The Value of Pregnancy Testing Beef Cows

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Abstract

Less than half of cow/calf producers in south-central Oklahoma and north-central Texas utilize pregnancy testing. The objective was to illustrate to beef cattle producers the effect that pregnancy testing and the subsequent adoption of an effective culling practice on first-time open cows has on net profitability of the cow/calf enterprise.

Introduction

There are approximately 37 thousand cow-calf producers operating in the south-central Oklahoma/north-central Texas region of the United States, accounting for approximately 2.7 million beef cows (NASS-Oklahoma, NASS-Texas)[1]. The size of operation varies from cow herds as small as 10 head to as large as 4500 head. A recent survey conducted of cattle producers operating in this region reported that producers who manage herds larger than 100 head glean over 40 percent of their household income from their cattle operations (Vestal et al). The same survey reported that producers who maintained herds smaller than 100 head received less than 40 percent of their household income from their cattle operations. Regardless of the size of herd, how well a producer manages his/her herd and subsequently how well they market their calves is critical for the long-term survival of their business.

There are several components and techniques to a successful cow-calf management strategy—among them should be an effective strategy for culling unproductive cows out of the herd. Not all that surprising, the survey mentioned above reported that only approximately 14 percent of the group of producers who manage less than 100 head of cows utilize pregnancy testing on the cows they own, and only about 25 percent of them utilize pregnancy testing on

[1] This statistic does not include the number of dairy cows, which accounts for an additional 120 thousand head (NASS-USDA, Oklahoma and Texas Quick Stats).

their raised heifer cows. However, a more surprising result from the survey was the percentage of those producers who have herd sizes larger than 100 head that utilize pregnancy testing. Out of these producers, only approximately one third of them utilize pregnancy testing services for the cows they own, and only about 53 percent used testing services for the heifers they raised.

The finding from the survey provide the impetus for demonstrating to producers in the region via economic analysis the need for increased adoption of pregnancy testing and an effective culling practice for first-time open beef cows in this region. The objective of this research is to illustrate to producers the effect that pregnancy testing and the subsequent adoption of an effective culling practice on first-time non-pregnant cows has on the net profitability of the cow/calf enterprise for the region.

In the next part of the paper we develop a conceptual framework of the producer's optimization problem. We then provide a description of the herd and describe the methodology used in the empirical analysis necessary to satisfy the objective of the paper. We then provide production and economic results and their implications. Lastly, we provide final conclusions and limitations of the study.

Conceptual Framework

Economic theory suggests that a producer operating in a competitive market will only adopt a new technology or production practice if the expected profitability from the technology is unambiguously larger than their current method of production. Conceptually, then, the profit-maximizing producer faces the following decision rule for whether or not he should adopt pregnancy testing and a strict culling practice into his cow/calf enterprise

$$\text{Adoption} = \begin{cases} \text{yes}, & \text{if } \mathrm{E}(R^P) > \mathrm{E}(R), \\ \text{no}, & \text{otherwise}, \end{cases} \tag{1}$$

where $\mathrm{E}(R^P)$ is the expected net return per cow when pregnancy testing is used and $\mathrm{E}(R)$ is the expected per cow net return when pregnancy testing is not used.

The value of information gleaned from pregnancy testing is defined as the difference between the expected net return per cow when pregnancy testing is administered and culling first-time open cows implemented and the expected per cow net return when pregnancy testing is forgone and culling of first-time open cows not implemented. The following approach is used to determine the average per cow value of pregnancy testing beef cows

$$
\begin{aligned}
V &= \mathrm{E}(R^P) - \mathrm{E}(R), \\
&= \{[p_i \mathrm{E}(w_i) + p^f \mathrm{E}(F) + p^c \mathrm{E}(C) - rx_i - t - b] - \\
&\quad [p_i \mathrm{E}(w_i) + p^f \mathrm{E}(F) + p^c \mathrm{E}(C) - rx_i - b]\},
\end{aligned} \tag{2}
$$

where V is the average value per cow of pregnancy testing, p is the price paid to the cow/calf producer for a calf of average weight w sold in marketing scenario i (where i = 1,…, 3), p^f is the price paid to producers for first-time open cows, F is the total number of first-time open cows culled from the herd, p^c is the price paid to producers for non-productive cull cows, C is the total number of non-productive cows culled from the herd, r is the vector of input prices for cow production inputs in vector x that corresponds to production activities related to marketing scenario i, t is the per cow cost of pregnancy testing, and b is the fixed production costs associated with ownership of capital (cows, equipment, buildings, fences, etc.) used in the production process.

Note that the management of cows is not expected to differ when pregnancy testing is adopted except for administering the palpation test itself, which ideally is conducted by a certified technician at the same time spring-born calves are sorted and separated from their dams in the fall. A positive expected value represents the average additional profit per cow that a

producer would expect to earn from adopting pregnancy testing and a strict culling regiment of first-time open cows into his cow herd management practices.

Herd Description

A culling management strategy was initiated on a group of 30 head of spring calving, 3-6 year bred cows of Angus, Brahman and Simmental inheritance in 1998. Any cow that did not wean a calf or that was not palpated pregnant in the fall of each year was removed from the herd. Additional bred cows of similar breeding were added back to the herd in the fall of each year to maintain a 30 head herd.

Prior to project implementation in the fall of 2000 a comparison group of 35 head of Angus, Hereford or Angus/Hereford cross bred heifers were purchased directly from a local producer. These cattle were selected to represent a typical set of English influenced heifers for the Noble Foundation service area and consisted of cattle with frame scores 4, 5 and 6.

The cow herd composition used in the study, then, consisted of 27 mature cows with an average age of seven years, and 35 two-year old cows for a total of 62 cows. The herd was located at the Noble Foundation's Wildlife Unit farm near Allen, Oklahoma. During the three-year study (2001-2004), no cows from either group were culled unless they died or displayed chronic unacceptable infirmities (e.g., broken leg). All 62 cows were exposed to 3 full-sib Angus bulls for 60 days from June 1 to August 1 of each year and similar management practices for all three years of the study.

Methodology

The data provided the opportunity to determine the net return of keeping open cows in the herd for each of the three years of the study. Enterprise budgets were developed for each cow in each group (i.e., the mature group and the young group) for each year, including the non-

pregnant cows. Cow costs for each group have been separated into variable expenses and fixed expenses. Variable expenses included the average costs for mineral, supplemental feed, hay for cows and bulls, pregnancy testing services, veterinary products for cows and bulls, machine hire/lease, pasture rent, pasture maintenance expenses (i.e., seed, custom hire, and fertilizer), labor, and miscellaneous expenses. Fixed costs include depreciation and interest for mature cows, young cows, bulls (sires), calf scales, and computer software used to keep track of the data and analysis. It is important to note here that the cost of an open cow was the same as the cost of a bred cow, except for any costs associated with the preconditioning program or any related feed yard expenses from the retained ownership program.

Cow-calf producers in the region have some flexibility regarding how they market their calves. As a result, we felt it important to determine the value of pregnancy testing for each of three alternative marketing scenarios: (1) selling calves at weaning, (2) selling calves after a preconditioning program, and (3) selling on a grid via a retained ownership program with a feed yard. A discussion of each marketing scenario and method used to calculate calf revenue for each scenario follows.

Selling Calves at Weaning

A large percentage of cattle producers operating in the region sell their spring-born calf crop at the time of weaning in early October. Typically, producers will wean calves from their dams and immediately transport calves to a sale barn for immediate sale. Because we did not actually sell calves from the study at the time of weaning, we use an alternative approach to place value on the calves produced in our study. We calculated calf value as the average calf weight by gender (which we recorded at the time of weaning) in pounds times the average price paid per pound to producers who sold calves of similar weight at the Oklahoma City National

Stockyards sale in early October. Weaning weights were adjusted by a shrink factor of three percent. Transportation and commission fees have been excluded for analytical convenience.

Selling Calves after Preconditioning

Even though the majority of producers in the region market their spring-born calf crop in early October at the time of weaning, a growing number of producers have elected to administer a preconditioning program to their calves as a means to add value to their calf crop. In our study, all calves received at the time of weaning viral vaccines against infectious bovine rhinotracheitis virus (IBRV), bovine viral diarrhea virus (BVDV), parainfluenza-3 virus (PI-3V), and bovine respiratory syncytial virus (BRSV). The calves were also dewormed and given a 7 way clostridial. The calves were revaccinated with the viral vaccines 14 days after the initial injections. During the preconditioning program calves were supplemental fed with high quality bermudagrass hay and 1.5% of body weight of a 14% weaning ration. Depending upon the year the preconditioning period lasted 42 to 61 days.

Because the preconditioning program is expected to add value to the calves over what they would be worth without the program, the price paid at the sale barn in December does not reflect the true value of a preconditioned calf. We calculate the gross receipts from calves sold in December (after the preconditioning period of 42 to 61 days) as the average calf weight by gender in pounds times the average price paid per pound to producers who sold calves of similar weight at the Oklahoma City National Stockyards sale in early December plus a value added adjustment to reflect the higher value associated with preconditioning. This adjustment was determined to be approximately $0.25 per pound, which was based on a report published by Iowa State University and preliminary findings from a study being conducted in collaboration

between Oklahoma State University and the Samuel Roberts Noble Foundation, Inc. Transportation costs and commission fees have been excluded for analytical convenience.

Selling Calves via a Retained Ownership Program

Retained ownership is gaining attraction from several producers, because it allows producers to capitalize on their investment into superior genetics and management. For this study, calves from both groups of cows were transported in November to Decatur County Feed Yard in Decatur, Kansas. Decatur County Feed Yard utilizes an electronic cattle management system that uses an electronic tracking program that involves measuring the animals several times in the feed yard and sorting them into the most appropriate outcome group while also gathering individual feed yard performance and carcass data. The retained ownership program lasted from November through June of each year. Actual carcass values paid were used to determine the average calf value for each group and year of the project.

Results

Descriptive statistics for the cows for each year are reported in Table 1. After the calving season in 2003, four cows were sold due to excessive illness, reducing the total herd size to 58 for the 2004 production season. In 2002 it was determined that a total of 12 cows were open based on the pregnancy testing results. Of the 12 cows, three were from the mature group and nine from the young group. In 2003, there were 15 open cows, 13 of which from the young group. In percentage terms, approximately 37 percent of the cows in the young group were open relative to only 13 percent of the mature cows. By 2004, the results were better with only 10 open cows between both groups.

Descriptive statistics for the calves for each year and group is reported in Table 2. The data show that there was a substantial difference between calving rates between the two groups

in all three years. Over the three years of the study, the mature group of cows realized an average calving rate 17 percent greater than that of the younger group. The calving rate for the younger group was the lowest in 2003, which is not surprising given that almost 40 percent of the cows in that group were open.

A count of non-pregnant cows for both groups by cow identification ear tag number is reported for each year in Table 3. Although several cows were identified as open over the three year period of the study, only two cows were identified as open in each of the three years of the study (i.e., cow number 1 in the mature group and cow number 72 in the young group). Table 3 also shows that cow number 41 from the younger group was found to be open in the first two years of the study (i.e., 2002 and 2003), but pregnant in the last year (2004). Moreover, we found that cows number 60, 61, and 65 from the younger group were open in the first year of the study (2002), pregnant in the second year (2003), but were found to be open again in the last year (2004).

Interestingly, we see from Table 3 that cows 41, 60, 61 65, and 72 turned out to be open at least twice over the three years of the project while cows 52, 53, 56, and 71 were open only once over the three years of the project and appear to have become productive after just one year of being open. We can not say anything about cow number 64 in the final year of the study (2004), except to say that she was in fact open; we do not know whether or not she would have been more productive in time.

Weaning weights per cow exposed are reported in Table 4. In all three years the average weaning weights of the calves from the mature group were heavier. In addition, it appears that the average weaning weight increased over time for all groups, which likely was influenced by the increase in the age of the cows. As one would expect due to differences in age, weaning

weights per cow exposed was greater for the mature cows compared to the younger cows. This result was consistent with findings reported by the Beef Improvement Federation (BIC).

The total cost of non-pregnant cows for each of the two groups and years are reported in Table 5. As one can see the total cost for all open cows in the herd over the duration of the study was approximately $18,600. Without much surprise we can see that there was an $11,250 difference between the total costs associated with the open cows in the mature herd versus that of the young herd. Over the span of the study, the average total cost of the open cows in the young herd was approximately $3,750 more than that of the mature group of cows.

Net return to all unpaid resources for both the mature group and the young group of cows for each year is reported in Table 8. The older, more mature group of cows (those that received pregnancy testing and a strict culling protocol prior to the project implementation) outperformed the younger group (the group that did not receive testing) in all three marketing scenarios. For the sell-at-weaning scenario, the average value of information from pregnancy testing and implementation of a strict culling protocol was equal to $34 per cow. The average value of information from pregnancy testing under the preconditioning program scenario was equal to $4 per cow, which was substantially less than the value of information when calves were assumed to be sold at weaning. Likely, the adjusted value-added premium ($2.50/cwt) price paid in December at the sale barn was not large enough to reflect the true value of the high performing calves. The true value was reflected when the calves were sold via the retained ownership program, as the calves likely performed much better in the feed yard than other calves of similar size and genetics that did not receive a preconditioning program.

The average value of pregnancy testing information and the strict culling regiment was the greatest under the retained ownership program scenario that was actually implemented in the

study. This value was equal to $77 per cow, and was $43 greater per head than that of the sell-at-weaning marketing alternative. Noteworthy is that net return varied substantially across years, and the value of pregnancy testing information varied substantially across years and groups.

Summary and Conclusions

In 2001, the Noble Foundation initiated a cow-calf project that sought to demonstrate to cow-calf producers operating in south central Oklahoma or north central Texas the economic benefits from utilizing information gained from pregnancy testing and implementation of an effective cow culling strategy. Within the herd, one group of 27 mature (7 year old) cows had been subjected to pregnancy testing and a strict culling protocol since age three. An additional 35 two-year old cows were purchased from a local producer an added to the herd. The entire herd then was commingled and managed similarly for three years. During this period no cows were culled unless they died or displayed chronic illness.

Results from the study indicated that a substantial value to pregnancy testing information and strict culling protocol existed for three alternative marketing scenarios, including selling spring-born calves at weaning, selling calves after a 45 to 60 day preconditioning program, and selling calves on a price grid via a retained ownership program with a feed yard. Net return results indicated that much of the difference in the expected value of the pregnancy testing information is due to substantial open cow cost differences between the young group of cows and the mature group of cows. However, some of the difference is due to lighter calves from the younger group of cows than the older, more mature group.

The younger group that did not receive any culling protocol realized a much larger number of first-time, and repeat open cows, and hence higher costs than the mature group. This affected the bottom line of the herd over the three year period of the study negatively by

approximately $15,000. The total difference in cost of open cows between the young and mature group was approximately equal to $11,250. However, it needs to be pointed out that this would not be the cost associated with an actual cow/calf producer operating in the region for they would likely cull cows after the second year of being open; however, many would cull their first-time open cows, which would reduce this cost.

The results provide a strong case for adoption of pregnancy testing and culling first time open cows. However, the expected value of pregnancy testing in this study is based on only three years of data. We expect this average value to change with additional years of data. Another limitation has to do with changing livestock prices and input costs over time, which unambiguously affects profitability.

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Table 1. Descriptive Statistics for Cows and Calves by Cow Group and Year

Year	Number of Cows in Total Herd	Number of Cows in Mature Herd	Number of Cows in Young Herd	Number of Open Cows in Total Herd	Number of Open Cows in Mature Herd	Number of Open Cows in Young Herd
2002	62	27	35	12	3	9
2003	62	27	35	15	2	13
2004	58	24	34	10	3	7

Table 2. Descriptive Statistics for Calf Crop by Cow Group and Year

Year	Number of Cows in Herd	Number of Calves In Mature Group	Number of Calves in Young Group	Calving Rate Total Herd	Calving Rate Mature Group	Calving Rate Young Group
2002	50	24	26	81%	89%	74%
2003	47	24	23	76%	89%	66%
2004	47	21	26	81%	88%	76%

Table 3. Open Cow Identification by Group, Year and Year-by-Year Interaction

Year	ID # Mature Group	ID # Young Group
2002	1,13,22	41,52,53,56,60,61,65,71,72
2003	1,10	38,41,51,54,55,57,59,63,66,68,69,72,75
2004	1,6,25	51,56,60,61,64,65,72
2002, 2003	1	41,72
2002, 2004	1	60,61,65,72
2003, 2004	1	51,72
2002, 2003, 2004	1	72

Table 4. Weaned Pay Weight, Preconditioned Weight, and Carcass Weight by Group and Year (pounds)

Variable	2002	2003	2004	Average
Weaned Pay Weight (Mature Group)	489	494	499	494
Weaned Pay Weight (Young Group)	445	431	487	454
Preconditioned In-Weight (Mature Group)	532	544	558	544
Preconditioned In-Weight (Young Group)	495	488	579	514
Carcass Weight (Mature Group)	694	692	699	695
Carcass Weight (Young Group)	660	628	671	653

Table 5. Weaning Pay Weights per Exposed Cow by Group and Year

Variable	2002	2003	2004	Average
Total Herd	391	364	411	389
Mature Group	468	455	451	458
Young Group	332	289	383	335

Table 6. Total Cost of Open Cows by Group and Year ($)

Year	Total Herd	Mature Group	Young Group	Difference
2002	5,940	1,423	4,518	3,095
2003	7,772	905	6,867	5,963
2004	4,969	1,388	3,582	2,194
Total	18,681	3,716	14,967	11,250
Average	6,227	1,239	4,989	3,750

Table 7. Prices for Weaned, Preconditioned, and Slaughtered Carcass Calves by Group and Year ($/pound)

Variable	2002	2003	2004	Average
Weaning (Mature Group)	.8513	1.061	1.174	1.029
Weaning (Young Group)	.8950	1.138	1.191	1.075
Preconditioning (Mature Group)	.8588	1.045	1.101	1.002
Preconditioning (Young Group)	.8838	1.108	1.096	1.029
Carcass (Mature Group)	1.270	1.380	1.380	1.340
Carcass (Young Group)	1.270	1.360	1.380	1.340

Table 8. Net Return for Weaned, Preconditioned, and Feed Yard Calves by Group and Year ($)

Variable	2002	2003	2004	Average
Weaning Value (Mature Group)	-39	46	139	49
Weaning Value (Young Group)	-101	-30	85	-15
Preconditioning Value (Mature Group)	-56	31	121	32
Preconditioning Value (Young Group)	-120	-38	74	-28
Carcass Value (Mature Group)	41	93	116	83
Carcass Value (Young Group)	-41	-17	76	6