RETURNS TO RECORD-KEEPING AND BENCHMARKING FOR CANADIAN COW-CALF PRODUCERS

Subtheme: Knowledge and Information

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Abstract:

Farmers and ranchers seek to adopt appropriate management tools and utilize a variety of strategies to reduce costs, increase productivity, and improve overall performance. This paper examines how farm management tools, specifically record keeping and benchmarking, effect production and performance on cow-calf farms in Canada and how market orientation and organizational learning mediate this relationship. A theoretical framework was developed around managerial factors (market orientation and learning orientation), strategic factors (efficiency and product differentiation), and management tools (record keeping and benchmarking). Data was collected from a panel of 61 cow-calf producers in Alberta, Saskatchewan, and Manitoba. Estimations are carried out using Ordinary Least Squares models. The results suggest that the almost all respondents maintain some level of record keeping but a significant number of them did not use benchmarking. In addition, learning oriented producers were most likely to use both record keeping and benchmarking. While we do not examine the impact of record keeping and benchmarking on profitability, our results show that benchmarking leads to greater beef production efficiency.

Introduction

Farmers and ranchers seek to increase farm performance by reducing costs and improving productivity. For example, it has been shown that the adoption of recommend tools, such as antibiotics, growth promotants, and vaccines can increase the efficiency of beef production (Hersom, Thrift, and Yelich 2014). As producers of products that are highly undifferentiated, improving performance requires farmers and ranchers to find efficiencies in production while ensuring that their cattle meet the needs of downstream channel partners (Fearne 1998). In this sense, the manner in which farmers and ranchers improve farm performance, increase efficiency, and utilize new technologies has drawn a lot of attention from scholars and practitioners (Hersom, Thrift, and Yelich 2014; Pruitt et al. 2012; Ramsey et al. 2005)

While scholars now claim that reimagining agriculture as a knowledge based bio-economy may lead to greater societal gains in terms of improved sustainability and performance of the sector (Levidow et al., 2012), agriculture has constantly relied on learning and knowledge to facilitate innovation (Nieuwenhuis 2002). Along those lines, a variety of strategies that relate to organizational learning have been discussed in the management and marketing literature (Beverland and Lindgreen 2007; Jiménez-Jiménez and Cegarra-Navarro 2007). Researchers have applied these concepts to agricultural contexts and have found a direct influence of market orientation and learning orientation on firm performance, often through innovation (Micheels and Gow 2015; Johnson et al., 2009). For instance, market oriented and learning oriented cow-calf producers are likely aware of competitor strategies as well as channel demands for cattle that meet the needs of downstream firms in the value chain. Given the highly competitive nature of beef production, awareness of competitor

strengths and weaknesses (a component of a firm's market orientation) may encourage greater learning by the firm in an attempt to close a gap in productivity.

While cultural resources such as a market orientation or a learning orientation may facilitate innovation and subsequent changes in performance outcomes, some researchers have suggested that a refocus to the practice-based view of examining differences in performance (Bromiley and Rau 2014). This suggests that research that goes beyond the somewhat abstract ideas of culture and delves into practice-based explanations of farm-level performance may be warranted. Given that simulations suggest that cow-calf farms in Canada may not be profitable (Brewin et al. 2014), it may be worthwhile to re-examine the effect of best practices on beef performance. To date, very little attention has been directed at studying the management practices (record keeping and benchmarking) and productivity measures in the Canadian cow-calf industry even though researchers have examined the value of record keeping systems elsewhere (Kuhlmann and Brodersen 2001; Verstegen and Huirne 2001). Consequently, this paper combines these two approaches to examine how market awareness and a culture of learning in Canadian beef cow-calf industry affects the use of recommended management practice tools. In order to fill this gap, this paper will investigate how record keeping and benchmarking affect cow-calf production and overall performance and how the constructs of market orientation and organizational learning mediate this relationship.

Overview of the Canadian Cow-Calf Sector

In the Canadian beef industry, more than 80% of the beef cows are located in the Western provinces of Alberta, Saskatchewan, and Manitoba (Statistics Canada 2016).

Alberta and Saskatchewan account for 70.4 percent of the total 3.8 million Canadian beef cows in beef production (Statistics Canada 2016).

In Canada, the size of the cow-calf operations can range from many small lifestyle farms to large commercial producers. A cow-calf operation is the starting point for commercial beef production which breeding takes place. After calving, cow-calf producers feed the calves until weaning which occurs when calves are 400 pounds to 600 pounds (Brocklebank et al., 2008). Research has been conducted on how calving dates and weaning methods can influence beef productivity and farm performance (Khakbazan et al. 2014). Additionally, the combination of increased input costs, an increase in feed cost, and the recent droughts are some of the factors that can lead to higher feed costs (Saskatchewan Forage Council 2011). High feed prices have increased producers awareness of costs. Thus, it is vital for livestock operators to strategically manage costs of feeding in order to have financially successful cow-calf operations.

On the other hand, revenues for cow-calf operations are generated from the sale of weaned calves, cull cows, and bulls, so productivity is also important. The focus on productivity is because cow-calf producers have little influence on cattle prices in the market. Consequently, it is important for farm managers to minimize the costs of production and maximizing the beef productivity in order to achieve better performance.

Strategic Management Theory

For a firm interested in improving performance, a manager has two basic strategic options. Firms can compete based on comparative advantages based on productivity or on differentiation (Porter 1991). Strategic planning is a predetermined approach to organize resources to produce agricultural commodities, and the resources need to be organized into

the proper amounts and combinations. An important step in this process is establishing a goal. Traditional economic theory suggests firms attempt to maximize profits, but due to bounded rationality and other factors, may allocate resources in an effort to maximize utility rather than profits, particularly for owners of small businesses (Dunkelberg et al. 2013; Zereyesus and Featherstone 2017). Therefore, adjustments to resource allocation may be based on the difference between observed performance and aspirations (Park, 2007). In this manner, farmers who feel performance could be improved have three options:

1. Reducing costs (mainly focus on the direct cost), ceteris paribus
2. Increasing gross product, ceteris paribus
3. Combining and implementing the both approaches 1 and 2 simultaneously.

Keeping detailed production records and pairing this with benchmarking in order to determine how the farm is performing relative to other firms may give farmers greater insight to gaps in performance between their own farm and that of comparable operations. While the adoption of computer based record keeping systems may pose additional costs on the producer (Batte et al., 1990), more detailed records may allow for more effective resource reallocation in an attempt to close productivity gaps (Goldsmith and Gow, 2005). This may entail searching for ways to manage direct costs, feed costs, pregnancy rate, or any number of measures that help the manager close this gap. Better managerial control over production records may subsequently lead to better financial performance (Pena and Klinefelter, 2008). For price-taking firms, increasing the efficiency of production is an important means to increase profit.

Data and Methods

A questionnaire was designed to measure the extent cow-calf producers adopted or were using practices recommended by economic and livestock specialists. The questionnaire asked producers about management areas such as marketing, business planning, finance and farm record keeping, as well as farm demographics and farm characteristics. While we acknowledge that maintaining detailed production records adds to both labour and opportunity costs of the operation, due to constraints on survey length, we were not able to collect this data at this time. The population for this study was comprised of 110 cow-calf producers participating in a five-year project led by Dr. John Campbell of the Western College of Veterinary Medicine. In total, 67 respondents completed our survey, yielding a response rate of 61%. Based on previous studies, several reports pointed out that achieving a 50% response rate on the first round is good, and that second round response rate of about 70% should be considered average, respectively (Carley-Baxter et al., 2009).

Table 1: Demographic information of respondents

		Min.	Max.	Mean / %	Comparative Cdn. statistics	Std. Deviation
Age		26	79	47.3	54	11.09157
Herd size		77	2700	317.25		374.065
Experience		2	50	29.3		
Location:	AB			50.90%	40.70%	
	SK			30%	29.80%	
	MB			19.10%	11.60%	
Education:	High School			41.70%	49.30%	
	Trade/technical school & College degree			32.30%	28.10%	
	University Degree			23.20%	16.60%	
	Graduate Degree			5.80%	6.00%	
Off Farm Work				14%		

An objective of this research is to ascertain what kind of production records cow-calf producers maintain. Respondents were asked to check all that apply options for their beef production record, which includes *Birth weight, Birth date, Individual ID, Weaning weight, 205 day adjusted weight, Culling/death loss records,* and *Health records* as can be seen in Figure 1. These records are in addition to animal identification tags that producers must apply to livestock in accordance with the Canadian Food Inspection Agency traceability system before animals can be transported from the farm. Based on a discussion with experts in the beef industry, it was determined that three key records to maintain are *birth date, weaning weight* and *calf's ID linked to dam ID* Approximately 98.6 % of total number of respondents' record *Birth date,* and 91.3% link the calf ID to the ID of the dam. However, only 42% of respondents track *weaning weights*. If producers track birth date, weaning weight, and calf ID linked to dam ID, they can calculate calving distribution, calving span, calving interval, pounds weaned per cow wintered, therefore, the producers could be able to look at the individual productivity level (per cow) rather than overall herd productivity level.

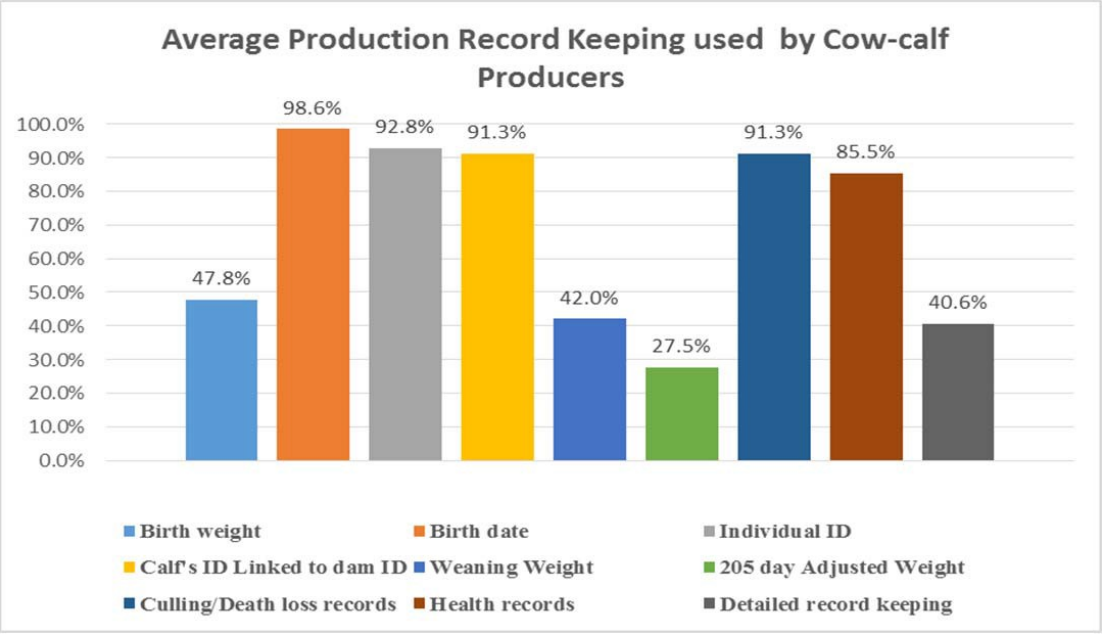

Figure 1: Production records maintained by respondents
Source: Created by author using survey data. Number of respondents=61

Model

The model presented here examines the factors related to greater productivity. Three econometric models are estimated using SPSS 22.0 and E-views 8 statistical programs. In order to test overall performance, we estimate an Ordinary Least Squares model. Specifically, the dependent variable was beef production efficiency, which is measured by *total pounds of calves weaned* divided by *total number of females exposed*. Two underlying constructs of market orientation and learning orientation as the structural factors were also used (See Appendix A for these items). Managerial factors (record keeping and benchmarking) were included to examine how these affect overall performance. Furthermore, other factors such as average weaning weight and feed costs were also considered in this model. Finally, several demographic variables are also included: age, years of experience, level of education (High school, Trade technical School/College degree, and University degree with Graduate degree omitted as a reference variable), location (Saskatchewan and Manitoba with Alberta omitted as a reference variable), extent of producer off-farm work, and herd size.

Table 2: Cow-calf producers Characteristics, Descriptions and Expected Signs

Variables	Variables Description	Expected Sign
Age	Actual age in years for the cow-calf producers	+
Herd size	Actual herd size of cattle in operation	+
Education Level (Highest level of education attained by producer)	High school (1=YES, 0=NO) Trade or Technical school/College degree high school (1=YES, 0=NO) University degree and graduate degree (1=YES, 0=NO)	+
Feed Cost	Actual average feed cost per cattle for one cycle	+
Experience	Actual number of years in operation	+
Influencers in Decision Making Process	Banker/accountant (1=YES, 0=NO) Paid consultants (1=YES, 0=NO) Veterinarian (1=YES, 0=NO) Ag Extension personnel (1=YES, 0=NO) Spouse/other members of the family (1=YES, 0=NO)	- + + + +
Experience	Actual number of years for the cow-calf producers	+
Family Income Derived From the Operation (percentage)	0% to 24.99% (1=YES, 0=NO) 25% to 49.99% (1=YES, 0=NO) 50% to 74.99% (1=YES, 0=NO) More than 75% (1=YES, 0=NO)	+
Off-farm Work	Extent of producer off-farm work (1=YES, 0=NO)	
Location	Province operation is located. Alberta (AB) (1=YES, 0=NO) Saskatchewan (SK) (1=YES, 0=NO) Manitoba (MB) (1=YES, 0=NO)	?
Benchmarking	Cow-calf producers adopt benchmarking (1=YES, 0=NO)	+
Record keeping	Cow-calf producers adopt record keeping (1=YES, 0=NO)	+
Average Weaning Weight	Actual average weaning weight for each cow-calf business (pounds)	+
Market Orientation	Factor score were computed in Factor analyses, which could use as variables to facilitate in the Binary logit analysis as well as Ordinary Least Squares analysis.	+
Organizational Learning	The measurement was the exact same done by Market orientation.	+

Results

The model seems to fit the data well as the R-squared value for this estimation is 0.799, and the adjusted R-squared is 0.653. The model also produced an F-statistic value of 19.277 making the overall model significant. In our model, the significant independent variables are *benchmarking, market orientation, learning orientation, weaning weight, feed cost, educational level, experience,* and *some of the influencers in the decision making process.* In general, Table 3 shows that both market orientation and learning orientation have significant positive association with beef production efficiency. In addition, results show that benchmarking has a positive impact on overall performance.

Market oriented and learning oriented management cultures are the most influential in determining the variation in production efficiency. In addition, producers who compare their production records with industry benchmarks are also shown to have higher production efficiency. The positive sign of market orientation, learning orientation, and benchmarking shows that greater the extent of those relationship variables, the higher the level of production efficiency.

The regression coefficient of the independent variable feed cost is positive and statistically significant at 1% significant level. Based on this estimate, a one unit increase in feed costs ($) increases total beef production (pounds) by 2.97 pounds per exposed female. Similarly, a one-unit increase in average weaning weight increase total beef production by 0.746 pounds per exposed female. These results confirmed previous research that found increased feeding increase total pounds weaned as a result of higher weaning weights or more calves to sell, which can lead to better reproductive rates (beef production efficiency) (Ramsey et al., 2005).

The estimate for the *influencers in the decision-making process* and beef production efficiency show primarily that producers have greater returns from discussing their beef production with veterinarian and other farmer/ a discussion group. This result is not surprising, because veterinarians are important to ensure and provide a service to maximize the health and productivity for each individual herd. Results show that discussion of beef reproductive efficiency between producers and bankers/accountants or paid consultants may lower beef production efficiency. One possible explanation may be that bankers and paid consultants may focus more on costs and the impact of changes on farm profitability, rather than on the effect on production efficiency.

The coefficient for *the level of education* indicates that respondents holding high school education and trade, technical and college degrees have lower production compared with producers having university degree or higher, thus corresponding to previous research (Johnson et al., 2010; Pruitt et al., 2012). In addition, experience was negatively associated with increased beef production. Results show that a one-year increase in *Experience* decreased the beef production by 1.979 lbs.

The construct of market orientation was significant. This is consistent with previous research that found market orientation is important in determining overall performance (Micheels and Gow 2015; Martino and Tregear 2001). Furthermore, benchmarking was positively associated with beef production. Cow-calf producers who use benchmarking increase total beef production by 18.45 pounds per exposed female.

Table 3 Results of Ordinary Least Squares model

Independent Variables		Coefficient	Std. Error	P-value
Constant		98.846	116.196	0.441
Detail Record Keeping		-18.828	31.258	0.151
Benchmarking		18.45*	30.464	0.096
Total size		-0.029	0.04	0.473
Feed costs		2.97***	0.087	0.002
Experience		-1.979*	1.038	0.065
SK		-27.37	33.151	0.415
MB		-14.127	33.943	0.683
High school		-68.708*	33.955	0.051
Trade/technical school/ college degree		-88.407**	41.82	0.042
Age		0.235	1.132	0.837
Percentage of total 2015 family income from cow-calf operation	0-24.99%	-12.038	42.01	0.776
	25%-49.99%	9.983	37.315	0.791
	50%-74.99%	-6.917	36.607	0.881
Banker/accountant		-5.195*	29.443	0.081
Paid consultants		-6.81*	48.523	0.079
Veterinarian		45.476**	37.896	0.038
Ag extension personnel		-62.884	60.816	0.308
A discussion group/other farmers		49.841*	26.951	0.073
Past production goals		-0.44	77.747	0.996
Off Farm work		-46.597	44.742	0.305
Market Orientation		29.465*	31.11	0.056
Learning Orientation		16.887*	21.43	0.096
Average Weaning Weight		0.746***	0.104	0.000
R^2		0.799		
Adjust-R^2		0.653		
F-Statistic		19.277		0.000

***p > 0.1** ** p > 0.05** *** p > 0.01**

Discussion

The results presented here suggest that cow-calf producers who benchmark their production against peer farms observe an 18 pound gain per exposed female, which at current prices is a significant economic gain. As using benchmarks requires the use of detailed

record-keeping, this would also suggest that there are returns to record-keeping even though the model estimate is not significantly different from zero. While scholars and consultants have previously championed the value of record keeping for farm management (Mishra et al., 2009), and our results seem to corroborate those earlier findings. Moreover, this research and the results generated from the analysis follow the suggestion of Bromiley and Rau (2014) for management research (in general) to go beyond resources and to study the practices undertaken by firms. While the development of strategic resources may deliver firms in other industries competitive advantages, for producers of commodities, knowing which practices generate positive returns may be more beneficial in both the long and the short run.

To be clear, these findings do also show a positive return to human capital development, particularly when one looks at the coefficients on education as well as the coefficient on the use of a discussion group as well as the learning orientation scale. For farmers who question assumptions and look to peers for help diagnosing and solving problems they face on their operation, the benefits of developing these networks (and in some cases, resources) are clear. The findings presented here follow the work done elsewhere on the returns to group learning and problem solving (Clark et al. 2007) and would suggest some best practices to follow for those farmers who are looking to improve different areas of farm performance.

Conclusions

In order to be more efficient and productive, learning oriented cow-calf producers use record keeping and benchmarking. For example, self-comparison via detailed production records requires producers to assess their own strengths and weakness and to identify deviations from

historical performance. The purpose of self-comparison is to gain experience and identify opportunities to improve performance. Therefore, it is critical to develop measurable indicators that permit inter-firm comparisons through record keeping. In addition, benchmarking is a way to compare performance metrics with other producers, governmental programs and industry organizations. Producers can increase awareness of costs and production after the comparison. Benchmarking was one of the key success factors for beef production. Thus, greater and improved use of benchmarking can help producers (and regions) achieve higher productivity; therefore, producers could earn extra revenue if they increased their use of this practice.

The final recommendation is to promote record keeping and benchmarking. Both managerial practices played an important role on cow-calf sector because these strategies were found to assist in improving beef efficiency and overall performance. Especially, benchmarking is a process that makes it possible to research producers' business to find opportunities to improve efficiency and profitability. Having comparable, quality data is key step to making decisions. As a result, taking specific actions is crucial to long-term success. In this thesis, benchmarking is promoted widely as a best management practice and is important to cow-calf producers. Effective use of benchmarking is probably one of the most important tools and skills for cow-calf producers. Cow-calf producers that use benchmarking can improve cattle efficiency and increase the profitability of their business.

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Appendix A: The Market Orientation and Learning Orientation Scale

Market Orientation (Narver and Slater 1990) (Cronbach's Alpha =0.827, λ_2 =0.835, AVE =61.359%)	Factor loadings	Corrected Item Total Correlation
We discuss information concerning competitors' (neighbours and other cattle producers) strategies.	0.634*	0.494
We are quick to respond to competitive actions that threaten our operation.	0.639*	0.495
We target buyers where we have, or can develop, a distinct advantage.	0.603	0.592
We regularly discuss competitors' (in our case, it refers to neighbor and other cow-calf producers') strengths and strategies.	0.646*	0.543
We regularly visit current buyers to see how our cattle are meeting their needs.	0.697	0.580
We discuss reasons for successful and unsuccessful buyer experiences on a regular basis.	0.690	0.651
We coordinate all of our business functions (from buying to producing, selling and accounting) in order to better serve the needs of our target markets.	0.733	0.591
We understand how everything in our operation can contribute to creating market value.	0.599	0.470
The business objectives on our operation are driven by consumer (in our case, it refers to the feedlot owner buying a producer's cattle) satisfaction.	0.724	0.734
We continually monitor our level of commitment to serving market demands.	0.827	0.849
Our strategy to improve performance is based on our understanding of what the market wants.	0.794	0.798
Our strategies are driven by our beliefs about how we can create greater value for our buyers.	0.811	0.828
We measure buyer satisfaction regularly.	0.863	0.835
We pay close attention to our buyer, even after our cattle are sold.	0.770	0.691
Learning Orientation (Sinkula, Baker, and Noordewier 1997) (Cronbach's Alpha =0.720, λ_2 =0.795, AVE =60.776%)		
We basically agree that our farm/ranch's ability to learn is the key to our competitive advantage.	0.702	0.724
The basic values of this farm/ranch include learning as key to improvement.	0.617*	0.703
The sense around here is that learning is an investment, not an expense	0.815	0.765
Learning on my farm/ranch is seen as a key commodity, necessary to guarantee survival.	0.779	0.692
Our culture is one that does not make learning a top priority	0.609*	0.275

The collective wisdom on this farm/ranch is that once we quit learning, we endanger our future.	0.772	0.481
We are not afraid to reflect critically on the beliefs and assumptions we have about the way we ranch/farm.	0.824	0.464
Decision-makers on this farm/ranch do not want their "view of the world" to be questioned.	0.796	0.094
Our farm/ranch places a high value on open-mindedness.	0.809	0.593
All labourers on this farm/ranch – paid and unpaid - are encouraged to "think outside of the box."	0.778	0.522
An emphasis on constant innovation is not a part of our farm/ranch's culture.	0.425*	0.169
Original ideas are highly valued on this farm/ranch.	0.662	0.668

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