AgriProfit$

Research Bulletin

Insights into Managing Winter Feed Costs in Alberta Cow/Calf Operations

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Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT

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Foreword / Acknowledgements

I would like to gratefully acknowledge the contributions of many folks who had a direct or indirect hand in bringing this project report to fruition. Alberta Agriculture staff providing valuable input and insight include Jake Kotowich, Jeff Millang, Lorne Erickson, Brian Perillat, Brian Radke and Freeman Iwasiuk. Dr. Erasmus Okine from the University of Alberta and Duane McCartney with Agriculture and Agrifood Canada in Lacombe also merit special mention. Last but not least, the cooperation of ***AgriProfit$*** program participants from across Alberta have made this project possible through contributions of their time, information and experience. Their dedication to the program and desire to proactively manage their businesses has given meaning to this undertaking.

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Managing Winter Feed Costs

Introduction

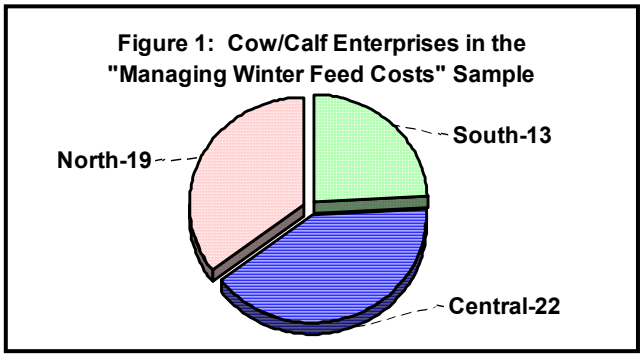
The largest single cost of maintaining a cow herd relates to feeds consumed, either in the form of winter feeds or summer grazing. These costs vary from region-to-region, depending on climate and resources available. They also vary from year-to-year, as related to unit costs of feed stuffs and grazing.

What and how cows are fed also has a significant effect on other cow/calf enterprise costs. Operating costs, labour required and assets utilized are directly related to the feeding system employed. In the long run, the integrated feeding and grazing system choices by producers can have a significant effect on the profitability of the cow/calf enterprise.

For producers to make knowledgeable decisions regarding what and how to feed their cow herds, information on unit costing, as linked to management practices, is key … both for their own operations and with respect to benchmarks or comparables. To this end, the ***AgriProfit$*** Business Analysis and Research team set out to examine these elements with ***AgriProfit$*** cooperators for the 2000 production year. Standard cost and returns analysis was supplemented by a set of questions on feeding system and management practices. This report presents the results of this focused research work, creating valuable management information for Alberta producers to address the choices they have at hand regarding managing the winter feeding aspects for their cow herds.

Study Group Overview

From the total pool of producers in the ***AgriProfit$*** program for the 2000 production year, 54 provided supplementary "Managing Winter Feed Costs" information to go along with their basic cow/calf enterprise cost and returns analyses. The regional[1] distribution of participating farms (Figure 1) was Southern Alberta – 13; Central Alberta – 22; and Northern Alberta 22. 82% (44) of the producers provided full farm level (production and financial) information in addition to the basic cow/calf enterprise cost and returns. This farm level perspective gave individual cooperators additional information upon which they could:



- assess the efficiency of their herds within their business, and
- options to evaluate possible changes to their feed choices and/or feeding systems in the context of the both economic and financial performance.

The importance of feed and grazing cost, as related to "dry matter (DM) utilization", is readily apparent from Chart 2. During the 2000 production year, across Alberta the share of feed, bedding and pasture costs of total production costs averaged 60%, ranging from a low of 43% to a high of 77%. The winter feed component alone averaged 32%, with a low of 15% and a high of 54%.

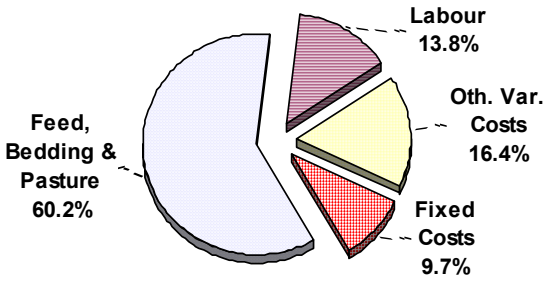
[1] For the purposes of this report, the Southern region includes the Mixed Grassland, Fescue Grassland and Moist Mixed Grassland grass type areas. Central encompasses the Aspen Parkland and the North is a combination of the Boreal Transition and Peace Lowland grass types.

As expected, there was some regional variation in these cost shares, as related to:

- feeding season length, and/or
- regional unit feed cost effects.

In the south, feed costs averaged 25% of total costs compared to 33% in Central Alberta and 36% in the North. The DM utilization cost shares (summing feed, bedding and pasture) also exhibited some regional variability with the South averaging 60% of total costs, Central averaging 58% and the North at 62% of total costs.

Figure 2: Shares of Cow/Calf Enterprise Costs - Alberta - 2000



Cow/Calf Enterprise Size & Performance

Before turning the focus to the influences of feed choices and feeding systems, a review of the general productive and economic performance of the cow/calf enterprises in the project pool during 2000 provides a starting point for comparative analysis. Table 1 provides a cross-section of descriptive statistics regarding size of operation, productivity and economic performance. A more detailed review of performance characteristics is provided, on both a per cow and a per lb. weaned basis, in Appendix A. For each characteristic, the mean[2], coefficient of variation (C.V.)[3] and lower and upper quartiles[4] are provided. This gives insight into both the general level of performance and the variability in each.

Provincially, the herd size for the study pool averaged 162 cows, ranging from an average of 132 cows in the south to 196 cows in the northern grass type regions. These herds weaned an overall average of 564 lbs. of calf per cow wintered, with the higher gross productivity occurring in the north – although this difference is muted somewhat when weaning performance is measured relative to mature cow weights observed in the different regions.

Table 1: Selected Production & Economic Descriptive Statistics - Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta
	Herd Size (Cows Wintered)			
Mean	131.6	149.5	196.1	161.6
C.V.	45.7	54.3	40.7	49.1
Lower Quartile	104	85	120	101
Upper Quartile	144	187	242	211
	Lbs Weaned / Cow Wintered			
Mean	541.4	558.5	584.7	563.6
C.V.	23.9	16.3	20.8	19.8
Lower Quartile	461.7	475.3	512.2	474.9
Upper Quartile	561.1	626.7	653.3	633.9
	$ per Cow Wintered			
	Feed Costs			
Mean	174	230	222	214
C.V.	29.5	26.5	34.0	31.5
Lower Quartile	120	195	170	165
Upper Quartile	212	263	295	263
	Total Cash Costs			
Mean	562	555	506	539
C.V.	23.7	24.8	22.3	23.8
Lower Quartile	502	453	400	451
Upper Quartile	579	616	583	593
	Total Production Costs			
Mean	685	693	617	664
C.V.	23.2	22.8	23.3	23.3
Lower Quartile	600	617	503	570
Upper Quartile	722	748	712	730
	Returns to Equity			
Mean	209	179	269	218
C.V.	94.2	119.6	63.3	89.9
Lower Quartile	61	42	164	80
Upper Quartile	392	308	396	369

[2] All averages quoted are "simple or arithmetic means", ie. they are not weighted by herd size or production as is the standard practice in ***AgriProfit$*** benchmarks. As such, there will be minor variations when comparing the results of this analysis to benchmarks generated through the ***AgriProfit$*** analysis.

[3]The coefficient of variation is an indication of the relative variability of a characteristic. It is defined as "the percent of the standard deviation of the mean". The higher the C.V., the greater the characteristic's variability.

[4] The lower (upper) quartile defines the point at which 25% of the observations are below (above). Combined with a C.V., quartiles give the reader an indication of the range and variation of a characteristic around an "average" value.

Feed costs, the primary focus of this analysis averaged $214/cow provincially, with 25% of producers experiencing feed costs of $165/cow or less (lower quartile) and 25% at $263/cow or greater (upper quartile). Regionally, southern producers' feed costs average the lowest $174/cow, followed by the North at $222/cow and then Central Alberta at $230/cow for the 2000 production year. It's important, however, to note the variability in feed costs both within and between the geographic regions, as expressed by the coefficients of variation (C.V.'s) and quartile ratings. Although there are tendencies in feeding relative to the production environment, the statistics are indicative of a wide variation in "producer choices and management practices" … and likely within year effects.

Feeding Season Length & Regional Feed/Forage Price Effects

Cow herd feeding days statistics are laid out in Table 2. During the 2000 production year, Southern operators fed, on average, 44 days less than their Central and Northern counterparts. Although this may appear to be a distinct advantage, a look at the unit feed and forage prices in Table 3 shows that the shorter feeding season was, at least in part, offset by generally higher forage and grazing prices that year. A lack of rainfall in the south of the province put producers in a shortfall position relative to other years. As bulky forages tend to be less "economically" transportable than feed grains, upward pressure on forage values was observed. Southern unit feed values were in the range of 25% higher than those in the Central and Northern part of the Province, valued at the cow herd's feeding site.

Table 2: Cow Herd Feeding Season (days)
Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta
Mean	146	190	190	179
C.V.	28.4	15.4	12.7	20.0
Lower Quartile	132	164	175	161
Upper Quartile	177	212	206	205

Table 3: Forage & Feed Values
Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta
	Feed Stuffs ($/tonne - As Fed)			
Hay	80.96	65.20	60.92	67.58
Silage	n.a.	30.54	31.27	30.91
Greenfeed	62.19	49.65	51.42	54.53
Straw (feed)	52.33	30.06	32.67	35.38
Grains	94.25	105.50	93.85	99.72
	Summer Grazing ($/AUM)			
Grazed Forages	21.66	17.52	16.19	18.05

Tables 4 and 5 add some clarity to the events across the Province during the study year. Table 4 presents the feed costs and Table 5 provides lbs. of feed dry matter utilized, all standardized to a per Animal Unit Day of feeding the cow herd (1 AUD = 1,000 lbs. of mature cow weight per day). These estimates at least partially factor out the differences in mature cow weight observed from Southern Alberta through to the North. In addition, they also partially adjust for differences in feeding season length, with the lower feeding days being observed in the South.

Table 4: Feed Cost ($) / 1,000 Lbs. MCW / Day
Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta
Mean	0.95	0.91	0.87	0.91
C.V.	37.2	27.4	33.5	31.8
Lower Quartile	0.75	0.76	0.65	0.71
Upper Quartile	1.02	0.98	1.07	1.04

Table 5: Lbs. Feed D.M. / 1,000 Lbs. MCW / Day
Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta
Mean	21.7	24.5	24.6	23.9
C.V.	31.7	28.7	36.4	32.2
Lower Quartile	18.8	20.1	18.5	18.8
Upper Quartile	25.2	29.9	31.1	29.1

Weather events, regionally centered, affected each of these factors in 2000. These are good examples of the short term variability in "feed dry matter" availability and cost that producers experience. This provides insight to producers when assessing, strategically, what and how their herds can be fed in a longer term context. The cash and non-cash pressures accompanying this variability in part form the basis for the selection of the most appropriate feeding system … the combination of feeds and assets required to deliver feed dry matter to their herds in the most economical fashion over time.

Winter Feeding Management Practices

As noted previously, both *what and how* the cow herd is fed can have a significant impact on the cost of providing "dry matter" to cow herds. This can be affected by short term variations in feed values and other input costs (annual or seasonal). It also has implications regarding those "enduring" costs, ie. the operating and overhead elements associated with the feeding system and management practices.

The next 5 sections review the responses of ***AgriProfit$*** cooperators when posed questions about their approach to various aspects of herd management, feeding systems and business management. These will be linked, later, to interpretations of the economic performance of the operations.

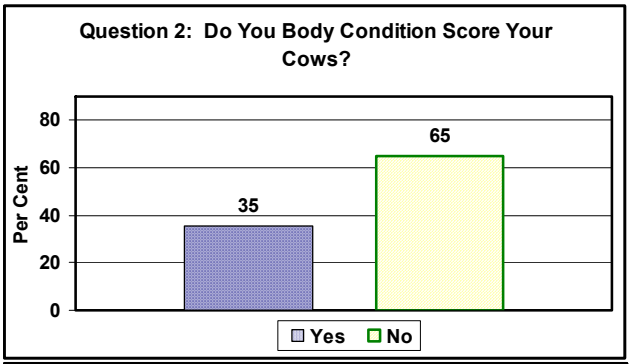
A. General Management

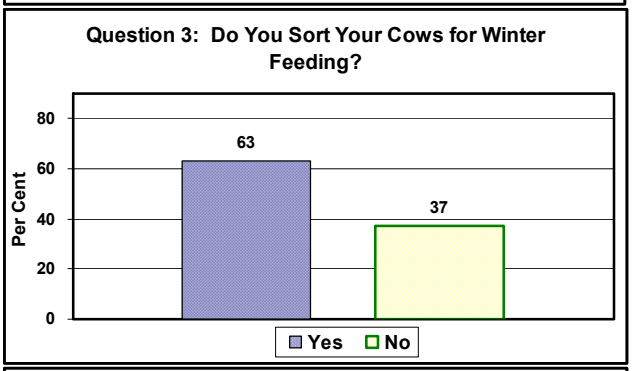
The first series of questions dealt with general management issues. The intention of these information items, for those producers that use them, is to ensure that they meet the nutritional requirements of the cow herd over the course of the winter feeding period.

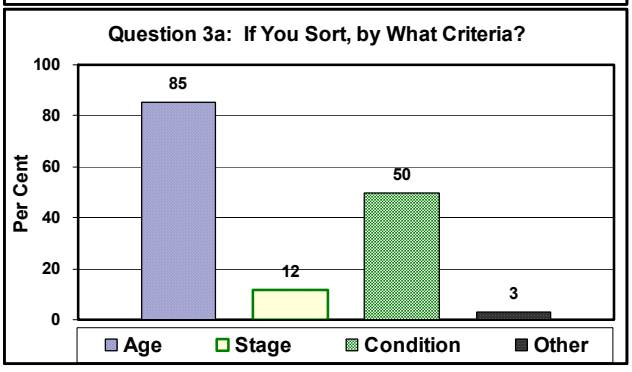
Question 2 focused on condition scoring, supposedly as additional management information to monitor the well being of the herd. 35% of cooperators conditioned scored their herd. Inherently, the question was interpreted as to whether or not the producers employed a more formal condition scoring system. It appears, in responses to subsequent questions, that a greater proportion of producers follow less formal systems/practices in managing their herds.

Sorting of the herd for winter feeding is used as an avenue to manage nutritional and production aspects. 63% of the producers indicated they employed this practice (Chart Q.3).

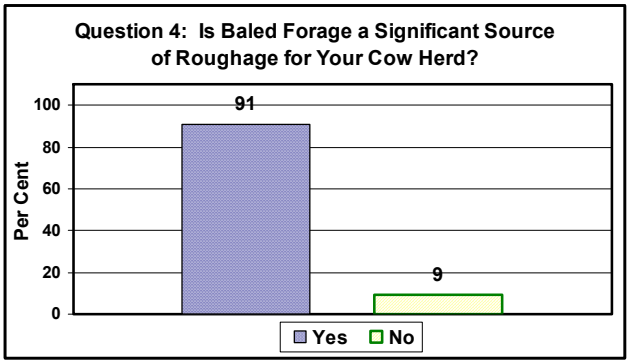
Individuals were questioned as to the major criteria they used for sorting their herds during the winter feeding season (Chart Q.3a). Some sorted and managed by more than one criteria, which is reflected in the responses. 85% indicated they sorted their herds by age (eg. first calvers vs. mature cows). 12% sorted by stage (eg. main herd vs. due to calve vs. calved out). 50% indicated they used cow condition as a sorting criteria, whether it be by condition score or just identifying unduly thin animals for specific nutritional attention. 3% of cooperators indicated they employed other sorting measures.

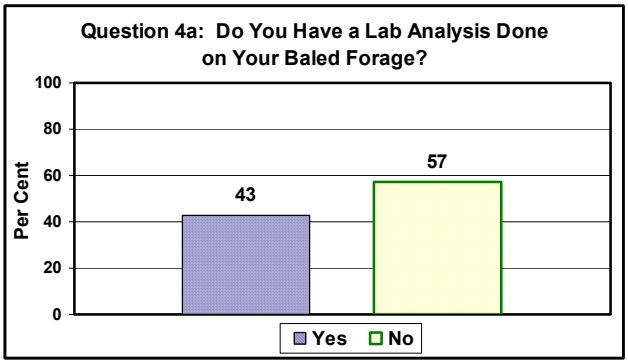


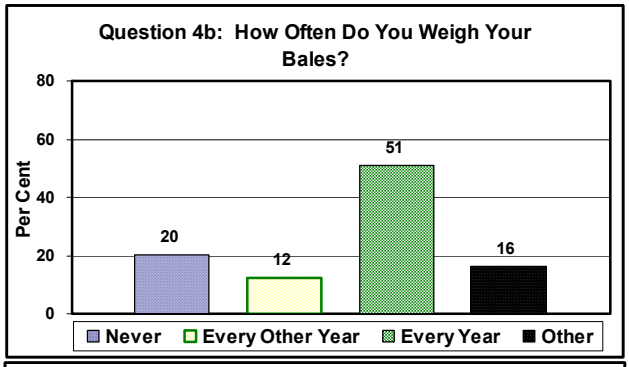




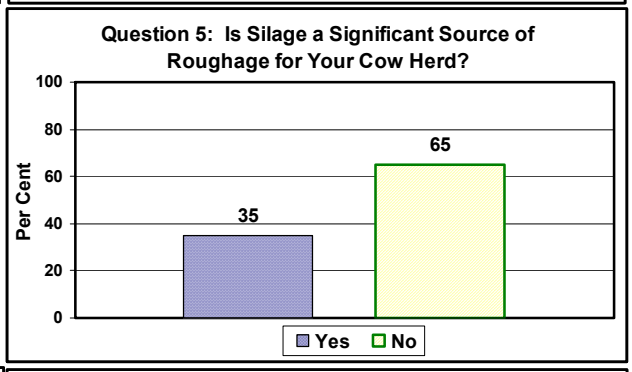
Just over 90% of the respondents indicated that baled forage was a significant roughage source for feeding their herds through the winter (Chart Q.4). 43% of these producers indicated they had a laboratory analysis done on their baled forages (Chart Q.4a). With respect to frequency of weighing bales, 20% never weighed bales, 12% weighed them every other year, 52% did so every year and 16% weighed their bales under other circumstances (Chart Q4b).

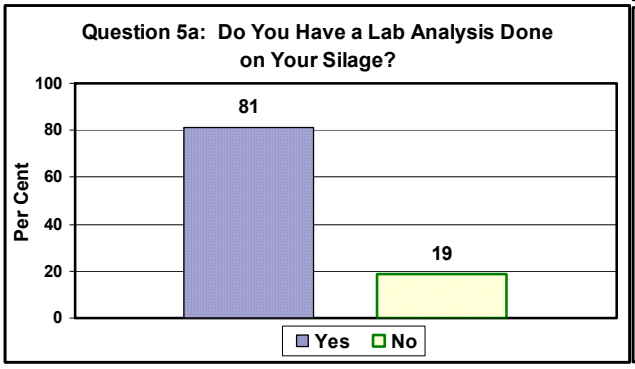


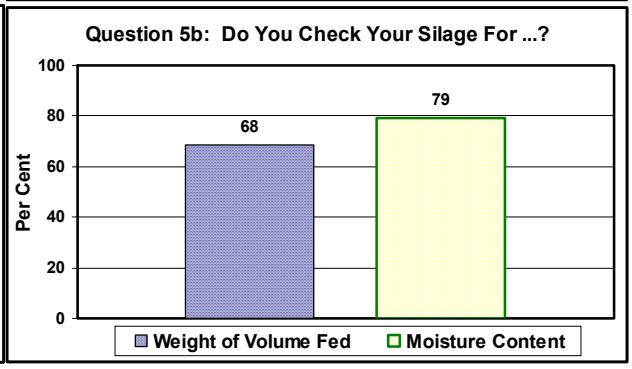




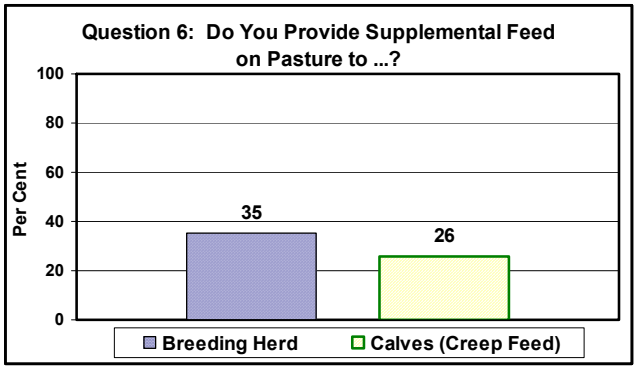
Silage was a significant roughage source for winter feeding cows for 35% of respondents (Chart Q.5). 81% of these producers had a laboratory analysis done on their silage (Chart Q.5a). Chart Q.5b shows that 68% of those feeding silage checked the weight of the volume fed and 79% checked the moisture content of their silage. These are key elements in monitoring feed dry matter delivered to the cow herd.







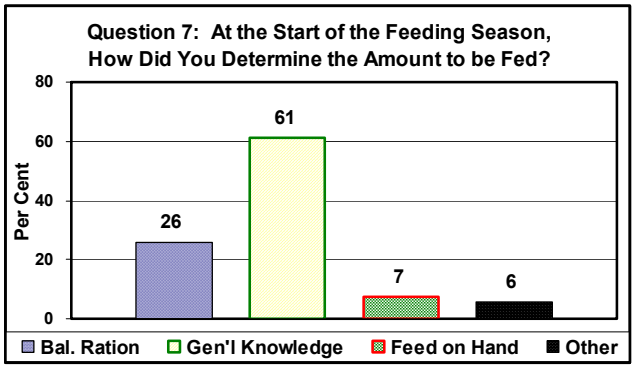
Participants were questioned as to whether or not they provided supplemental feed to their stock on pasture (Chart Q.6). 35% supplemented their cow herds while on pasture and 26% offered creep feed to their calves. These feed amounts are generally included in the feed totals, and as such, may inflate the overall winter feed volume estimates. From a cost control and management point of view, these feed elements are also often overlooked in establishing feed budgets over the course of the year … both as an expense element and as a cost to maintain a given degree of cow condition.

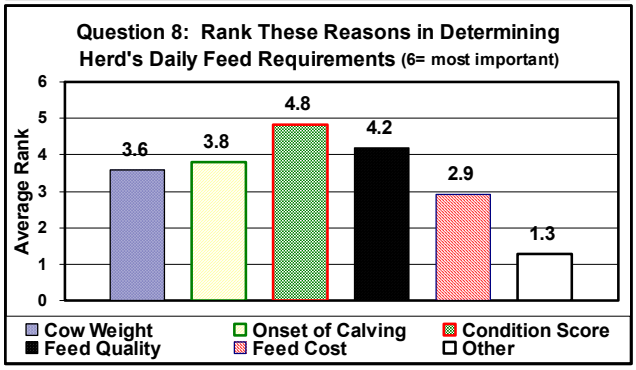


B. Feed Requirements

The next series of questions delved into how managers set out to meet their herd's feed and nutritional requirements. How feed rations and budgets were planned and defined, and the circumstances upon which they would be adjusted were specific areas addressed.

Chart Q.7 summarizes the responses to the question of "As you *entered the feeding season*, how did you determine the amount you expected to feed to your herd over the course of the year?" 26% of producers budgeted amounts to be fed based on ration balancing. The bulk of participants (61%) used general knowledge, or rules of thumb, to estimate the amount of feed they'd use. 7% of participants suggested feed amounts were adjusted relative to opening inventories of feeds on hand. 6% set up their feed budgets based on "other" criteria.

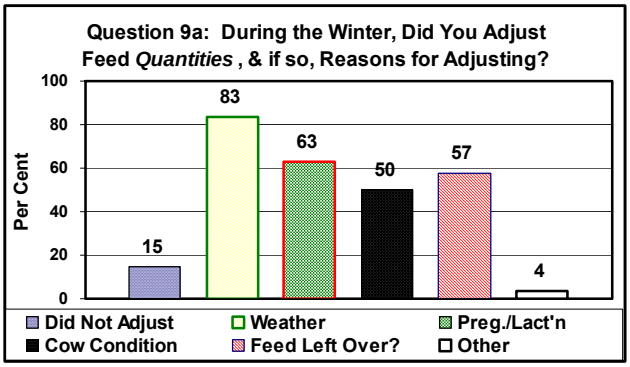


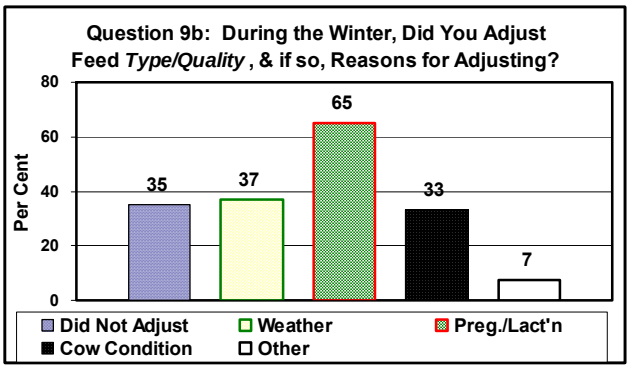


The next question dealt with ranking, by importance, those factors considered when determining daily feed required per cow. 83% of the producers in the study pool responded to this question with the results posted in Chart Q.8. The most important factor in determining daily feed requirements was cow condition score going into the feeding season at an average rank of 4.8 out of 6. Producers recognized and responded in their feeding programs to the condition of cows going into the winter. In second place was quality of feeds on hand at an average rank of 4.2. Participants knew they had to adjust rations with respect to quality shortcomings (or bonuses). The third ranked factor was the expected timing of calving season at an average rank of 3.8 of 6. This recognized the influence of pregnancy and lactation on feed requirements. In the fourth position was weight of cows at 3.6, indicating that participants adjusted feeds provided feedstuffs relative to body weight. Feed costs and "other criteria" ranked in at averages of 2.9 and 1.3, respectively.

Participants were then asked if they adjusted feed quantities over the course of the winter, and if so, to indicate the criteria they considered in making these adjustments (Chart Q.9a). 15% of producers noted they did not substantively adjust feed *quantities* over the winter feeding season. 83% indicated they made

weather-related adjustments. 63% adjusted feed quantities to accommodate stages of pregnancy and lactation. 57% of respondents monitored whether or not the herd cleaned up the feed provided and/or if there was feeds left over as a method to adjust quantities provided. The implication is that if they cleaned up too quickly, they weren't receiving enough as opposed to feeds not readily consumed as an indication that excess was being offered. Half of the cooperators indicated they made in-season adjustments to feed quantities with respect to observed changes in condition score.



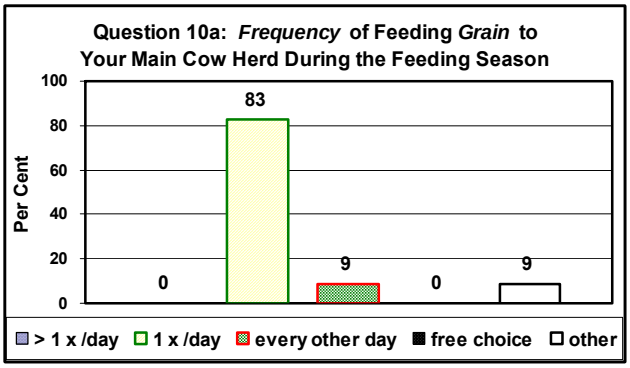


Similar questioning was posed regarding adjusting *feed type and/or quality* during the feeding season. 35% noted they did not change substantively within the feeding season. Of those that did, the primary criteria used to adjust quality was stage of pregnancy / lactation, identified as important by 65% of producers. 37% adjusted feed type / quality to compensate for changes in weather. 33% modified type/quality offered relative to changes in cow condition.

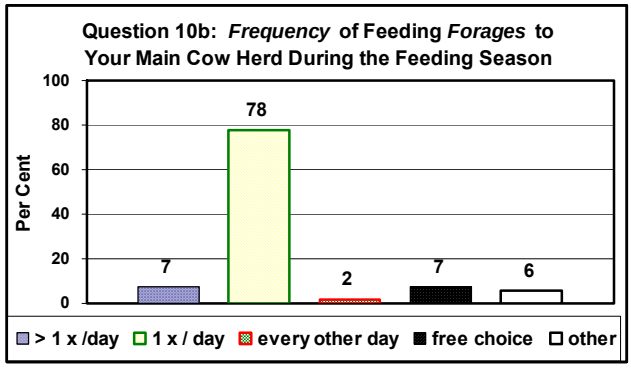
C. Feeding Practices / Systems

The next segment of supplemental questions focused on feeding systems characteristics. Cooperators were reminded that the questions pertained to the winter "in-yard" segment of the feeding program for the cow herd, not to include supplemental feeding on pasture or extended grazing circumstances.

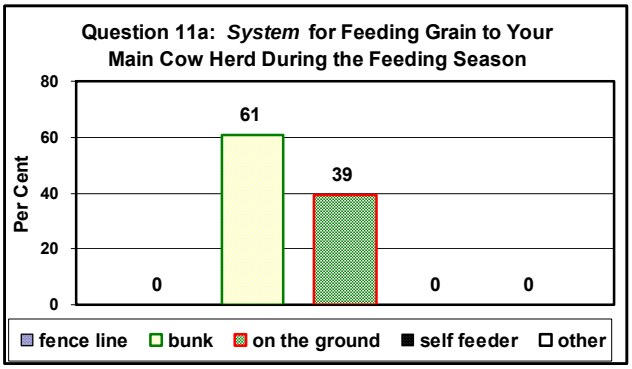
With respect to provision of grains to their cow herds, 43% or respondents made feed grains a measurable proportion of the winter ration. Of those that did provide feed grains, 83% fed this element on a one-time per day basis. 9% provided grains regularly every other day. None fed on a free choice basis and 9% offered feed grains in the ration on an "other" frequency (Chart Q.10a).



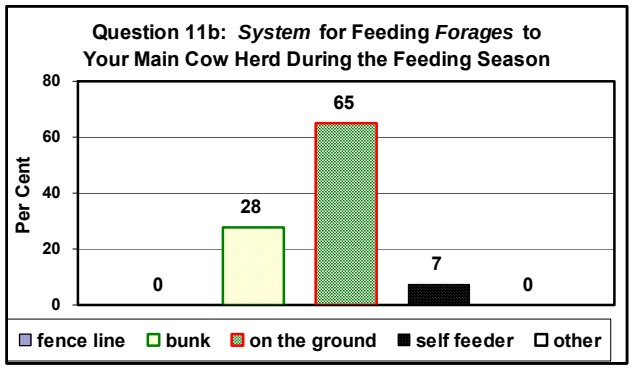
The forage feeding frequencies (Chart Q.10b) followed similar patterns with some slight variations. 7% of cooperators provided forages on average at greater than a one-time per day frequency. This was coupled with 7% offering forages on a free choice basis. 78% of the producers were on a once per day feeding scheme and 2% followed an every other day system. 6% of the farm managers followed different feeding patterns or combinations, of varying frequency, that couldn't be classified in the other 4 groups.



Question 11 turned the focus from frequency of feeding to the assets used to feed. Each of these system options have operational and fixed cost implications for both facilities and machinery elements. Of those cooperators feeding grains, 61% provided them in a feed bunk (Chart Q.11a). The remaining share, 39%, made the grains available on the ground. Both of these options could have been done as a part of mixed rations in either location.



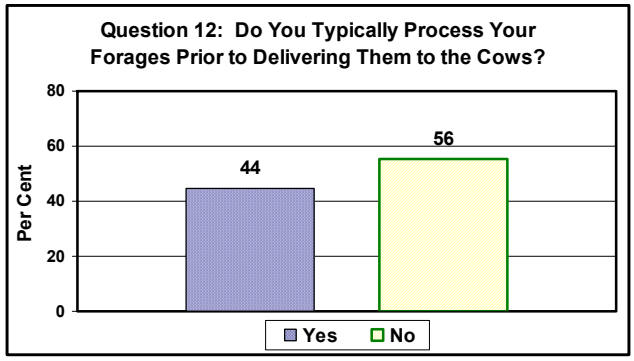
The results of Question 11.b, describing the system/assets utilized for feeding forages, reflect the predominance of "forage-only" rations (Chart Q.11b). 28% of cooperators provided forages in bunks. The majority, 65%, offered forages in "on the ground" systems. 7% of participants used self-feeders.



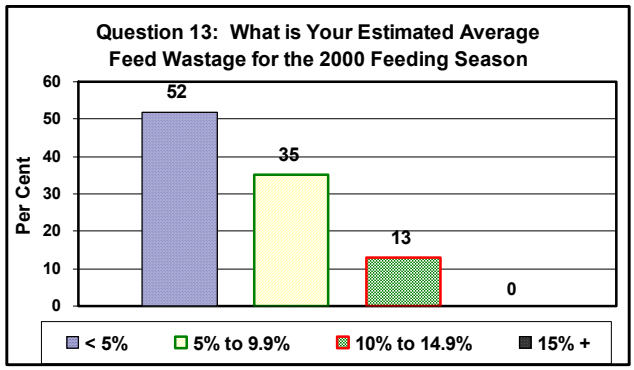
The next two questions delve into a couple of key questions on the minds of cow/calf producers in terms of the combinations of feeding systems used, level of processing rations and feed wastage experience. The inherent goal of producers in providing feed stuffs to their herds is to provide:

- adequate, nutritionally-balanced rations,
- in a cost-effective manner,
- with minimal (acceptable) wastage,
- offering short term flexibility in feed elements used, that
- maintains long term productivity.

In reality, there are a number of trade-offs that occur among these elements. These pose a significant management challenge to producers in investing in a system that best meets these goals.

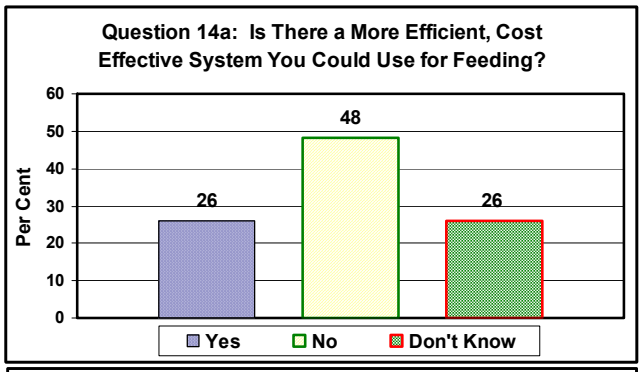


Question 12 related to whether or not producers processed their forages prior to delivering them to the cow herd. This relates to either a mixing of combined forages or particle size change to affect utilization. 44% of producers in the sample responded to the affirmative (Chart Q.12). Responses bridged across both wet (silage) and dry (hay/greenfeed) systems.

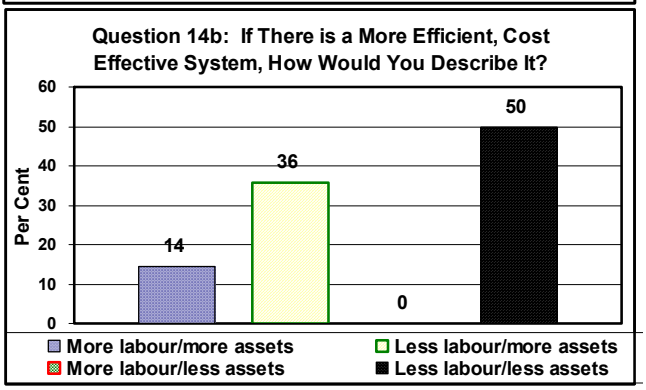


Question 13 addresses the issue of perceived feed wastage among cooperators. 52% of respondents estimated their feed losses, as a per cent of total as-fed volume delivered, at less than or equal to 5%. 35% indicated losses in the range of 5% to 10%. 13% estimated losses in the order of 10 – 15%. None of the cooperators felt their losses exceeded 15% of total as-fed feed volume delivered.

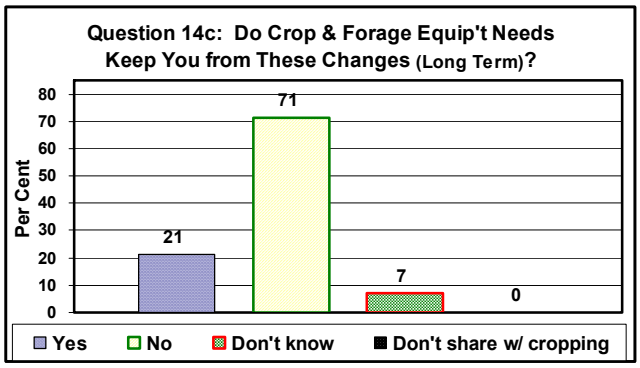
Is there a better feeding system than the one currently in use? Producers were questioned about this in context with the feed availability, resource-base and financial constraints that faced them (Chart Q.14a). 26% felt that, yes, there was likely a more efficient, cost effective system they could use. 48% felt that they system they were currently using was the most appropriate according to these two conditions. A further 26% did not know if there was a better system they could employ.



Of those producers that perceived they had a better feeding system option, half described it as taking less labour and less assets both (Chart Q.14b). A little over a third thought it would involve less labour and more assets to operate. The balance expected the system would require more labour and more assets both. None identified a feeding system alternative, for their business, that would take more labour and less assets.



The final link in defining the "ideal" feeding system relates to the notion that the cow herd shares assets with other farm enterprises … creating a perceived inflexibility to change. Of those respondents identifying an opportunity to change, 21% indicated that because equipment was shared with a cropping and/or forage enterprise, it would keep them from moving to a more efficient, effective system for their cow/calf enterprise (Chart Q.14c). Over 70% noted that crop and forage equipment needs would not affect changes they would make to their feeding system infrastructure and 7% weren't sure. Probably one of the more significant responses was that all producers in this category did share, to some extent, the machinery/equipment assets among their farm enterprises.



D. Value & Cost of Feeds

The fourth leg of supplementary questioning focused on the role of home-grown feeds in meeting, in whole or in part, the cow herd's requirements. This is also linked to producers' perceptions of value of feeds vs. cost of feeds and is the basis for a fundamental business management dilemma in owning and managing a cow herd. This dilemma is flanked in a few key questions:

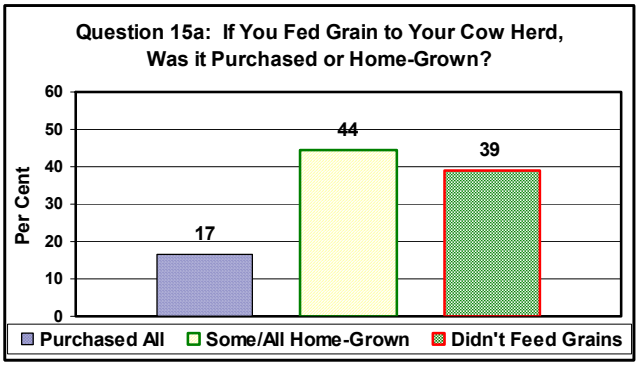
- *if my cow herd can't pay market value for feeds and still turn a profit, should I still "run cows"?,*
- *if my land can produce forages and grains (valued at the market) for a profit, why would I feed them to my cows at less than market value?,*
- *if my cow herd can cover feed costs at market but my land cannot produce forages and grains at a profit, why would I burden my cow herd with these feeds at the higher cost of production vs. prevailing market value?, and*
- *in the long run, under what circumstances should I entertain my herd paying more than, or less than market value for my home-grown feeds … and why?*

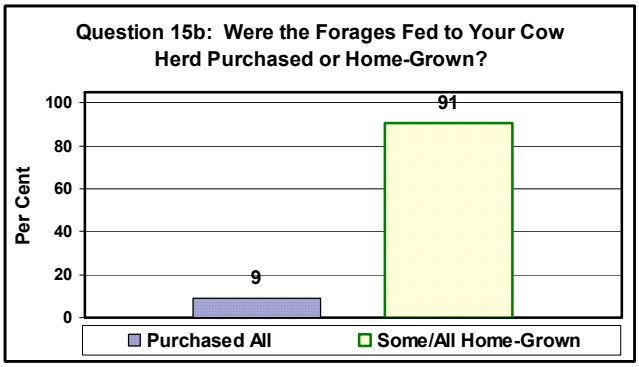
The next few questions are designed to provide some insight into producers perceptions and experience on this issue.

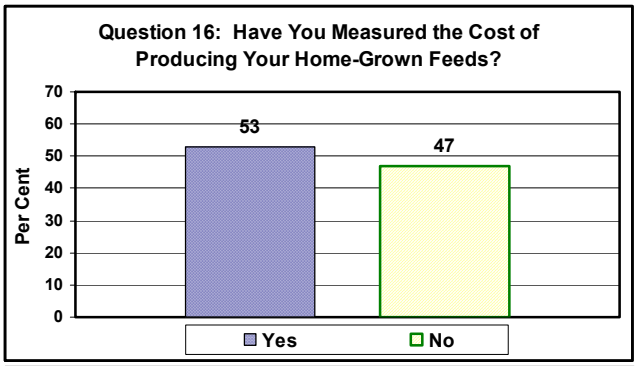
Question 15 defines the "baseline" in the study pool regarding use of home-grown feeds. 17% of cooperators purchased all the grains necessary to meet their cow herds' requirements (Chart Q.15a). 44% of the operators sourced a combination of market and home-grown sources for feed grains. The balance, 39%, did not feed grains to their herds. Turning to forages for the cow herd, 9% of producers purchased all from external sources (Chart Q.15b). Over 90% of producers obtain some or all of their forages from home-grown sources.

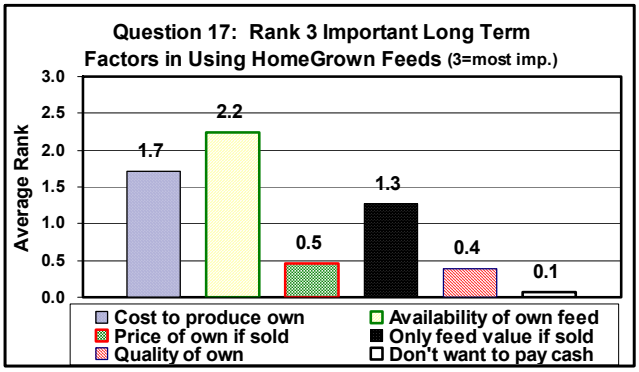
Referring back to the key questions flanking the business management dilemma, a fundamental issue surrounds the notion of whether or not home-grown feeds can be raised "profitably", ie. can producers raise these feeds in a competitive manner. Participants in this leg of the ***AgriProfit$*** program were receiving a business analysis and unit costing on their cow herds. However, this did not necessarily mean they were doing the same for their own forages, placing this costing in context with the use on their farms. Chart Q.16 shows that over the past few years, 53% of participants had measured the costs of farm raised feeds they used for the cow herd.

Intuitively, the decision to raise and use one's own feeds for complementary livestock enterprises is one that needs to be assessed from a longer term, investment-like perspective. Yields, prices and input costs vary from year-to-year like any other agricultural production venture. Producers are longer term in their cost-coverage and/or profit objectives and motives for raising their own feeds. Cooperators were asked to identify and rank the 3 most important long term (2+ years) factors driving their decision to use home-grown feeds for their herds (Chart Q.17).









The most important factor they identified was "availability of own feed", which scored an average rank of 2.2 (with 3 = most important). The reasoning combines a couple of basic thoughts. Firstly, producers felt that home-grown sources provided some certainty of supply. Secondly, producers had land and equipment dedicated to crop and forage production, plus there were cultural and rotational issues linked to land use that motivated them to raise, and have available, feeds for home use. There are certainly other possible interpretations to this response but they were not probed through the questionnaire process.

The second ranked factor (average = 1.7) was "cost to produce own feed". Cooperators recognized the long term importance of being cost effective in producing feeds considering the elements of profitability, flexibility and risk management. However, this question did not address fully the "level" of cost coverage that motivated producers to give it such a high ranking.

"Only feed value if sold" was the third ranked factor, with an average rating of 1.3. This factor implies a chain of events. Firstly, producers regularly have crop and forage production that does not meet the quality targets they may have budgeted for, and as such would receive a price discount in the market place. Secondly, these same producers then have a regular supply of feeds that they put through their cow herds in an attempt to re-coup some of this lost value … adding value to the crop through an alternate use.

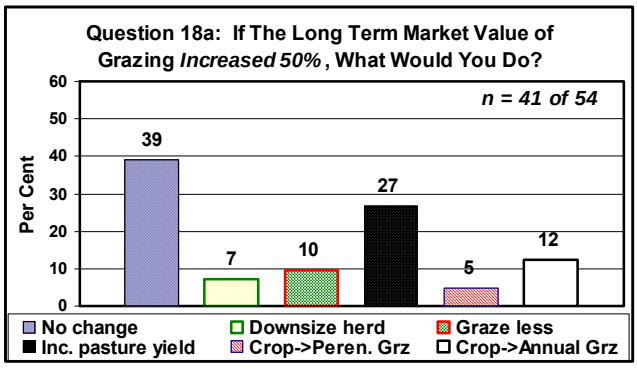
The remaining three factors "price of own if sold", "quality of own" and "don't want to pay cash", ranked well below the others, averaging 0.5, 0.4 and 0.1, respectively.

E. Land Use & Feeding Alternatives

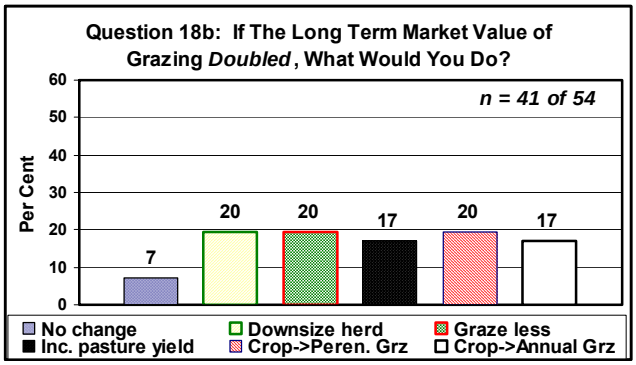
The final area of supplementary questioning related to producers perceptions of how they would adjust their operating approach and business structure in response to long term changes in the value of the grazing. Change options open to respondents covered the gamut of the cow/calf, crop/forage and grazing enterprises. Responses can be interpreted as producers' estimation of where their farms' short and long term competitive strengths and weaknesses lie.

Producers were asked, "If the *long term market value of grazing* were to increase, how would you change the way in which you manage your cow herd?" They were presented with three rate increase scenarios and given a list of herd, grazing and crop land use alternatives from which they were to select one. The land use options relate to how the cow/calf enterprise utilizes these resources in an integrated fashion on farms.

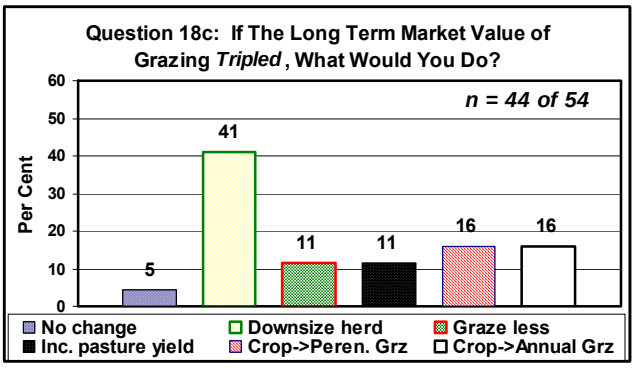
Facing a 50% increase in the market value of grazing (Chart Q.18a), 39% of producers indicated they would not change. 27% would take steps to increase the productivity of their pastures (more grass off of less acres). Conversion of crop land to annuals for grazing would be pursued by 12% of cooperators, while a conversion to perennial forages for grazing would be considered by 5%. 10% of participants would graze less (increase days on feed) and 7% would take steps to reduce the size of the cow herd over the long term.



When the grazing market value scenario bumped up to double of current, the proportion of producers in the "no change" category dropped dramatically to 7% (Chart Q.18b). 20% would respond by downsizing their herds and an equal proportion would respond by reducing their use of grazing. The share of producers relying on increasing the productivity of existing grazing land fell from 27% to 17%. The proportion of producers expecting to shift crop land to either perennial or annual grazing options also jumped, from 5% to 20% in the former and 12% to 17% in the latter case.



In the final scenario, with grazing values tripling, the shifts in practices became even more pronounced (Chart Q.18c). Only 5% of cooperators expected to carry on unchanged while 41% stated they would downsize their herds. Reduce grazing and increase pasture yields were options selected by 11% of respondents (each). Similarly, 16% of producers expected to shift to perennial or annual grazing (each). A proportion of producers who felt they could manage through grazing at double the value started to shift into herd reduction.



Focused Statistical Analysis

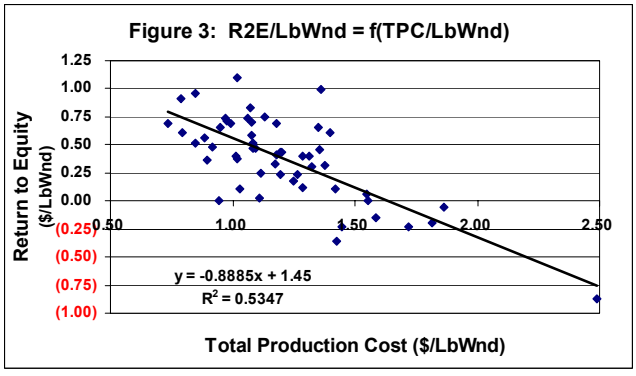
The previous section offered insight into the production and business management "thinking" of producers. Their management practices, with the focus on what they, as individuals, do to improve productivity and manage unit production costs, were reviewed. The ultimate long term goal of these and other related activities is to improve long term profits. Furthermore, the goal of doing this on a per lb. of calf weaned basis is inherent, although in many instances not explicitly stated. The next step in the analysis process is to overlay some of these "practice descriptors" with economic performance.

Cow/calf enterprises, and farms containing these enterprises, are complex businesses. There are many different layers of production relationships taking place over a range of resource-use choices. Although it is possible to define a relationship between an overarching cost total (total cost of production) and enterprise profit (return to equity), a direct connection between individual cost or productivity elements and profit, at the surface, is not as clear. Statistical procedures[5] are applied to the combined 2000 production year economic data and supplementary information to clarify this point.

A. Relationship Analysis

The first leg of the analysis uses simple regression to define a statistical relationship between key variables or observations. Validity of the relationships hinge on statements of confidence (is it statistically significant?), and strength (how well does the input variable explain the result?).

In Figure 3, cooperators' enterprise profits (Return to Equity or "R2E") are charted against their total production costs (TPC), all on a per lb. of calf weaned basis. The regression equation on the chart relates that profits go up by $0.89 for each dollar reduction in total production cost. The relationship is reliable, ie. significant at the 95% confidence level. The R^2, as a measure of the strength of the relationship, is 53%[6]. TPC as a predictor of profit is essentially 53% effective. Frankly, one would expect that cost would be strongly related to profit. However, upon reflection, this result is sending a message.

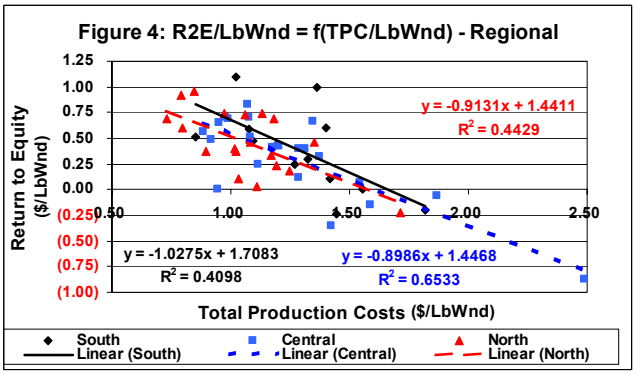


[5] Appendix B provides a basic description of the statistical analyses used and their interpretation.

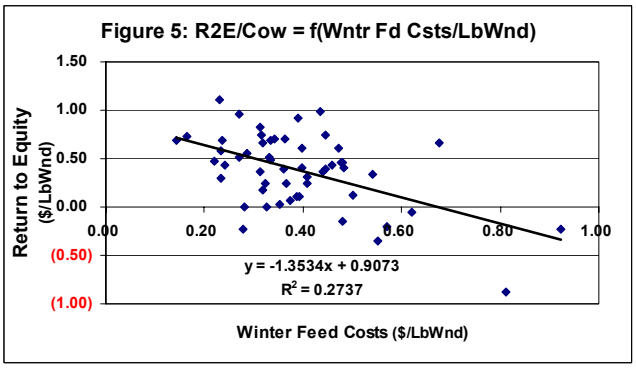
[6] Technically, this means that approximately 53% of the variation in cow/calf R2E/ lb. weaned can be explained by the variation in TPC.

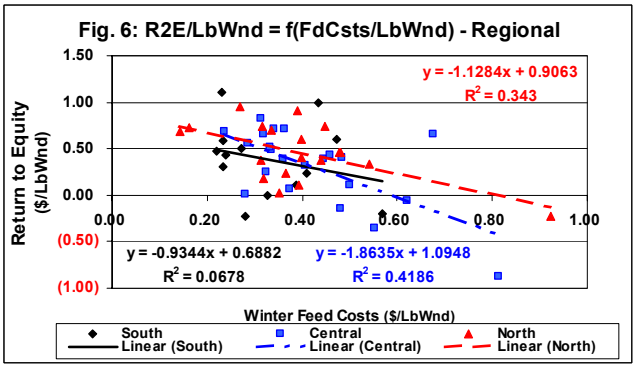
A number of factors can deliver low R^2, particularly when the relationship itself is statistically significant. Firstly, there may simply be another single factor that would be a better predictor. Secondly, other variables or factors may need to be added to increase the predictability. Alternately, there may be insufficient observations to statistically "fine tune" the result. A look at how, the relationships play out at the regional level gives some clues.

Participants' R2E results are charted against their TPC in Figure 4, but this time they're segmented out by geographic region. All three of the regional relationships are significant (95% confidence level). Each have different slopes (rate of change in profit per dollar change in TPC) and each have different R^2 , or predictive strength. When the producers are split out regionally, the total production cost-to-profitability relationships differ. There is something in what the producers do differently, and/or the resources they have at hand that changes this profit relationship.



With this as a clue, a direct examination of winter feed costs was performed with the results shown in Figures 5 and 6. At the provincial level, although reliable (95% confidence), the predictive power of winter feed costs relationship with profit was poor, with an R^2 of only 23%. Moving on to a regional view, the segmentation of the data was even more revealing. In the south, the relationship between winter feed costs and herd profitability was non-existent. This result is intuitive given the lower degree of reliance on feeding vs. grazing as a source of feed dry matter for the herd. Moving to Central Alberta, the winter feed cost element became significant and prominent, with a predictability rating of 42%. In the northern regions, the predictability slipped somewhat to 34%, although the relationship remained reliable at the 95% level.





So what conclusions can be drawn? Although technical scientists tend to look for the more direct answer – statistical proof – from a production economics point of view, it's also critical to look at the converse. What is the analysis saying is NOT happening. Because cow/calf businesses are so dynamic in terms of the resources at hand, the interactions between the levels of productivity and economic factors, and the influence of management, a short list of "drivers" of profitability should not be expected.

From the first round of statistical analysis, the following conclusions can be drawn:

- *winter feed costs are significant components of overall total production costs,*
- *managing feed costs and total costs are critical to profitability of cow herds,*
- *how cow herds are maintained (facilities and systems) must be very important determinants of productivity and unit costing, and*
- *there is likely not one single factor that drives cost control and profitability.*

Given these results, and thoughts, the next section examines the performance of "low cost" producers.

B. Performance Comparisons

The second leg of the statistical analysis involved looking at the productive and economic performance of groupings of producers within the ***AgriProfit$*** data pool, with the objective of determining significant differences in performance means. The intent is to reveal operational, structural, productive and business management areas that producers can focus on in making adjustments to their businesses.

It is important to keep in mind when reviewing comparisons of means that they *do not necessarily imply a "causal relationship"*, ie. for instance, because the mean winter feed cost is higher for one group over another, doesn't necessarily drive a difference observed in some other cost total between the groups. Some caution is advised in "jumping to conclusions" with the results.

The regression analysis in the previous section gave grounds for an examination of cost groups within the data pool. Table 6 presents the results of the comparison of groups defined by total production costs. Producers were ordered by total production costs per lb. weaned and split into equal low cost, medium cost and high cost groups[7]. t-tests for differences in means were performed at the 90% confidence level.

The following points touch on a few highlights on the production and feed value elements:

- low cost herds tended to be larger than the medium group, but not significantly different from the high cost herds
- productive performance regarding average wean weight, lbs. weaned per cow, and wean weight as a percent of mature cow weight was not different between the low cost and mid-cost groups. There were significant differences, however, in the low-high, and medium-high comparisons.

Table 6: Statistical Comparison of Selected Means - By TPC 1/3rds

Alberta Cow/Calf Enterprises - 2000

Production Indicators	LowCost	MidCost	HighCost	L v. M	M v. H	L v. H
Cows Wintered	194.5	143.5	146.7	a		
Growth	603.6	618.2	517.5		b	c
Open Cows	5.5	8.1	7.4			
Length of Calving Season	98.2	92.0	114.3			
Death Loss of Calves	2.3	2.2	1.9			
Calf Crop %	91.7	89.1	90.0			
Calved 1st 2 Cycles	78.6	79.7	80.5			
Lbs Weaned/Cow Wintered	595.2	606.0	489.6		b	c
Wean Wt as % MCW	47.5	45.9	40.2		b	c
Wt Per Day Age	2.84	2.85	2.70			
Mature Cow Wt (MCW - lbs)	1,322.2	1,398.6	1,336.1	a	b	
Herd D.O.F.	189.6	172.3	175.6			
Lbs Feed DM/AUD	22.3	23.6	25.7			
Labour Hrs/Cow	7.7	9.5	10.8			c
Feed Values / Cost	**LowCost**	**MidCost**	**HighCost**	**L v. M**	**M v. H**	**L v. H**
Price - Hay - $/tonne	61.37	70.91	70.81	a		c
Price - Silage - $/tonne	30.88	29.86	32.63			
Price - Greenfeed - $/tonne	49.95	65.66	51.98			
Price - Straw (feed) - $/tonne	35.64	32.70	37.60			
Price - Grain - $/tonne	91.21	106.63	103.44			c
Price - Pasture - $/AUM	16.14	18.57	19.44	a		c
Feed Cost - $/AUD	0.74	0.96	1.01	a		c
Economic Indicators	**LowCost**	**MidCost**	**HighCost**	**L v. M**	**M v. H**	**L v. H**
	- - - $ per Lb. Weaned Basis - - -					
Calf Sales	1.389	1.425	1.515		b	c
Value of Production	1.516	1.595	1.642			
Winter Feed Costs	0.308	0.369	0.494	a	b	c
Pasture Costs	0.241	0.310	0.363	a		c
Feed, Bedding & Pasture	0.572	0.697	0.885	a	b	c
Machinery Operating	0.023	0.026	0.037			c
Labour Costs	0.128	0.153	0.219		b	c
Other Variable Costs	0.119	0.168	0.230	a	b	c
Total Variable Costs	0.841	1.044	1.370	a	b	c
Depreciation	0.064	0.072	0.097		b	c
Other Fixed Costs	0.022	0.037	0.068			c
Total Fixed Costs	0.086	0.109	0.164		b	c
Total Production Costs	0.927	1.154	1.535	a	b	c
Total Cash Costs	0.741	0.944	1.263	a	b	c
Contribution Margin	0.675	0.550	0.271		b	c
Gross Margin	0.775	0.651	0.379		b	c
Return to Unpaid Labour	0.711	0.579	0.296		b	c
Return to Investment	0.598	0.461	0.145		b	c
Return to Equity	0.589	0.441	0.107	a	b	c
Investment	3.397	3.711	4.391		b	c

- the letters "a", "b" and "c" indicate the means of the respective groups are significantly different at the 90% confidence level

[7] The data pool was segmented into TPC thirds with the expectation that each of these groups would generally employ different management practices, feeding systems and asset bases/business structures in maintaining their herds. Similarly, regional & size comparisons are presented in Appendix C.

- average mature cow weights were essentially the same between the low and high cost herds but significantly different between the other pairs.
- the low cost operations brought in grazing at lower cost than both the mid and high cost groups. They also had lower feed costs on a pro-rated cost per animal unit day.

Moving on to the economic indicators, the differences among groups were even more substantial. A few highlights include:

- across the board, in all costing categories, plus calf sales and enterprise investment, the low cost group displayed a significant advantage.
- this theme carried forward, to almost the same extent, between the mid and high cost groups. The exceptions here, which may be of important note, included the elements of pasture costs, machinery costs and fixed costs other than depreciation.
- significant differences between the low and mid cost groups appeared in the key cost categories of winter feeds, grazing and "other" variable costs. These appear to have accumulated to a significant difference in cow/calf enterprise profitability.

All-in-all, the results indicate the low cost producers do something "right". They get the profitability results, but the linkage to "what they do right" is still not clear.

C. Analysis of Management Practices and Perceptions

The earlier section on management practices revealed a number of insights regarding what producers do to manage the winter feeding leg of their production year. It also put into context how producers pursue winter feeding activities as related to grazing options.

This overview was followed with a statistical analysis designed to show that there were differences in producers' costing performance. These differences, covering a range of production practices, resource base and environmental (locational) considerations, and productivity factors accumulated to significant costing and profitability performance between producers following a low cost (per lb. of calf weaned) strategy vs. those that do not.

The final leg of the statistical analysis focuses on identifying the management practices, approaches and insights used by the producers who consistently earn cow/calf enterprise profits. The ***AgriProfit$*** data pool was segmented into low cost, medium cost and high cost (per lb. of calf weaned) groups and the responses to the supplementary winter feeding management questionnaire were evaluated to discover differences between these economic performance groups.

The results of the statistical analysis[8] are summarized in a step-wise fashion below. These discussions focus only on those results showing statistically strong or significant relationships. In this regard, attention should also be given to those practices or approaches that, in some cases, were expected to, but did not turn out to be "significant".

One final note of clarification on "significance" is required before launching into the findings of the statistical analysis. Each result is accompanied by an indication of the "statistical strength of the relationship". "Highly significant" relationships meet the 95% confidence level criteria and are identified, as appropriate, by "(***)". Similarly, "significant" relationships meet the 90% confidence level criteria and are identified by "(**)". The analysis employed, Chi-Square, offers the interpretation that "reasonably probable" results can be taken as an indication of a strong tendency or trend but are not as statistically reliable. Given the diversity of operations in the pool, items scoring between a 75% and

[8] Tabular presentation of the statistical analysis, along with a description of the procedures employed, is provided in Appendix D.

90% confidence level are brought forward as trends to give serious consideration to in identifying practices that may be worthy of adopting.

Sorting for Winter Feeding

Generally speaking, low cost operators tended to sort their herds for winter feeding as compared to high cost producers (*). Looking more closely at the criteria for sorting, low cost producers were more apt to segment their herds by age (**) than high cost producers. Medium cost operators tended to sort by stage more than high cost producers (**). The ability to focus on the nutritional needs of identifiable segments of the herd is a criteria that can result in cost savings.

Weighing and Testing Forages

The analysis did not show a statistical difference between the costing groups regarding weighing bales, or checking silage for unit weight or moisture content. Interestingly enough, low cost producers were less likely to have a lab analysis done on their bales or silage than their medium or high cost counterparts (* and **). Combining these results with the relationship analysis in Section A leads to some interesting suppositions and are certainly grounds for closer scrutiny.

Criteria for Setting Rations

Low cost operators tended to rely more on general knowledge (*) and/or a combination of knowledge and ration balancing (*) than their medium cost peers. The medium cost group relied less (**) on general knowledge than their high cost counterparts. The affect of "other criteria" on determining rations appears to have washed out some of the expected differences.

Feed Quantity and Quality Adjustments

The notion of matching quantity and quality of feed to the herd's needs over the course of the feeding season turned out to be one of the more significant findings of the statistical analysis. Low cost operators were more likely to make adjustments than the high cost group (*). Particularly, they were more likely to adjust for weather circumstances compared to the high cost third (*) and adjust to stage (pregnancy / lactation) than the medium cost third (*). The most significant relationship observed related to the practice of responding to cow condition with adjustments to feed quantities (** vs. both medium and high cost groups). They were also more likely to use more than one criteria to drive feed quantity adjustments than their higher cost peers. On the feed quality side, low cost producers tended to respond, more than the high cost group, to changes in weather circumstances with a change in feed quality. This is coupled with the tendency to supplement the forage based rations with grains, as required (* vs. combined medium and high cost groups).

All-in-all, it appears the lower cost group focuses on managing both the productivity and cost sides of the ledger through a few focused management activities. Firstly, they tend to sort the herd to manage quantity and quality delivered to identified segments of their herds. Then they're more likely to make mid-season adjustments dependent upon environmental factors and the nutritional needs of these sub-groups … matching feeds to cow condition. In so meeting these needs, the productivity of the herd (eg. provide a live calf and re-breed), plus the opportunity to manage cost by managing quantities, are both maintained.

Feeding Systems

Few discernable differences were revealed amongst the costing groups with respect to feeding systems. Given the diversity of producers in the study pool, this perhaps should not be too surprising. The analysis did bring forward the notion that the lower cost group was more likely (*) to stick to a "once-a-day" feeding frequency than the upper cost group. They also felt that there was likely a more cost-effective, efficient feeding system than the one they currently employed (* vs the medium and high group combined).

Value and Cost of Feeds

Once again, fewer differences than anticipated were revealed in the comparison of the costing groups regarding feed sourcing and cost of feed. Low cost producers were more likely to purchase feed grains for their herds than the mid-cost group (*). The medium group, in turn, were more likely to have measured the cost of producing their home-grown feeds than the high cost group (*). Overall, all three groups consistently ranked cost of producing home-grown feeds and availability of own feeds as the top two most important factors in their long term decision to use home-raised feed sources.

Land Use & Feeding Alternatives

The final section of the supplementary questioning was designed to bring forward insights on management actions producers would take when pressed with higher grazing costs for their cow herds. As grazing is generally viewed as a lower cost alternative to drylot feeding, cooperators were indirectly weighing how they would balance these higher in-yard costs with other production, and investment alternatives, on their farms.

Under the scenario of a 50% increase in grazing market value, the low cost group, as compared to their medium and high cost counterparts, would be:

- more likely to "stand pat" … ie. not change (***),
- less likely to downsize their herds (*), and
- less likely to pursue measures to increase the productivity of their existing grazing lands (***).

Given the scenario of a doubling in grazing market values,

- the low cost group would be more likely to "not change" (*) than the medium group,
- the low cost operators would have less of a tendency to convert crop land into annual or perennial grazing than the medium group (*),
- the medium group would be tend to downsize compared to the high cost group (*), and
- medium unit cost operators would be less likely to pursue productivity enhancements on their existing pastures than the high cost group (*).

Under the final scenario of tripling grazing market values, the low cost group compared to their medium and high cost counterparts, would:

- still be more likely to "not change" (***), and
- have less of a tendency to pursue measures to increase productivity of their existing grazing lands (*).

Suffice it to say that producers' insights into how they would respond under these circumstances can have many interpretations. On one hand the results seem to indicate that the low cost producers feel comfortable enough with their productive, economic and financial performance to stay with a long term strategy, to positively manage change. On the other hand, the data, analysis and questioning needs to be a bit deeper to reveal some of the finer subtleties.

Home Stretch

The Managing Winter Feed Costs project started out with the basic premise that,

> *"for producers to make knowledgeable decisions regarding what and how to feed their cow herds, information on unit costing, as linked to management practices, is key … both for their own operations and with respect to benchmarks or comparables."*

To this end, the ***AgriProfit$*** data set was turned to taking the first step in assessing combinations of unit costing profiles and management practice information to shed some light on firstly, the performance differences in cow/calf enterprise, and then some of the reasons why these differences may exist. The goal was to offer insight, to Alberta cow/calf producers, on practices they could take on to "take control of their businesses".

What Has Been Learned?

The following paragraphs summarize the key findings and conclusions of the "Managing Winter Feed Costs" project.

Cow/calf enterprises are dynamic. Profitability in this business can be a function of environment/location, cost management, production management and how the herd "justifies" itself within the rest of the farm, ie. it's economic performance.

Winter feed costs are significant components of overall cow/calf enterprise total production costs and managing these costs are critical to the profitability of cow herds. Moreover, how cow herds are maintained (facilities and systems) must be very important determinants of productivity and unit costing … lowering feed costs is not just about reducing quantities or using cheaper feeds. It's also about the systems and management practices employed to deliver these feeds and what they can do to reduce unit costs and/or improve productivity. There is likely not one single factor that drives cost control and profitability.

Managing unit costs has a firm basis in productive performance. Improving "lbs. weaned" in-and-of itself improves unit costs. Beyond this basic element, differences in short term cost management and longer term systems management can reap benefits in profitability. Low cost enterprises are consistently profitable and more risk-proof than higher cost operations.

There is a range of management practices/systems that can be turned to manage winter feed costs. Some may be more broadly applicable, while others may only be effective and practical under specific circumstances. Low cost producers tend to pay more attention to addressing the feed/nutritional needs of sub-segments of their herds. This appears to offer latitude to maintain productivity while targeting to needs. Feeding to the "average" brings with it the opportunity to over-feed, under-feed and waste feed, all at the same time.

How Can This Information Be Used?

The first step in utilizing this information follows the adage "you can't manage what you don't measure". In order to assess if current management practices or feeding systems are performing well or could be improved implies knowledge of one's own costing. Producers with this knowledge can more readily assess the changes in production performance, and unit costing, as associated with a management practice or feeding system change. Partial budgets and cash flows are more simply created and relate more directly to what actually happens on the farm. Expecting regional or provincial averages to reflect an individual's costs does not recognize the uniqueness of that farm … results and successes will only come by chance. Finally, these performance benchmarks can be used as a basis for setting long term cost-based management strategies … as "guide posts" to controlling one's own business.

What Is Yet to Be Learned?

This analysis is the first of it's kind for Alberta cow/calf businesses. It has revealed many valuable insights, but at the same time, left many questions unanswered. The process of analyzing the data has brought to light another layer of applied research questions that can be posed to producers, and spun into management opportunities, such as:

- the circumstances under which more feeding system (depreciable) assets would be appropriate,
- how big does a beef operation need to be to economically feed silage,
- economics of, and methods to feed to a spring time cow condition score target,
- evaluating extended grazing season options in the context of both the cow herd's economic performance and as a "best use" for the farm's land base,

and many more. These will provide more focus on those "things that producers can do to be more profitable".

Appendix A: *AgriProfit$* Producer Sample Descriptive Statistics

Productive Performance

A cross section of herd size and productivity statistics, by region and for the provincial total, are given in Table A1. These offer insight into the composition of the data pool and, in some measure, further the interpretation of the statistical analyses.

Table A1: Productive Performance - Alberta Cow/Calf Enterprises - 2000

	South	Central	North	Alberta	South	Central	North	Alberta
	Herd Size				*Calf Crop %*			
Mean	131.6	149.5	196.1	161.6	90.8	90.6	89.5	90.3
C.V.	45.7	54.3	40.7	49.1	6.5	8.8	6.4	7.4
Lower Quartile	104	85	120	101	88.8	85.5	85.7	86.7
Upper Quartile	144	187	242	211	94.2	96.5	93.6	95.2
	Wean Weight (lbs/hd)				*Open Cows (%)*			
Mean	535.5	580.0	609.7	579.8	6.1	7.1	7.5	7.0
C.V.	18.0	15.5	14.6	16.2	98.5	100.2	59.0	84.6
Lower Quartile	481.9	518.7	571.7	512.7	1.9	1.7	4.5	2.8
Upper Quartile	554.2	628.6	671.9	648.6	7.3	8.7	9.7	9.0
	Length of Calving Season (days)				*Death Loss of Calves (%)*			
Mean	90	105	105	101	2.7	1.3	2.7	2.1
C.V.	18.9	50.4	37.6	41.3	93.4	85.1	83.8	94.9
Lower Quartile	80	75	84	76	0.8	0.6	1.1	0.6
Upper Quartile	100	108	117	111	3.0	2.0	3.7	2.8
	Lbs Weaned / Cow Wintered				*Weight per Day of Age (lbs.)*			
Mean	541.4	558.5	584.7	563.6	2.61	2.96	2.73	2.80
C.V.	23.9	16.3	20.8	19.8	9.1	21.0	14.5	17.6
Lower Quartile	461.7	475.3	512.2	474.9	2.45	2.61	2.48	2.53
Upper Quartile	561.1	626.7	653.3	633.9	2.72	3.25	3.03	3.00
	Mature Cow Weight (lbs.)				*Wean Wt. as % of MCW*			
Mean	1,335	1,364	1,351	1,352	41.4	44.2	47.1	44.5
C.V.	4.9	7.6	8.4	7.3	17.3	15.4	11.9	15.2
Lower Quartile	1,300	1,300	1,250	1,300	36.8	40.9	43.1	41.1
Upper Quartile	1,400	1,475	1,413	1,400	42.8	46.5	51.0	48.1

Economic Performance

Insights into the economic performance of ***AgriProfit$*** program participants are enhanced by the regional-based descriptive statistics presented in the following pages. Table A2 – "Unit Costs & Returns, by Element" focuses on specific cost and returns items thought to be of particular importance as drivers of enterprise profitability. Table A3 – "Unit Cost Totals and Margins" describes averages and variation in economic performance for a range of economically significant cost totals and "residuals".

Table A2: Unit Costs & Returns, by Element - Alberta Cow/Calf Enterprises - 2000

	$ per Cow Wintered				$ per Lb. Weaned			
	South	Central	North	Alberta	South	Central	North	Alberta
	Value of Production							
Mean	894	872	886	882	1.673	1.575	1.534	1.584
C.V.	22.6	17.7	20.0	19.4	18.6	15.5	15.3	16.4
Lower Quartile	826	759	779	772	1.530	1.440	1.408	1.421
Upper Quartile	1,044	955	1,013	1,007	1.663	1.691	1.754	1.708
	Winter Feed Cost							
Mean	174	230	222	214	0.331	0.423	0.393	0.390
C.V.	29.5	26.5	34.0	31.5	34.1	33.7	41.4	37.3
Lower Quartile	120	195	170	165	0.234	0.326	0.317	0.313
Upper Quartile	212	263	295	263	0.409	0.482	0.443	0.456
	Feed, Bedding & Pasture Costs							
Mean	413	397	377	394	0.777	0.730	0.662	0.718
C.V.	24.9	17.1	22.5	21.0	21.2	24.4	26.0	24.5
Lower Quartile	349	352	307	324	0.640	0.609	0.595	0.603
Upper Quartile	440	437	446	440	0.879	0.815	0.681	0.817
	Labour Costs							
Mean	104	96	82	93	0.197	0.170	0.142	0.167
C.V.	54.7	54.4	103.1	50.0	50.1	49.4	28.9	46.6
Lower Quartile	55	63	63	63	0.128	0.111	0.106	0.110
Upper Quartile	148	104	96	104	0.271	0.189	0.178	0.194
	Other Variable Costs							
Mean	103	122	102	110	0.199	0.224	0.175	0.201
C.V.	26.5	44.3	38.9	40.0	35.9	50.1	35.7	44.3
Lower Quartile	82	88	75	81	0.150	0.168	0.129	0.150
Upper Quartile	123	151	126	126	0.220	0.237	0.210	0.226
	Total Fixed Costs							
Mean	64	78	56	67	0.121	0.143	0.092	0.120
C.V.	69.0	52.9	70.4	62.4	64.2	59.1	61.4	63.5
Lower Quartile	26	46	28	33	0.060	0.087	0.056	0.062
Upper Quartile	97	94	69	87	0.196	0.175	0.116	0.164

Table A3: Unit Cost Totals and Margins - Alberta Cow/Calf Enterprises - 2000

	$ per Cow Wintered				$ per Lb. Weaned			
	South	Central	North	Alberta	South	Central	North	Alberta
	Total Variable Costs							
Mean	621	615	561	598	1.173	1.125	0.979	1.085
C.V.	22.0	21.5	21.3	21.6	19.1	27.0	22.2	24.5
Lower Quartile	572	528	460	524	1.054	0.916	0.870	0.913
Upper Quartile	655	672	639	665	1.301	1.228	1.058	1.202
	Total Cash Costs							
Mean	562	555	506	539	1.062	1.022	0.883	0.983
C.V.	23.7	24.8	22.3	23.8	19.7	32.2	22.9	27.4
Lower Quartile	502	453	400	451	0.984	0.824	0.774	0.808
Upper Quartile	579	616	583	593	1.199	1.122	0.964	1.111
	Total Production Costs							
Mean	685	693	617	664	1.294	1.268	1.071	1.205
C.V.	23.2	22.8	23.3	23.3	19.5	29.1	21.3	25.7
Lower Quartile	600	617	503	570	1.096	1.010	0.934	1.015
Upper Quartile	722	748	712	730	1.418	1.369	1.177	1.353
	Contribution Margin*							
Mean	274	257	325	285	0.500	0.450	0.555	0.499
C.V.	68.6	74.5	50.2	63.2	75.0	78.1	53.9	67.4
Lower Quartile	171	136	225	175	0.232	0.252	0.419	0.290
Upper Quartile	434	392	445	418	0.648	0.701	0.810	0.779
	Gross Margin							
Mean	332	317	380	343	0.611	0.553	0.651	0.602
C.V.	59.5	62.1	43.4	54.0	63.2	63.8	44.9	56.1
Lower Quartile	215	227	283	231	0.319	0.402	0.505	0.411
Upper Quartile	497	449	491	468	0.857	0.793	0.874	0.861
	Return to Equity*							
Mean	209	179	269	218	0.379	0.307	0.463	0.379
C.V.	94.2	119.6	63.3	89.9	107.1	133.5	67.7	99.3
Lower Quartile	61	42	164	80	0.112	0.078	0.285	0.132
Upper Quartile	392	308	396	369	0.585	0.633	0.713	0.660

*** Contribution Margin = Value of Production - Variable Costs**
**** Gross Margin = Value of Production - Cash Costs**
***** Return to Equity = Value of Production - Total Production Costs**

Appendix B: The Context of Statistical Analyses

Statistics offers a number of tools to determine the validity of the conclusions and arguments arising from observations of behavior and productive, economic and financial performance. This document employs a few procedures to define the two key messages of statistical reliability and strength.

The first message is one of significance or confidence of the result. The confidence level gives an indication as to the statistical reliability or confidence in the result. A confidence level of 90% or greater implies that the result is highly reliable. Lower levels of confidence need to be interpreted with caution. In the case of the Chi-square analysis (see Appendix D), a lower significance level may interpreted as an indication of a "trend" but at levels less than roughly 75%, the probability of the conclusion being a matter of chance increases dramatically.

The second message is one of "explanatory power" (R^2). It's a statement of strength of relationship, or how much one factor can explain the result of another. The higher the R^2, the stronger the relationship.

To put this into context, in the physical or production world, it's common to find relationships with confidence and strength (high R^2's) as the relationships are more readily isolated. Interactions of variables can be focused on, or filtered out depending upon the research question at hand.

In the world of economics, however, it's more common to find "significant" relationships that do not have as high a level of explanatory strength. This is driven by the dynamic, complex interactions taking place among physical, economic and financial components with the enterprises and at the farm level. These cannot be as readily filtered or focused. Lower levels of strength of relationship are taken as important.

A final comment on the "context of statistical analysis" relates to the issue of causality. With the regression, or relationship analysis, the intent is to determine if one factor essentially causes another. With the proper care and technical rigour, one element can be said to "cause" the result observed in another. However, with the t-tests performed in the section on performance comparisons this same conclusion cannot necessarily be drawn. These assessments are made within a factor, such as winter feed costs, to determine as to whether or not they are statistically different. The interpretation of a "significant" result relates to the groups being different, not one "causing another to be different" or significance in a factor causing a result in another factor (eg. feed costs vs. grazing costs).

Appendix C: Additional "Comparisons of Selected Means"

In addition to the cost groupings presented in the body of this report, a range of other comparisons was undertaken. As regional and size comparisons are generally of interest to producers, these have been brought forward and presented in Table C1 and Table C2, respectively, below. The intent of doing so is to complement the interpretive power of the cost group comparisons by showing the performance in these popular alternative views.

Table C.1: Statistical Comparison of Selected Means - By Region

Alberta Cow/Calf Enterprises - 2000

Production Indicators	South	Central	North	S v. C	C v. N	S v. N
Cows Wintered	131.6	149.5	196.1		b	c
Growth	535.5	580.0	609.7			c
Open Cows	6.1	7.1	7.5			
Length of Calving Season	89.8	105.2	105.2			
Death Loss of Calves	2.7	1.3	2.7	a	b	
Calf Crop %	90.8	90.6	89.5			
Calved 1st 2 Cycles	89.1	78.1	74.9	a		c
Lbs Weaned/Cow Wintered	541.4	558.5	584.7			
Wean Wt as % MCW	41.4	44.2	47.1			c
Wt Per Day Age	2.61	2.96	2.73	a		
Mature Cow Wt (MCW - lbs)	1,334.6	1,363.6	1,351.3			
Herd D.O.F.	145.6	189.5	190.1	a		c
Lbs Feed DM/AUD	21.7	24.5	24.6			
Labour Hrs/Cow	10.3	9.6	8.2			

Feed Values / Cost	South	Central	North	S v. C	C v. N	S v. N
Price - Hay - $/tonne	81.0	65.2	60.9	a		c
Price - Silage - $/tonne	n.a.	30.5	n.a.			
Price - Greenfeed - $/tonne	62.19	49.65	51.42			
Price - Straw (feed) - $/tonne	52.3	30.1	32.7	a		c
Price - Grain - $/tonne	94.3	105.5	93.8			
Price - Pasture - $/AUM	21.7	17.5	16.2	a		c
Feed Cost - $/AUD	1.0	0.9	0.9			

Economic Indicators	South	Central	North	S v. C	C v. N	S v. N
	- - - $ per Lb. Weaned Basis - - -					
Calf Sales	1.543	1.433	1.385	a		c
Value of Production	1.673	1.575	1.534			
Winter Feed Costs	0.331	0.423	0.393	a		
Pasture Costs	0.434	0.277	0.249	a		c
Feed, Bedding & Pasture	0.777	0.730	0.662			c
Machinery Operating	0.028	0.032	0.025			
Labour Costs	0.197	0.170	0.142			c
Other Variable Costs	0.172	0.192	0.150			
Total Variable Costs	1.173	1.125	0.979		b	c
Depreciation	0.081	0.089	0.062		b	
Other Fixed Costs	0.040	0.054	0.030			
Total Fixed Costs	0.121	0.143	0.092		b	
Total Production Costs	1.294	1.268	1.071		b	c
Total Cash Costs	1.062	1.022	0.883			c
Contribution Margin	0.500	0.450	0.555			
Gross Margin	0.611	0.553	0.651			
Return to Unpaid Labour	0.541	0.469	0.590			
Return to Investment	0.398	0.335	0.480			
Return to Equity	0.379	0.307	0.463			
Investment	3.976	4.024	3.514		b	

- the letters "a", "b" and "c" indicate the means of the respective groups are significantly different at the 90% confidence level

Table C.2: Statistical Comparison of Selected Means - By Herd Size

Alberta Cow/Calf Enterprises - 2000

Production Indicators	**<100**	**100-199**	**200+**	**S v. M**	**M v. L**	**S v. L**
	- - - Cows Wintered - - -					
Cows Wintered	69.5	134.0	260.8	a	b	c
Growth	613.0	572.1	581.3			
Open Cows	6.4	6.3	9.1			
Length of Calving Season	115.6	93.5	104.9			
Death Loss of Calves	2.0	2.1	2.5			
Calf Crop %	93.0	90.1	87.9			c
Calved 1st 2 Cycles	77.0	78.0	83.2			
Lbs Weaned/Cow Wintered	620.9	559.5	542.7			c
Wean Wt as % MCW	47.6	43.3	45.0			
Wt Per Day Age	3.14	2.68	2.78	a		
Mature Cow Wt (MCW - lbs)	1,354.2	1,360.2	1,350.0			
Herd D.O.F.	177.0	178.5	179.2			
Lbs Feed DM/AUD	26.9	22.0	24.9	a		
Labour Hrs/Cow	14.6	8.4	7.0	a		c

Feed Values / Cost	**<100**	**100-199**	**200+**	**S v. M**	**M v. L**	**S v. L**
Price - Hay - $/tonne	65.9	69.8	64.9			
Price - Silage - $/tonne	24.8	33.1	30.1	a		c
Price - Greenfeed - $/tonne	41.71	55.36	57.06			
Price - Straw (feed) - $/tonne	43.5	32.2	32.1			
Price - Grain - $/tonne	97.3	100.5	99.0			
Price - Pasture - $/AUM	18.4	18.8	16.3		b	
Feed Cost - $/AUD	1.0	0.8	1.0			

Economic Indicators	**<100**	**100-199**	**200+**	**S v. M**	**M v. L**	**S v. L**
	- - - $ per Lb. Weaned Basis - - -					
Calf Sales	1.403	1.459	1.409			
Value of Production	1.525	1.587	1.535			
Winter Feed Costs	0.390	0.367	0.423			
Pasture Costs	0.299	0.317	0.286			
Feed, Bedding & Pasture	0.714	0.705	0.735			
Machinery Operating	0.042	0.027	0.023			c
Labour Costs	0.239	0.156	0.132	a		c
Other Variable Costs	0.202	0.183	0.148			
Total Variable Costs	1.197	1.072	1.039			
Depreciation	0.104	0.087	0.050		b	c
Other Fixed Costs	0.065	0.047	0.025		b	
Total Fixed Costs	0.169	0.134	0.075		b	c
Total Production Costs	1.366	1.206	1.113			
Total Cash Costs	1.065	0.981	0.947			
Contribution Margin	0.328	0.515	0.497			
Gross Margin	0.460	0.606	0.589			
Return to Unpaid Labour	0.375	0.521	0.540			
Return to Investment	0.185	0.411	0.434	a		c
Return to Equity	0.159	0.382	0.422			c
Investment	4.102	3.926	3.516			

- the letters "a", "b" and "c" indicate the means of the respective groups are significantly different at the 90% confidence level

Appendix D: Statistical Analysis of Management Practices & Insights

Chi-square procedures were employed to reveal statistically significant differences in the responses of producers between unit production cost groups. The tables below present only the results of those comparisons that were found to be significant. Confidence levels ranging from 75% to 90% are taken as an indication of a strong trend (noted as *), 90% confidence levels are indicated as **, and highly significant results, at the 95% confidence level are indicated with ***.

Q. 3 - Sort for Winter Feeding?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More*		

Q. 3a - Sort for Winter Feeding - by Age

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More**	More*	

Q. 3a - Sort for Winter Feeding - by Stage

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More**			*

Q. 3a - Sort for Winter Feeding - by 2+ Criteria

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*			

Q. 4 - Do a Lab Test on Bales?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less**		Less*	Less**	*

Q. 5 - Do a Lab Test on Silage?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less*		Less*	Less**	*

Q. 7 - Set Rations by General Knowledge

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*	Less**			*

Q. 7 - Set Rations by Balancing & General Knowledge

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*				

Q. 9a - Adjust Feed Quantity? - Did Not Adjust

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		Less*		

Q. 9a - Adjust Feed Quantity? - For Weather

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More*		

Q. 9a - Adjust Feed Quantity? - For Stage (Preg/Lact.)

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*			

Q. 9a - Adjust Feed Quantity? - For Cow Condition

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More**		More**	More**	*

Q. 9a - Adjust Feed Quantity? - For 2+ Reasons

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*	More*		

Q. 9b - Adjust Feed Quality? - Did Not Adjust

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*			

Q. 9b - Adjust Feed Quality? - For Weather

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More*		

Q. 10 - Did You Feed Grain to Your Herd?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*			More*	

Q. 10b - Forage Feeding Frequency - 1x per Day

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More*	More*	

Q. 14a - Is There a Better Feeding System - Yes

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		More*	More*	

Q.14a- Is There a Better Feeding System - Don't Know

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
		Less*		

Q.14b - Cropping Needs Constrain Change?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	Less*			

Q.15 - Purchase All Feed Grains?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*				

Q.16 - Measure Cost to Produce Feeds?

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*			

Q.18 - Grazing Cost Incr. 50% - No Change

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More***		More***	More***	***

Q.18 - Grazing Cost Incr. 50% - Downsize Herd

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less*			Less*	

Q.18 - Grazing Cost Incr. 50% - Increase Pasture Yield

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less***		Less*	Less***	**

Q.18 - Grazing Cost Incr. 2x - No Change

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*				

Q.18 - Grazing Cost Incr. 2x - Downsize Herd

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	More*			

Q.18 - Grazing Cost Incr. 2x - Increase Pasture Yield

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
	Less*			*

Q.18 - Grazing Cost Incr. 2x - Convert Crops to Pasture

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less*				

Q.18 - Grazing Cost Incr. 3x - No Change

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
More*			More***	**

Q.18 - Grazing Cost Incr. 3x - Increase Pasture Yield

Lo-Med	Med-Hi	Lo-Hi	Lo-M&H	All
Less*		Less**	Less*	

Appendix E: Supplementary Questionnaire

For the 2000 production year, the standard ***AgriProfit$*** questionnaire was supplemented with a range of questions pertaining to:

- specific questions designed to improve the accuracy of some of the key variables in the standard questionnaire
- management practices associated with winter feeding, and
- short and longer term perceptions regarding potential changes

The "Managing Winter Feed Costs" supplementary questionnaire is provided on the following pages.

Managing Winter Feed Costs

PRODUCTION YEAR 2000

A. General Management:

1. Based on your main breeding herd, estimate on a week-by-week basis how you staged the herd off formal feeding in the spring and then onto feed in the fall. Supplemental feeding, whether on pasture, swath grazing or aftermath, should not be included here. **Provide either head on feed or per cent of total.**

Spring - Last Day of Feeding _____ / 00

	# of Cows Wintered	4 Weeks Prior	3 Weeks Prior	2 Weeks Prior	1 Week Prior	Last Day of Feeding
# of Cows on Feed						0
or % of Herd on Feed	100%					0%

Fall - First Day of Feeding _____ / 00

	First Day of Feeding	1 Week After	2 Weeks After	3 Weeks After	4 Weeks After	# of Cows Wintered
# of Cows on Feed						
or % of Herd on Feed						100%

For example, up to 2 weeks prior to the last day of spring feeding, all of the cow herd was being fed. Half of the herd then moved out to a grazing situation for the remaining two weeks prior to the end of the feeding season. 100% would be entered in the 4 weeks & 3 weeks prior boxes. 50% would be put in the 2 weeks and 1 week prior boxes.

2. Do you Body Condition Score your cows? ☐ Yes ☐ No

3. Is the herd sorted for winter feeding? ☐ Yes ☐ No
   If YES, how are they sorted? Check (√) those that apply:

   ☐ by age (eg. 1st calvers, mature cows)
   ☐ by stage (eg. main herd, due to calve, calved out)
   ☐ by condition (eg. main herd, thin cows)
   ☐ other (specify) _____
   ☐ other (specify) _____

4. Is baled forage a significant source of roughage for your cow herd? ☐Yes ☐ No. If YES,

   Do you have a laboratory analysis done on these forages? ☐ Yes ☐ No

   How often do you weigh your bales? Check (√) one:
   ☐ every year ☐ never
   ☐ every other year ☐ other (specify)_____

5. Is silage a significant source of roughage for your cow herd? ☐ Yes ☐ No. If YES:

   Do you have a laboratory analysis done on these forages? ☐ Yes ☐ No

   Do you check for the: weight of the volume fed? ☐ Yes ☐ No
   moisture percentage? ☐ Yes ☐ No

6. Did you provide supplemental feeds on pasture / aftermath
   to the breeding herd? ☐ Yes ☐ No
   to calves (creep feed)? ☐ Yes ☐ No

B. Feed Requirements:

The following questions on feed quantity and quality include amounts of straw provided as feed and/or your allowance for (bedding) straw consumed. Quantities of straw for *bedding only* should be not be included.

7. As you *entered the feeding season*, how did you determine the amount you expected to feed to your herd over the course of the winter? Check the **one** that applies (√):

   balanced ration(s) ☐ — based on opening feed inventories ☐
   based on general knowledge ☐ — other (specify)_____ ☐

8. In estimating the *daily feed required per cow* for the feeding season, rank the following items according to the importance you feel they had in determining the quantity you expected to feed your cow herd over this period. (#6 = most important to #1 = least important)

   weight of cows ____ — quality of feeds on hand ____
   expected timing of calving season ____ — cost of feed ____
   condition score of cows ____ (going into the feeding season) — other (specify) _____

9. *Over the course of the feeding season*, if you periodically adjusted feed quantities or the type/quality of feeds provided to your cow herd, which factors caused you to adjust? Check **those** that apply in each category (√):

Quantity of Feeds		Feed Type / Quality	
Did not adjust	☐	Did not adjust	☐
Adjusted for:		Adjusted for:	
weather (eg. temperature/wind)	☐	weather (eg. temperature/wind)	☐
stage of pregnancy / lactation	☐	stage of pregnancy / lactation	☐
condition score	☐	condition score	☐
feed left over / cleaned up	☐	other (specify)_____	☐
other (specify)_____	☐		

C. Feeding Systems:

Questions in this section refer to “in-yard” or drylot feeding of the cow herd. They do not pertain to supplemental feeding in extended grazing systems where a significant portion of the daily feed requirements are provided by the “unharvested” or grazed forage source.

10. Describe *the frequency of feeding* for your main cow herd during the winter feeding season. For each of grains and forages, **check the one feeding option** that applies (√) ... (if they were presented in a mixed form, check both boxes for the same frequency option) :

	Grain	Forage		Grain	Forage
more than 1 x per day	☐	☐	other (specify)_____	☐	☐
1 x per day	☐	☐	_____	☐	☐
every other day	☐	☐	other (specify)_____	☐	☐
free choice	☐	☐	_____	☐	☐

11. Describe *the feeding system* you employ for your main cow herd during the winter feeding season. Check the **one** that applies (√) ... (if grains and forages are presented in a mixed form, check both boxes for the same feeding system option) :

	Grain	Forage		Grain	Forage
fence-line	☐	☐	self feeder	☐	☐
bunk	☐	☐	other (specify)_____	☐	☐
on the ground (open area)	☐	☐	other (specify)_____	☐	☐

12. Do you typically *process* your forages prior to delivering them to your main cow herd during the winter feeding season. ☐ Yes ☐ No

13. Please estimate your average feed wastage for the 2000 feeding season, ie. the *percentage of the total (as-fed) feed volume* presented to your cow herd that was not consumed. Check **one** (√) :

< 5% ☐ 10% to 14.9% ☐
5% to 9.9% ☐ 15.0% + ☐

14. Cow/calf and cropping enterprises often share the same machinery and equipment assets, particularly power equipment (tractors & trucks). As a result, the choice of cropping practices (eg. silaging) can impact the machinery and facilities investment plus labour used by the cow herd.

a) Is there a more efficient, cost-effective feeding system you could use to feed your cow herd (note that increasing wastage may increase your cost/cow)? Check **one** (√):

☐ Yes ☐ No ☐ Don't know

b) **If YES to (a)**, how would you describe it? Check **one** (√) of the following alternatives. (Note: assets are machinery, equipment & facilities used in the feeding system)

Feeding System "Attributes"		
More labour & more assets	☐	More labour & less assets☐
Less labour & more assets	☐	Less labour & less assets☐

c) **If YES to (a)**, do the equipment needs of your crop and forages enterprises keep you from making the changes noted in (b) over the longer term? Check **one** (√):

☐ Yes ☐ No ☐ Don't know ☐ Don't share equipment with cropping

D. Value and Cost of Feeds:

The following questions deal with the use of your own farm-raised feeds by your cow herd during 2000. **If all of the feeds for your herd were purchased, skip to Section E**.

15. Indicate below if you provided home grown feeds to your cow herd in 2000. Check the **one** that applies (√) for each of forages and grains:

	Grain	Forage		Grain	Forage
purchase only	☐	☐	used some/all homegrown	☐	☐

16. Have you measured the *cost per unit (ton, bale, etc.) of producing your homegrown feeds*, over the past few years? ☐ Yes ☐ No

17. *Long term decisions* (2+ years) to use home grown feeds for your cow herd are based on many factors. From the following list, *rank the 3 most important factors* you use in your long term decision to use homegrown feeds for your cow herd in order of importance (#3 as the highest and #1 as the lowest).

	Choice/Rank		Choice/Rank
cost to produce own feed	____	quality of own feed	____
availability of own feed	____	don't want to pay cash for feed	____
price you could get for your own feed if you sold it	____	other (specify)_____	____

E. Land Use & Feeding Alternatives

18. If the *long term market value of grazing* were to increase, how would you change the way you manage your cow herd? Three scenarios are provided below representing multiples of current market rates (50% increase; doubling current rates; tripling of current rates). Check **one** (√) management response for each rate scenario.

Management Responses	**50%**	**Double**	**Triple**
No change to current system	☐	☐	☐
Reduce size of cow herd	☐	☐	☐
Graze less (increase days on feed)	☐	☐	☐
Increase pasture productivity (more grass off existing acres)	☐	☐	☐
Convert cropland to:			
- permanent grazing	☐	☐	☐
- annual forages for grazing	☐	☐	☐