small producers. Larger operators retain more of their steers for feeding with 42.85% of large producers retaining at least a percentage of male cattle compared to 29.17% of small producers. Larger producers also market their cattle farther from the ranch. 22.22% of large operators sell all of their male cattle directly to feedlots. Only 5.26% of small operators sell cattle in this manner. Not surprisingly, larger operators were found to market cattle in larger, more uniform lots. 87.5% of large producers market cattle in large truckload lots compared to 5.88% of small producers. Larger producers tend to market their cattle regularly throughout the year. Furthermore, larger producers pursue risk management strategies to a greater extent, placing more value upon various components of preconditioning programs and utilizing risk management tools more frequently. A strong statistical difference was present between producer size groups concerning the use of futures, options, and forward pricing contracts. However, perhaps some surprising results conclude that larger operators infrequently use cooperative alliances or similar marketing programs.

Operation size has minimal effect on the adoption of business planning and financial management practices. Only in developing a cash flow and conducting historical analysis do larger operation’s business management differ from smaller operations. 12.5% of large operators indicate that they conduct historical analysis more than once per year compared to 1.85% of small producers.

Concerning the producer's demographic profile, producers of larger operations were found to pursue off-farm work to a lesser extent. 71.7% of larger operators indicated having no off-farm work, compared to 41.18% for small operators. Larger operations also highly value the objective of generating enough income to reduce off-farm work. 92.45% of larger operators compared to 58.82% of small operators viewed this objective as very important. Finally, net income from the cattle operation is also significantly greater for larger operations. 50% of larger operators compared to 2.94% of small operators generated over 60% of net household income from their stocker operation.

Income Dependency

It is assumed that producers who derive a greater percentage of net income from their cattle operation have a greater incentive to maximize cattle profits. Thus, the hypothesis was tested concerning whether producers who were more dependent on income from their stocker operation were more likely to adopt best management practices.

The adoption of nutrition management practices did not differ according to various income levels generated from the stocker operation. However, results indicate that income dependent producers are progressive in adopting cost reducing management practices pertaining to forage production. As with larger operators, producers who are dependent on income from the stocker operation are more likely to conduct soil and forage tests as well as better understand proper stocking rates.

Income dependent producers also demonstrate a tendency to adopt animal health management practices that result in increased animal performance. Statistical differences between producer groups were observed concerning tick control and deworming methods. 11.63% of non income dependent producers indicate that they do not deworm their stocker

calves. Only 1.89% of income dependent producers indicated likewise. Income dependent producers are also more likely to administer vaccinations as recommended. 90.32% of income dependent producers administer intramuscular injections in the neck, the ideal practice to reduce injection site lesions, compared to 73.74% of non income dependent producers. Income dependent producers are more likely to collect data on finished cattle if ownership is retained. 62.50% of non income dependent producers rarely, if ever, collect finishing data compared to 26.32% of income dependent producers. Income dependent producers are also more willing to use live vaccines in defending against animal diseases.

Like operation size, number of marketing and risk management practices were found to differ with the income dependency variable. Income dependent producers are more likely to purchase preconditioned cattle and to obtain their cattle through a wider variety of alternatives such as video auction and out-of-state direct purchase. 46.94% of income dependent producers purchased at least a percentage of their cattle preconditioned compared with 20.93% of non income dependent producers. Income dependent producers are also more likely to retain cattle for feeding, market their cattle directly to feedlots and less likely to use local auctions as marketing outlets. Furthermore, income dependent producers more frequently add a premium to their cattle by marketing cattle in larger, more uniform lots. 65.08% of income dependent producers market cattle in truckload lot sizes compared with 30.08% of non income dependent producers. Finally, producers who are dependent upon stocker income demonstrate a greater tendency to employ the wheat-stocker cattle enterprise as a production system. 83.93% of income dependent producers nearly always graze cattle on small grain pasture compared with 67.06% of non income dependent producers.

Adoption of several business planning management practices were also statistically significant across producer groups, with more significant differences than indicated by operation size. Income dependent producers generally have a better recordkeeping system, often using computerized financial record keeping systems. 66.10% of income dependent producers use a computer recordkeeping system such as Quicken, Quickbooks, Redwing, or FarmWorks to keep financial records compared to 44.44% of non income dependent producers. Furthermore, income dependent producers enter data more frequently, are more likely to draft summaries for tax reporting, develop income statements, and generate reports more frequently. In addition, income dependent producers are more likely to keep records on cattle medical treatments.

Producers who are dependent upon stocker income are less likely to be employed off the farm. 75.76% of income dependent producers indicated that they are not employed off the farm compared with 33.64% non income dependent producers. Income dependent producer's operations range in size levels up to more than 5,000 head. Not surprisingly, producers who are not dependent upon stocker income are more likely to have a smaller stocker operation, primarily under 100 head. Furthermore, income dependent producers place a much higher value on generating enough farm income so that off-farm work is not necessary. 90.91% of income dependent producers viewed generating enough farm income so that off-farm work is not necessary as very important, compared with 56.36% of non income dependent producers.

Specialized Operations

Theory suggests that specialized producers have the potential for greater returns to their investment yet also face increased risk, for example, from price volatility and narrow margins of cattle weight gain in stockers. A hypothesis was tested concerning whether specialized producers are more likely to adopt best management practices in their operation. Specialized stocker

producers, those beef producers not also having cow-calf operations, were found to be more likely to adopt a variety of management practices compared to the more diversified producer who simultaneously pursues cow-calf and stocker production.

Of the designated nutrition and management practices, specialized producers are more likely to implant and dehorn cattle. 58.62% of specialized producers nearly always implant steers compared with 28.81% of diversified producers. However, specialized producers were found to be less likely to use software in designing energy and protein supplements.

Regarding forage and pasture management, specialized producers indicate a shorter hay feeding season length. Specialized producers also consider themselves more knowledgeable about setting stocking rates with 51.65% of specialized producers indicating that they knew how to set a proper stocking rate, compared with 42.03% of diversified producers.

Several statistically significant differences were noted between specialized and diversified producers concerning quality assurance and animal health management practices. Specialized producers individually identify cattle more frequently by the hot branding method (58.06%), compared with 29.40% of diversified producers. However, not all management practices from this section delivered expected results. Specialized producers were found to more frequently administer intramuscular injections in the rump region of the animal. Diversified producers are found to administer injections in the neck more frequently than the specialized producer group.

All of the marketing and risk management practices analyzed between the two producer groups yielded significant statistical differences. Specialized producers market their cattle regularly and sporadically throughout the year rather than seasonally. Specialized producers also market larger lots of more uniform cattle. 43.26% of specialized producers market cattle in

truckload lots. This is compared with 16.43% of diversified producers. The use of futures and options contracts and forward pricing is also more common with specialized stocker producers.

In the business planning and management section, specialized producers conducted analysis and drafted summaries more frequently than diversified producers for two thirds of the given components to financial planning: drafting balance sheets, cash flow statements, income statements, and conducting historical analysis. For instance, 70.86% of specialized producers draft a cash flow plan either once per year or annually. This is the common practice for 56.97% of diversified producers. Specialized producers are also more likely to use a computerized record keeping system (52.3% compared with 38.29% of diversified producers).

A statistical difference between the producer groups was noted concerning the producer's preference for a dam breed type to their stocker cattle. More of the specialized producers preferred an Angus dam breed type. Brangus or Braham was a breed type that wasn't as highly desired by specialized stocker producers compared with diversified producers. 16.12% of diversified producers preferred their stocker cattle to have a dam of this breed type, as opposed to 8% of specialized producers.

Regarding the producer's demographic profile, specialized producers were found to be younger and to have a larger operation in terms of stocker cattle numbers. 27.22% of specialized producers were under age 40, compared to 15.75% of diversified producers. 70.45% of diversified producers indicated having between 1 and 100 head of cattle compared to 38.20% of specialized producers.

Summary and Conclusions

Larger operations are found to adopt BMPs to a greater extent than smaller operations. Larger operations often have the means and managerial capacity to implement specialized and

cost-lowering methods in stocker production. These operations often face greater risk and pursue a wider variety of methods and practices to reduce it. Concerning business planning and management practices, larger operations may be performing such analysis to report to financial lenders. In addition, larger operations perhaps have greater profit incentives. Their managerial capabilities are often directed towards on-farm work with the objective of generating enough income so that off-farm work is not required.

Producers who derive a greater percentage of net income from their cattle operation have a greater incentive to maximize cattle profits. These income dependent producers likely attribute a greater utility to profits from cattle, relative to other producers. Since profitability in stocker growth is so heavily dependent upon economical forage production, it is perhaps not surprising that producers highly dependent upon stocker income often choose cost reducing production practices particularly related to forage production, namely the hay feeding season length, soil and forage testing practices, and the stocking rates of income dependent producers. These producers also choose animal health practices that increase animal performance. At the end of ownership, stocker producers must have a healthy animal that is worth more than at the time of purchase. Just as recommended forage management practices are the key for controlling costs in the stocker enterprise, in the same way a strong animal health program is perhaps the key to insuring a return on the investment. Income dependent producers have also demonstrated themselves to be very attuned to a comparably greater number of business planning and management practices as compared with the size and specialization producer groups.

In theory, specialized stocker producers have the potential for greater returns to their investment but at the same time, they face increased risk due to factors such as price volatility and narrow margins of cattle weight gain. Our results confirm that specialized stocker producers

are progressive in adopting best management practices concerning marketing and risk management, differing the most from diversified producers in this area. Specialized producers are regularly marketing large lots of uniform cattle. The differences in business planning and management practices between the two producer groups are likely attributed to the fact that many stocker producers must report to lenders to both obtain and repay loans, perhaps more frequently than the diversified cow-calf producer group. Finally, the age difference between the two producer groups is certainly an observation of interest.

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Table 4. Chi-Square Results			
	Operation Size	**Income Dependency**	**Specialized Operations**[1]
Nutrition and Management			
Mineral supplements			
Energy and protein supplements	**(-)use of software		**(-)use of software
Implanting	*(+)steers, *(+)heifers		*(+)steers, *(+)heifers
Horns			*(+)
Forages			
Hay feeding season length			*(+)
Soil testing	**(+)	*(+)	
Setting stocking rate	**(+)	*(+)	**(+)
Forage testing	*(+)produced, *(+)purchased	*(+)produced, *(+)purchased	
Stockpiling			
Quality Assurance and Animal Health			
Tick control		**(+)fire	
De-worming		**(+)	n.a.
Modified live vaccines	*(+)	*(+)	n.a.
Killed vaccine products			n.a.
Retained ownership and data collection		*(+)data collection only	n.a.
Individual cattle ID	*(+)hot branding		*(+)hot branding
Intramuscular injections	*(+)neck	**(+)neck, *(-)rump, *(-)hip	*(-)neck, *(+)rump
Marketing and Risk Management			
Purchasing preconditioned cattle		*(+)	
Value preconditioned components	*(+)45-day weaned, **(+)respiratory vaccinations		n.a.
Source of cattle	**(+)broker, *(+)video auction	*(-)in-state auction, *(+)video auction, *(+)out-of-state direct purchase	n.a.
Receiving period	**(+)Sept-Nov		n.a.
Time of grazing	**(+)winter, *(+)spring, *(+)both winter and spring	**(+)both winter and spring	n.a.
Forage type	*(+)small grain, **(-)bermuda	**(+)small grain	n.a.
Male cattle sold/ retained as feeders	**(-)sold, **(+)retained	*(-)sold, *(+)retained	n.a.
Female cattle sold/ retained as feeders		*(+)retained	n.a.
Membership in cattle cooperative			
Frequency of marketing	*(+)regularly	**(+)regularly	*(+)regularly
Lot size	*(+)truckload	*(+)truckload	*(+)truckload
Lot type	*(+)uniform	**(+)uniform	*(+)uniform
Male marketing regular/ special sales <50mi.	*(-)regular sales	*(-)regular sales	n.a.

Female marketing regular/ special sales <50mi.	*(-)regular sales	*(-)regular sales	n.a.
Male marketing regular/ special sales >50mi.	**(+)regular sales		n.a.
Female marketing regular/ special sales >50 mi.			n.a.
Male marketing video/sat auctions			n.a.
Female marketing video/sat auctions			n.a.
Male sold direct from ranch to feedlot	*(+)	**(+)	n.a.
Female sold direct from ranch to feedlot	**(+)	**(+)	n.a.
Futures contracts	*(+)		*(+)
Options contracts	*(+)		*(+)
Forward pricing	*(+)		*(+)
Business Planning and Management			
Long and short term business plan			
Recordkeeping frequency		**(+)	*(+)
Financial record system		**(+)	
Financial planning/ assessment	**(+)cash flow, **(+)historical analysis	**(+)tax reporting summary, *(+)income statement	*(+)balance sheet, **(+)cash flow, *(+)income statement, **(+)historical analysis
Recordkeeping related to cattle		**(+)medical treatments	#only analyzed: vaccinations, medical treatments
Genetics			
Preference for sire breed			
Preference for dam breed	**(+)		**(+)
EPD's as purchasing decision			n.a.
Cattle traits as purchasing decision	*(-)reproduction		n.a.
Demographics			
Gender			
Extent of off-farm work	*(-)producer	*(-)producer, **(-)spouse	
Age			**(-)
Education			
Number of cattle	n.a.	*(+)	*(+)#stocker cattle
Generating income to reduced off-farm work	*(+)	*(+)	
Reducing labor			
Use of internet			
Net household income			
Net income from cattle operation	*(+)	n.a.	
Race			

* indicates variable is significant with p-value <.01, if necessary a distinction is described.
** indicates variable is significant with p-value <.05, if necessary a distinction is described.
# describes any distinction between questions for stocker and cow-calf surveys.
[1]n.a. is shown when no comparable question was asked about stocker production on the cow/calf producer survey.