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# Focus on Productivity

## COW/CALF PRODUCTIVITY

The feedlot and packing sectors have been very successful at driving productivity and efficiency gains through larger carcass weights, average daily gains, feed to gain ratios and yield in order to decrease per unit costs and maximize profits.

*Are things really so different for the cow/calf sector?*
Over the last 10 years producers have looked at every aspect of their cost structure and are saying there are no more costs that can be cut. From the capital investment in machinery and buildings, to the number of hours required to feed during the winter, cash costs have been reduced. The number of farms indicating they are using some form of in-field winter grazing or feeding in the 2011 Ag Census was 49.3% of all beef farms.

Producers are continually looking to reduce cash costs. Let's look at two producers: one with a low cost winter feeding program and total cash costs of $575/cow; the other with cash costs of $625/cow. A lower reproductive efficiency, higher death loss and lower weaning weight mean that the low cash cost producer actually has a higher per unit cost of production (COP) at $1.30/lb compared to the high cost and high productivity producer of $1.20/lb.

| | Low | High |
|---|---|---|
| Cash Costs | $575 | $625 |
| Reproductive Efficiency | 88% | 92% |
| Death Loss *to weaning* | 4% | 3% |
| Weaning Weight | 525 lbs | 585 lbs |
| COP | **$1.30/lb** | **$1.20/lb** |

By focusing solely on cash costs a cow/calf operation can miss productivity gains that ultimately impact the bottom line and profitability of the operation.

***Reproductive Efficiency***
Reproductive efficiency can range widely from 85-92% and is influenced by bull management, cow:bull ratio, pasture size during breeding, cow nutrition and heat. It is the combination of your conception rate and calving rate.

*Reproductive Efficiency = # Calves born / # Cows Exposed*

Higher reproductive efficiency means fewer cows are maintained to produce the same amount of beef. Being able to produce more beef from fewer cows and a smaller land base is important for the industry as a whole, but also for individual operations. Holding everything else constant, ***a 2% increase in reproductive efficiency decreases COP by $16.50/head.***

| | Low | High |
|---|---|---|
| Cash Costs | $625 | $625 |
| Reproductive Efficiency | 88% | 90% |
| Death Loss *to weaning* | 3% | 3% |
| Weaning Weight | 550 lbs | 550 lbs |
| COP | **$1.33/lb** | **$1.30/lb** |

Low reproductive efficiency also has implications on the number of heifers needed to be retained in order to maintain the herd. In a steady herd of 100 cows if the culling rate is 10% and the reproductive efficiency is 85%, 12 heifers need to be retained. But if the reproductive efficiency is 92% only 11 need to be retained in order to replace the 10 cows. Consequently, a lower reproductive efficiency increases the per unit cost of raising replacement heifers.

But there is also a multiplying effect. Not only is a higher percentage of available heifers required when reproductive efficiency is low, it also means fewer total heifers are available to replenish the herd. Only 42.5 heifers are available in the first scenario but 46

are available in the second. Thus, if a higher percentage of a smaller number is required for replacements, the impact upon the number of marketable heifers is dramatic with 30.5 heifers sold in the first scenario (42.5-12) but 35 in the second scenario (46-11). On average the herd operator who maintains high reproductive efficiency (92%) has almost 14.7% more marketable heifers each year than are available in a herd of low reproductive efficiency (85%), once again impacting the pounds of beef sold for every cow maintained.

This also means that as reproductive efficiency improves not only are fewer cows needed to produce the same amount of beef, but fewer replacement heifers are needed to create expansion. As we look at the current cattle cycle in North America with shrinking beef cow inventories and record low heifer retention, improvements in reproductive efficiency mean that smaller changes in inventories are needed to create a supply response in terms of pounds of beef produced. In fact, expansion could occur from improvements in reproductive efficiency alone.

***Death Loss***

Death losses from calving to weaning in the cow/calf sector vary widely not only from operation to operation but also from year to year as they are impacted by herd health, weather, and predators. There are advantages to a smaller operation that can give more attention to a smaller herd if it reduces death losses. However, that is not always the case. ***A 1% increase in death loss increases COP by $7.45/head.***

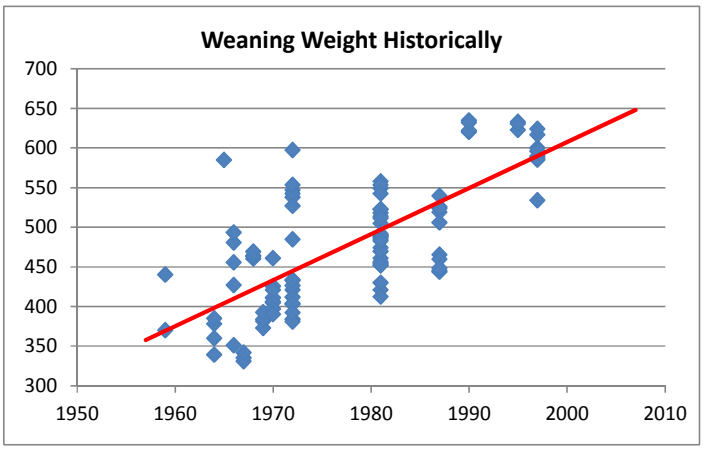
| | Low | High |
|---|---|---|
| Cash Costs | $625 | $625 |
| Reproductive Efficiency | 90% | 90% |
| Death Loss *to weaning* | 4% | 3% |
| Weaning Weight | 550 lbs | 550 lbs |
| COP | **$1.315/lb** | **$1.302/lb** |

Losses caused by outside factors like predators can accumulate quickly and create incentives to invest significant dollars to remove the problem. A 12% increase in death loss increases COP by over $100/head.

***Weaning Weight***

This is where there have been tremendous gains in the cow/calf sector over the last 20-30 years with weaning weights steadily increasing. ***A 5 lb increase in average weaning weights decreases COP by $6.75/head.***

Weaning weights have increased around 4 lbs per year from around 350 lb in the 1950s to around 600 lbs in the last decade. This increase is a large contributer to the average annual gain in carcass weights, which is not surprising since the feedlot practice is generally to have cattle on feed for a minimum number of days to produce the desired marbling regardless of the weight cattle enter the feedlot. So as in-weights increase, out-weights correspondingly increase.

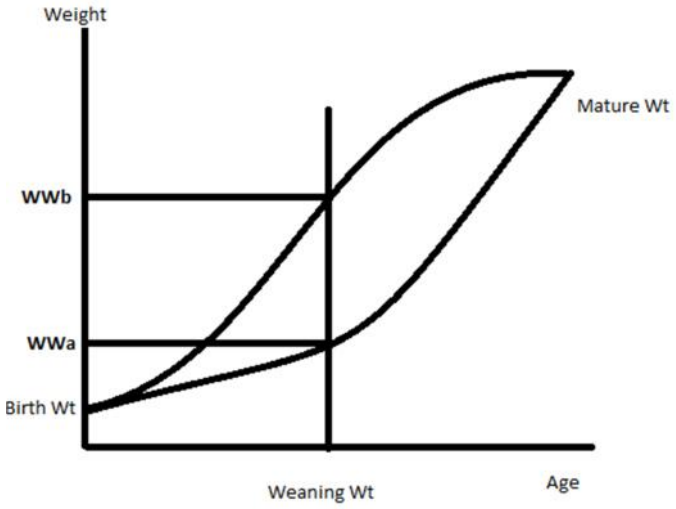



## COW SIZE, WINTER FEED, WEANING WGT

The goal is to produce a calf that is 45% of the mother's body weight. Research has shown that cow efficiency is dependent on the level of nutrition they receive. Larger higher-producing cows are the most efficient in lush, high nutrition environments and smaller low-producing cows are the most efficient in limited nutrition environments. Measuring beef cow efficiency includes determining the amount and quality of feed consumed compared to the net return.

A better (lower) feed conversion ratio such as 17 vs. 24 kg DM/kg of calf weaned can be achieved from a lower mature body weight and therefore lower energy requirement for the cow, or higher productivity through heavier weaned weight, lower death loss, or higher reproductive efficiency. The idea is to have a low birth weight, same mature

weight but a heavier weaning weight, resulting in a bent growth curve with faster maturing cattle.




This can be achieved with a cow of any size. Assuming a cow will eat around 2% of body weight per day, a 1200 lb cow will eat 24 lbs/day and a 1500 lb cow will eat 30 lbs/day. If feed costs are $80/tonne, annual feed costs would be $318 and $397 respectively. If the calf of both cows is 45% of the mature body weight the breakeven on feed costs for both calves will be the same at $0.589/lb.

| Mature weight of cow (lbs) | 1200 | 1500 |
|---|---|---|
| Daily Intake (lbs/day) | 24 | 30 |
| Tonnes per year | 3.97 | 4.97 |
| $ of feed | $318 | $397 |
| Weaning weight (lbs) | 540 | 675 |
| $/lb weaned towards cow feed | 0.589 | 0.589 |

Hence, the ideal cow size will vary with the environment, with the goal of a bent growth curve attainable at any cow size.

## BENCHMARKING PERFORMANCE

There are a number of provincial programs that provide cost of production benchmarking. While each province may use a different methodology to calculate costs and margins key performance indicators are relatively static wherever you are located. The following table provides some of the more accessible performance information.

As previously noted these performance indicators can vary within an operation from year to year with weather conditions as much as across operations in a province. Tracking trends over 2-3 years provides an indication if your operation is improving or standing still in these areas.

| | AB | SK | QC |
|---|---|---|---|
| Reproductive Efficiency | 86.5% | | 92% |
| Death Loss | 4.6% (3.2-5.0) | 4% (0-20) | 9.5% |
| Weaning percentage | | 88% (72-103) | |
| Weaning weight (lbs) | 579.8 (542-580) | 549 | |
| Avg Selling Wt | | | 670 |
| Wean wt % of cow wt | 44.5% (41.8-44.5) | 40% | n/a |

AB – Alberta Agriculture, AgriProfit$ Production year 2010. October 2011
SK – Western Beef Development Centre, 2011 Production year
QC – Federation des producteurs de bovins du Quebec

## VALUE OF A BRED HEIFER

The value of a bred heifer can be indicated by its Net Present Value (NPV). NPV is the sum of future cash flows in present value dollars. It's calculated as:

$$NPV = \sum R_t / (1+i)^t$$

*where:* t is the year in the future;
*i* is the discount rate; and
$R_t$ is the net cash flow (income less expenses) for the year t.

NPV is affected not only by cash costs like annual maintenance and economic factors like salvage value and calf prices, but also by productivity factors such as reproductive life span and weaning weight (discussed above). For the purpose of this discussion, we assume that the salvage value of a cow is $937.50 ($75/cwt at 1250 lbs live when culled) and the average weaning weight is 550 lb. A 5% discount rate will be used to calculate future cash flow.

***Annual Maintenance Costs*** include breeding stock replacement, veterinary and medicine, repair and maintenance, depreciation, insurance, custom work, utilities, office expenses, interest cost and all other yardage costs. They vary across operations and negatively affect the NPV of a heifer.

Suppose a heifer produces 8 consecutive calves in her lifetime and the calf price is expected to average $150/cwt, a producer whose annual maintenance costs for a heifer is $650 will have a net return of

$1760 from this heifer. ***For every $50 increase in annual maintenance costs, the NPV on a bred heifer decreases by $324***.

| Varying Maintenance Costs | | |
|---|---|---|
| Maintenance Cost | Calf Price | Net Present Value |
| $650 | $150/cwt | $1766/head |
| $700 | $150/cwt | $1442/head |
| $750 | $150/cwt | $1119/head |
| $800 | $150/cwt | $796/head |

Since NPV determines a producer's willingness to pay for a bred heifer, this also has implications on a producer's purchasing decision. A producer who has lower maintenance costs will have more opportunities to buy bred heifers at or below his willingness to pay and therefore more likely to expand first.

***Reproductive Lifespan***

Another essential component of the economic value of a cow is the value of the calves she produced during her lifetime. Cows that produce more calves are more profitable. While the above discussion assumes a bred heifer produces eight consecutive calves in her life time, a significant number of beef females are culled between 3 to 5 years old. First calvers are typically the hardest to re-breed – they are still growing and they need to raise a calf, cycle and breed all at the same time. Management (particularly nutrition) of first calf heifers before and during the breeding season can impact the proportion that re-breeds. Open cows at a young age contribute to a lower average slaughter age for cows which is around 8 years old (after 6-7 calves). Therefore the impact of an open cow and early culling should also be taken into account when valuing a bred heifer.

The three scenarios shown in the table represent: (1) the ideal case where a cow produces eight consecutive calves; (2) open in the second year producing seven calves; and (3) culled after producing five consecutive calves.

The NPV of a heifer missing her second calf at $695/head is $748 or 50% lower than the ideal case at $1,443/head. The lower value is due to a 14% reduction in the total calf value while the costs for maintaining this heifer for that year are $635 increasing the per unit cost of production of all other calves raised. A cow that is open after her first calf is valued at $695, while a cow that is open after her seventh calf is valued at $884. While both produce seven calves the difference of 21% is because the lost revenue in the second year is worth more today than the lost revenue in year eight.

| | 8 Calves | Open Yr 2 | Early Cull |
|---|---|---|---|
| Maintenance Cost ($/year) | $700 | $700 | $700 |
| Calf Price ($/cwt) | $150 | $150 | $150 |
| Calves # | 8 | 7 | 5 |
| NPV of Salvage ($/hd) | $635 | $635 | $735 |
| Total Value of Calves Produced | $5332 | $4584 | $3572 |
| Total Maintenance Cost ($/hd) | $4524 | $4524 | $3031 |
| NPV of Bred Heifer | $1443 | $695 | $1276 |

For the third scenario, where the heifer is expected to be culled after five calves, her NPV at $1,276 is 12% lower than the ideal case as the higher salvage value and lower total maintenance costs are not enough to offset fewer calves being produced.

A group of heifers purchased will typically represent a combination of the above scenarios. The below table provides the weighted average value for a group of heifers based on various percentages in each group. So if 40% had eight calves, 30% were open in the second year and 30% were culled after five calves the weighted average value of that group of bred heifers would be $1,168.50/head. ***A 10% reduction in heifers that are open after their first calf increases the weighted average value of a group of heifers by $75/head.***

| | Bred Heifer $ | Scenario 1 | Scenario 2 |
|---|---|---|---|
| 8 calves | $1443 | 40% | 30% |
| Open year 2 | $695 | 30% | 40% |
| Early Cull | $1276 | 30% | 30% |
| Weighted Average Value of a Bred Heifer | | $1,168.50 | $1,093.70 |

It should be noted that as the above estimation is based on prices at one point of time, the actual impact of open cow and early culling will vary depending on where we are at the cattle cycle.

## FEEDLOT PRODUCTIVITY

As previously noted, feedlots have focused, measured and been successful at improving productivity of cattle on feed over the years.

The ***Feed: Gain Ratio*** is a key performance measure in feedlots indicating how many pounds of feed are required for every pound of gain. If a 550 lb calf is placed on feed and taken to 1250 lbs with a feed:gain ratio of 7:1, ***improving feed:gain by 2% to 6.86:1 decreases feed costs by $11/head*** and if reduced by 4% to 6.72 would decrease feed costs by $23/head. In a small margin business, these changes in productivity can make the difference in profitability and long term survival.

| | | | |
|---|---|---|---|
| Feed:Gain | 6.72 | 7 | 7.14 |
| Feed Intake (tonnes) | 2.13 | 2.22 | 2.27 |
| Cost of Feed | $542 | $564 | $575 |

**Barley priced at $253.81/tonne*

Feed:Gain ratios have improved and become more consistent over time, averaging 7.14 with a range of 5.81 to 8.47[1]. Most improvements in feed:gain ratios have been connected to higher average daily gain, as daily feed intake is more difficult to monitor.

A higher ***average daily gain*** (ADG) can reduce the number of days on feed and potentially increases the turn rate of the feedlot and the fixed costs applied to each animal. For placements gaining 600 lbs in the feedlot with ADG ranging from 3 lbs/day to 4 lbs/day; days on feed (DOF) will range from 150 days to 200 days. Consequently, bunk space can only be turned 1.83 times a year for animals gaining 3 lbs/day versus 2.4 times a year for animals gaining 4 lbs/day.

| ADG | DOF | Turns/year |
|---|---|---|
| 3.0 | 200 | 1.83 |
| 3.5 | 171 | 2.13 |
| 4.0 | 150 | 2.43 |

A 15,000 head feedlot with a fill rate of 75% and 1.82 turns per year will spread $100,000 of operating costs over 20,475 head for fixed costs of $4.88/animal. While that same 15,000 head feedlot with a fill rate of 83% and turn rate of 2.17 will spread costs over 27,017 head with fixed costs of $3.70/animal.

| Lot Size | Fill Rate | Turn Rate | Fixed Costs $/head |
|---|---|---|---|
| 15,000 | 83% | 2.17 | $3.70 |
| 15,000 | 75% | 1.82 | $4.88 |

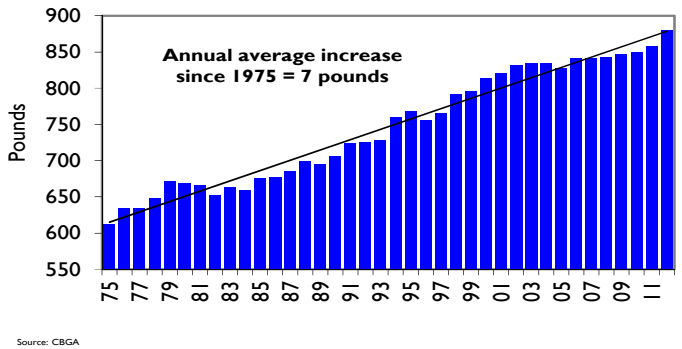
The ADG on finishing rations has increased over the last 50 years from 1.75 lbs/day to 3.2 lbs/day, an average increase of 0.03 lbs per year. Advancements in daily gains have come from changes in diet and feedlot management, moving from primarily forage based diets to higher grain concentrate.

***Death losses*** in the feedlot are typically low (~1%) with the high risk time in the first 45 days after weaning. This creates incentives for feedlots to place cattle that have been pre-conditioned, backgrounded or are yearlings. This is a high risk with implications on potential profits for cow/calf producers who are considering retained ownership.

While carcass weights, yields, and quality grades are measured at the packing house they are impacted by feedlot management. When paid on these attributes feedlots are able to drive performance in these areas.

Packers continue to pay by the pound because they are paid by the pound for boxed beef. If they can sell the same number of pounds of beef with fewer shifts they are able to spread that margin over fewer labour hours, decreasing the variable cost per pound. So while fixed costs per head increase, the fixed cost per pound does not as long as packers are able to continue to produce the same amount of pounds annually.

**Canadian Annual Steer Carcass Weight**




Source: CBGA

Since 1975, steer ***carcass weights*** have increased on average 7 lbs per year with some years more and others less. In 2012, the annual steer carcass weight jumped 22 lbs from the previous year to 879 lb. Larger

[1] Peer Reviewed Journal Articles. BCRC Historical Evaluation April 2012.

carcass weight can offset the impact of decreased cattle slaughter on beef production. In 2012 when slaughter cattle marketings was down 6.6%, beef production was only down 3.9% as a result of heavier carcass weights.

***Dressing Percentage*** is calculated by dividing the warm carcass weight by the shrunk live weight of the animal. Two animals with same live weight and same live price can have different economic value due to the difference in dressing percentage. As shown in the table below, for two 1350 lb animals at $113/cwt live price ($1,525.50/head), a 0.5% difference in dressing percentage will result in a 7 pound difference in carcass weight. Consequently, the breakeven on the carcass is $1.60/cwt higher for the one yielding 0.5% lower, representing $13.30 on an 840 lb carcass. Hence, the major shift away from live to rail pricing over the years.

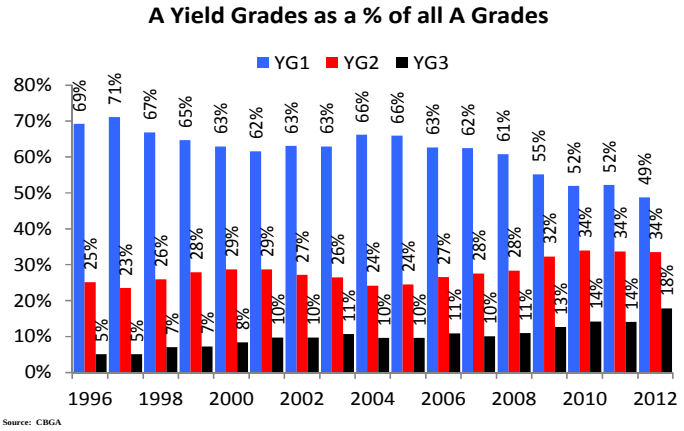
| | | |
|---|---|---|
| Value of Live Animal | $1,525.50 | $1,525.50 |
| Dressing Percentage | 60.0% | 59.5% |
| Carcass Weight (lb) | 810 | 803 |
| Breakeven on the Carcass weight ($/cwt) | $188.33 | $189.92 |

In addition to dressing percentage, the economic value of a carcass is also affected by its quality (i.e. Prime, AAA, AA and A) and yield grades (YG1, 2, 3).

***Yield Grades*** give a prediction of the amount of red meat on a carcass. A yield grade 1 (Y1) indicates that a carcass contains 59% or more lean meat while a yield grade 3 (Y3) contains 53% or less lean meat.

| | Y1 (>59%) | Y2 (54-56%) | Y3 (<53%) |
|---|---|---|---|
| Warm Carcass Weight (lb) | 800 | 800 | 800 |
| Lean Yield (lb) | 472 | 448 | 424 |
| AA cutout price ($/cwt) | 179.59 | 179.59 | 179.59 |
| Revenue from red meat ($) | 847.66 | 804.56 | 761.46 |
| Discount per carcass ($) | -- | 43.1 | 86.2 |

The industry is interested in lean yield because two carcasses, which are at the same weight, can vary significantly in terms of the amount of meat they yield. For two carcasses, which are both 800 lbs, the amount of meat yield from a Y1 is 472 lbs while the meat yield from a Y3 is 424 lb. This 48 lbs difference in red meat will result in a $86 difference in revenue per carcass. Correspondingly, that is 48 lbs of fat that a feedlot has paid to put on and then a packer, processor, or retailer is paying someone to cut off and find a use for elsewhere.




From 2010 to 2012 the percentage of A grades which are Y1 has decreased from 52% to 49% while Y2 is steady at 34%. Consequently, the proportion of Y3 cattle has increased from 14% to 18%. Obviously there is very little market incentive to reduce Y3 production and increase Y1 production.

Over the past 20 years, there has been significant improvement in ***quality grades***. From 2008 to 2012 the percentage of AAA+Prime product increased from 52% to 57%. This 5% improvement in the percentage of AAA+Prime product, increased packer returns on every 10,000 lbs of A grade product by $23.80. In years when the premium on AAA product over AA product is larger there is a larger impact on revenue.

| | | |
|---|---|---|
| All A Grades (lb) | 10,000 | 10,000 |
| % AAA + Prime | 57% | 52% |
| AAA cutout price ($/cwt) | 184.35 | 184.35 |
| AA cutout price ($/cwt) | 179.59 | 179.59 |
| Revenue from all A grades ($) | $18,230 | $18,207 |

## CONCLUSION

Regardless of the calf price or how low you are able to reduce cash costs if there is not a focus on productivity in the cow/calf herd there is money being left on the table. Benchmarking is a popular term for a reason. But your best competition no matter where you are on the scale is what your herd did last year and if there is improvement. Feedlots have shown how a focus on productivity can drive profitability in a small margin business. Keeping records is the first step!