OMAFRA Virtual Beef

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Wild Cattle - Is it in their eyes?

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Temperamental cattle are both dangerous and frustrating to handle. Animals who constantly try to leap over gates or charge towards openings are a danger to themselves, other animals and to their handlers. Injuries caused by this type of behavior affect the price of a carcass due to increased trimming of bruised areas. Temperamental cattle also have decreased gains in the feedlot as well as poorer meat quality. All of these factors contribute to lower profits for the producer.

Evaluating Docility

Accuracy of measurements is a key aspect for genetic progress. Currently, there are many temperament measurements and evaluations that can be performed. These range from temperament scoring to flight speeds to physiologic responses. Each has its own pros and cons, including varying levels of accuracy.

Figure 1: Bovine Showing a Large Amount of Eye White

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Temperament scoring can be completed while animals are restrained in a chute or during routine handling. A score between 1 and 5 is assigned to each animal, with 1 being calm or docile and 5 being agitated or aggressive. This method is easy and inexpensive to do, but relies on the consistency of the observer. Strict definitions of each score should be determined before evaluations occur and the same person should complete all observations in order to maintain precision. If these conditions are met, temperament scoring can be an effective method of evaluation.

Figure 2: Bovine Showing a Small Amount of Eye White

Flight speeds can also be calculated easily and may be a good predictor of temperament. The most common method is to record the time it takes an animal to exit a squeeze chute. This method can work well as long as there are not any changes in the surroundings, such as extra animals around the exit pen or sudden noises which may cause some animals to react uncharacteristically.

The third method, based on physiologic responses, often includes measuring changes in blood levels of cortisol, which is similar to adrenaline. Resting animals with higher levels of blood cortisol often have prolonged stress responses and more anxiety. However, measurement of this hormone can result in highly inaccurate evaluations of temperament because it is difficult to collect blood samples without causing stress to the animal. As well, this procedure is expensive. Additionally, cortisol levels can be increased for many other reasons, such as digestive processes, estrus cycles and circadian (daily) rhythms.

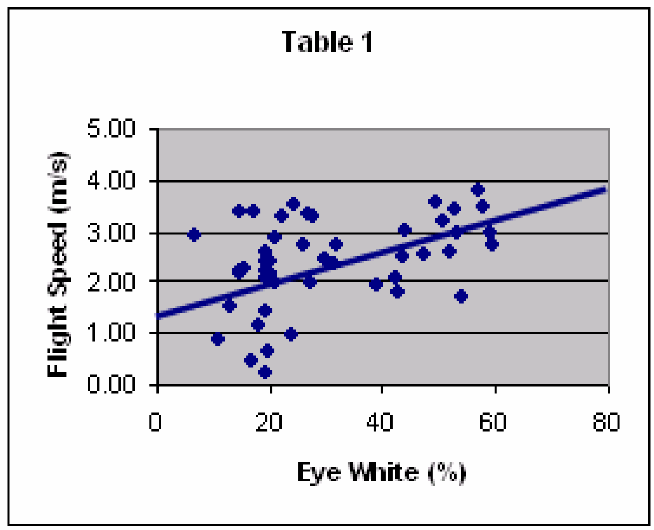
Current Selection Programs for Docility

Limousin breeders have made the greatest strides in improving temperament within their breed. They were the first to develop a temperament scoring system that could be used to rank animals with Expected Progeny Differences (EPDs) for docility. When the value of an EPD is high, there is a greater chance that the bull will pass on its docile traits. In 2005 the average EPD for docility in Limousin bulls was +12. These EPD values have improved significantly in the last 20 years. In 1990 it was estimated that the average EPD for Limousin bulls was only +1!

Since heritability for this trait is relatively high, genetic progress has occurred rapidly due to a high level of selection pressure. Through these intensive selection programs, it is estimated that Limousin breeders have increased the percent of docile animals by 16% in ten years. These breeders have shown that it is possible to improve temperament efficiently and that docility should become an industry breeding focus.

For more information on Limousin breeding programs, visit: http://www.limousin.com/pdfs/breedimprovementsection/CLAfactsheetDocilityAug2007.pdf

Table 1.: Relationship of Flight Speed With Eye White%



Current Research on Evaluating Temperament

Recently, innovative research at the University of Guelph has shown that the percentage of revealed eye white can be used as a predictor of temperament. Eye white evaluations were conducted at the Elora Beef Research Station on bulls, steers and heifers as a graduate research project. This method was promising as it is an easy, inexpensive technique that can be consistently evaluated by a physical measurement rather than behavioural scoring. A digital camera was set up near the squeeze chute so that it captured the animal's eye. Video recording then took place while the animals were run through the chute. Images were then stored and analyzed to assess the amount of eye white revealed by each animal.

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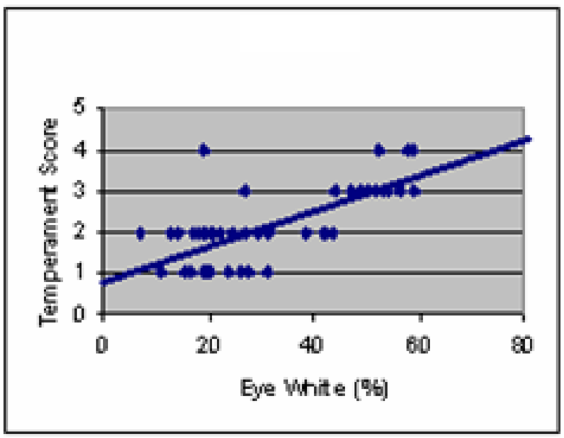
Flight speed was measured and chute score evaluations were also conducted. The results of these analyses showed that percentage of eye white had a significant positive correlation with both temperament scoring and flight speed. The correlations can be observed in Tables 1 and 2 (0.4 and 0.78 respectively).

The difference in per cent eye white between docile and temperamental animals within the study can be observed in images 1 and 2. This type of measure can be repeated on the same animal with a precision of 80 per cent. An additional benefit of this method is that it provides digital image records that can be used or re-analyzed at a later date. Since this measurement is reliable and highly correlated with temperament, percent eye white is a good tool for identifying animals that should be implemented in intensive selection programs for temperament.

Table 2: Relationship of Temperament Score With Eye White%



Implications

The study of temperament and its effects on productivity is a booming area of research, but so far the results are not widely used in breeding and selection programs. With increasing consumer demands for higher quality products and better management of livestock, selection for docility in cattle and other behavioural traits will play a key role in increasing profit margins throughout the beef industry. As technology improves, and better methods of assessment are developed, temperament will become an important part of future selection decisions.

Acknowledgements

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Marketing Mindset? Begin at the End!

Nancy Noecker
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As fuel, grain and land prices soar many producers are watching their margins shrink or disappear entirely. To combat this, some are eyeing brand and niche markets as possible alternatives. While the prices there may look attractive its best to get the whole story before you jump in!

While your cattle may have been "among the best" in the commodity markets, or in past sales, do they "fit" in the brands or niches you are looking at? Too often we get caught up in producing what we think is best and then expecting the market to accept it.

In production driven selling we focus on our product, figuring out what we like to produce, what we think we can produce best and then selling it to someone. Most beef operations won't fit into this mould. We select the breed of cow we like to run, breed her to a bull that we think creates a really good calf and then take that calf to a sale and expect someone to buy it. Many are not very willing to change this pattern even when they sell in the bottom half year after year. This may indicate one of two things ... they may have their cattle in the wrong market for their type, or they may not be willing to take on a marketing mindset.

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Table 1: Product Driven Mindset versus Marketing Mindset

Product Driven	Market Driven
Emphasis on the Product	*Emphasis on the Customer*
Love the Product	*Love the Customer*
Sell what you can Make	*Make what you can Sell*
Make a Sale	*Get a Customer*
Producer defines Quality	*Customer defines Quality*

To compete in many of the niche or brand markets will take a major shift in mindset. That shift is to a marketing mindset where the ultimate customer or consumer calls the shots. The emphasis here is on what the customer needs or wants and what they think is high quality. The focus switches to getting a customer (that will be a repeat buyer) rather than making one sale.

It doesn't matter whether the production criteria are what you would pick, or you don't like the size of animal they want. The point is, if the customer likes it, and is willing to pay for it, then that system creates the market and that is what you will deliver. The only question is whether you choose to produce that product and be part of the brand. Many of the niche/brands do not allow any antibiotics. This means you cannot ever put animals that have been treated into the program. You can not decide that it was just one shot a long time ago. That is not the point. In a marketing mindset you deliver what the consumer asks for every time, with your integrity and the product's integrity being unquestionable.

So when you look at options for your calves this fall shift your head into a marketing mindset and look to the end user. No matter if you are considering a different niche market or selling through your regular channels, you need to begin at the end with your buyer's wants and needs. Then perhaps you will have created a customer rather than just a sale!

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Genomics – A Fast Train Coming

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It would be almost impossible for beef producers at this stage to not have had some exposure, either in articles or advertising to the use of DNA technologies in beef cattle. Genomics is the buzz word and simply refers to the general field of genetics using DNA technologies. At this stage, the implementation of DNA markers is still pretty sparse, with most producers not yet using the technology although the tools are readily available, with three major companies competing in North America. What producers on the front lines today don't realize is that the tools that will be available in the future for selection and management will be greatly different then those of today. This article is intended as an introduction to the subject and to give the beef industry an idea of the impact to expect from the genomics train that is racing down the industry track.

Genetics 101

The DNA that is in every cell of the beef animal contains the code that will determine the genetic basis of everything that animal will become, from its hair color to its capacity for growth rate, to the tenderness of its meat. Obviously, the environment (feeding program etc.) has a huge impact on the animal's development as well. In fact, for most of the traits we are interested in, the environment will be responsible for 60-80 per cent of the differences that we see among animals. The 20-40 per cent of the differences that are due to genetics are very valuable, and we can exploit these for effective genetic selection as can be seen in genetic trends for traits like growth in beef cattle, milk in dairy cattle and lean growth in swine.

What genomics allows us to do is to directly read the animal's DNA and determine what that animal's potential is for a trait, for example lean meat yield. This is the destination, but getting there is a long haul. The good news is, the technology is advancing at an incredible rate. Much of the improvements to technology have been related to the Bovine Sequencing Project, which has sequenced the genome of the bovine. The DNA code for an animal is made up of four basic elements (called primary nucleotides) and we will represent these by their first letters, G, A, C and T. The animal's sequence is then just a unique sequence of these four letters, like

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AAGCTCGTGGCAATGGTCCATAGCCC…

However, the code for a single animal includes three billion letters. If you were to type out this code for an animal on a typewriter in standard 10cpi font, you would have a ribbon of Gs, Cs, As and Ts that would stretch across Canada from coast to coast. If you were to sequence two different cows and line their ribbons of code up, you would find that for much of the time, the codes are the same. The reason for this is that any two cows, even if they are different breeds, have much more of their codes in common than that which differs. For example, both are cows, have four legs, two eyes, hair, are mammals etc. For this reason, a lot of the code is the same. However, as you travel along from Halifax to Victoria reading these two ribbons for these 2 cows, you will notice where there are some differences between them, for example where a G might be in one cow, at the same location on the other cow might contain a C. This difference is called a Single Nucleotide Polymorphism or SNP (pronounced "snip"). There are over two million of these SNPs identified in cattle to date (more will be discovered). That means that as you traveled across the country reading this code, you would run into a SNP about every 1500 letters or every 12 feet. If you can imagine stopping every 12 feet from Halifax to Victoria, you can soon imagine that there are a lot of SNPs discovered!

These SNPs are the fundamental genetic differences that we want to exploit when we select animals. This may sound like science fiction, but it is not. In fact, beef breeders have been doing this since cattle were domesticated. Consider our cross-Canada ribbon of As, Gs, Cs and Ts. Lets say a particular beef breed is selecting for more growth rate and there is a SNP on the Ribbon just east of Bowmanville that is a G/C, where animals that have a G at this spot grow faster then those that have a C. Over time, as selection pressures continue for growth rate, the occurrence of Gs will increase as bulls with GG genotype (the "ribbons" are actually paired in an animal, since each cell has a pair of each DNA strand) will tend to be faster growing then CC bulls, and as more and more GG bulls are used the occurrence of a G at this location becomes more common until eventually the Cs at this location disappear altogether. This breed is then fixed for Gs at this location. You might think that after selection for some time, that a breed would fix all the good SNPs and response to selection would stop. This has been shown to not be true, as along the genome there are mutations happening as well. These mutations create new SNPs and some of these will be related to growth rate as well, so selection can continue. In fact, as has been shown with experimental fruit flies (that reproduce very fast), after hundreds of generations of selection, selection response does not diminish. This is good news for livestock breeders.

"The Gene" Does Not Exist

When genetic testing was first released as a commercial service, breeders used to say "They found the marbling gene, now we don't have to use ultrasound anymore." This statement is wrong on two accounts. Firstly, "The Marbling Gene" does not exist. There are many genes that influence an animal's genetic potential for marbling. In fact, for most of our traits it is estimated that close to 100 SNPs will be required to explain almost all of the genetic differences for each individual trait. Secondly, genomics is developing into an incredible tool that will revolutionize the genetic improvement industry, however, we are a long way from abandoning traditional recording programs in beef cattle in the near future. Genomic technologies will instead be a tool integrated into those systems. EPDs in the future will combine the DNA, pedigree and animal performance data together to provide a more accurate and informative estimate of the animal's genetic potential for a trait, so the rate of genetic improvement can increase.

Turning SNPs Into Improvement

As mentioned, there are many SNPs identified in cattle. This in itself gives the beef breeder nothing to use. What is needed is a relationship between these SNPs and the traits that are of interest. This is exactly where research at the University of Guelph is positioned. The University of Guelph, through a collaboration with the Alberta Bovine Genomics Program at the University of Alberta is genotyping 1250 cattle for 50,000 (50K) SNPs each. The cattle are measured for a number of important traits from birth through to carcass, including traits like feed efficiency and beef tenderness. The research will determine which SNPs are related to a trait, for example, feed efficiency. These SNPs can then be moved to a commercial DNA testing panel for beef breeders in the field to use to improve selection for these traits.

This research is leading edge. This Canadian initiative is collaborating with the United States Department of Agriculture and the Beef CRC in Australia to combine datasets to provide the best tools to breeders in all three countries, as it has been determined that there will be more power in a combined data set. Inclusion in these international activities indicates the tremendous resource that we have available in Ontario.

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Arriving or Leaving the Station?

We have had much discussion of current research and what is coming down the track. However, there are genomics tools available now which have been validated to be quite useful to breeders. Also, these commercially available tests are constantly increasing in power as more and more SNPs are discovered to be associated with key traits. Current research at the University of Guelph is involved with validating new panels of SNPs due to our unique data resource. Producers can expect some improved panels in the near future, ahead of results from the 50K genotyping project mentioned above.

Speculation is always dangerous. However, looking to the future, a producer might ask what to expect next? When will bigger panels of SNPs be available and how big will they be? Based on how technologies are unfolding, it would appear that while we have had panels of SNPs commercially available for the last few years with two SNPs, this could jump to 10-20 SNPs over the next two years, and by 2012 we will see these commercial panels double again in size to 40 SNPs. This is exciting technology acceleration!

Future Articles

Now that the basics of genomics, genetics and the current state of technologies is established, future articles in ***OMAFRA Virtual Beef*** can focus on the practical development and validation on new DNA tools to select for important traits like beef tenderness and feed efficiency.

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Financial Measures that Strike A CORD

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It may be hard to imagine but there are some people that do not find financial analysis particularly appealing! Part of the problem may be that there are so many different financial measures to choose from that it is hard to know which ones to use. If you are looking for some quick 'hits' there are some key ratios, the 'A CORD', that can reveal a lot about your operation.

First let's separate financial measures into four main categories: financial efficiency, liquidity, profitability and solvency. Financial efficiency refers to how successful the business is at using its assets to generate income. Liquidity assesses your ability to pay your bills as they come due. Profitability is well known and measures how well the business is able to generate a profit. And finally, solvency determines how much you are relying on debt to finance the business.

By category, here are my top five ratio picks and how they are calculated:

Efficiency:
Asset Turnover = Gross Farm Sales divided by Total Assets

Liquidity:
Current Ratio = Current Assets divided by Current Liabilities

Profitability:
Operating Profit Margin Ratio =
(Net Farm Income + Interest Expense)
divided by Gross Farm Sales

Return on Assets = (Net Farm Income + Interest Expense) divided by Total Assets

Solvency:
Debt to Equity Ratio = Total liabilities divided by Equity.

Table 1 presents the average 2006 results for the Ontario Beef Cow Calf Enterprise Analysis project and compares them to dairy and swine farrow-to-finish operations. The last column provides an industry target for each of the measures. These targets are good starting points but they

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can vary depending on your farm type. It is important not to look at individual ratios in isolation. A weakness in one area can be compensated for by strengths in others.

Table1: Financial Measures For Three Livestock Enterprises

Ratio	Beef Cow Calf[1]	Dairy[2]	Swine Farrow to Finish[3]	Target
Asset Turnover (Efficiency)	0.11	0.14	0.26	Greater than 0.40
Current Ratio (Liquidity)	2.71	1.10	1.50	Greater than 1.5
Operating Profit Margin (Profitability)	2.5 %	30.0 %	17.0 %	Greater than 15.0 %
Return on Assets (Profitability)	⅓ %	4.7 %	4.4 %	Greater than 5.0 %
Debt to Equity (Solvency)	0.15	0.30	0.49	Less than 0.40

[1] Cow-Calf Enterprise Analysis Project, University of Guelph & OMAFRA
[2] Ontario Farm Management Analysis Project, OMAFRA
[3] Ontario Data Analysis Project, University of Guelph - Ridgetown College

In the May edition of ***OMAFRA Virtual Beef*** I talked about the cow-calf enterprise analysis project being carried out by the University of Guelph and OMAFRA. Forty-five Ontario cow calf producers contributed their time and information to the cow-calf benchmarking project.

The focus of the project is looking into the variability across the farms. What management traits make top performers different? You may look at the dairy, swine or target columns and think most are just unattainable for the cow-calf sector. Actually in all five measures there were individual herds that met or exceeded the target numbers.

Beef cow-calf herds tend to be low debt operations and Table 1 bears that out. The average farm in the group had a current ratio of 2.71 and debt to equity of 0.15. A current ratio of 2.71 means for every dollar of debt that has to be paid in the next 12 months there are $2.71 in assets that can be easily converted to cash to pay them. A debt to equity measure of 0.15 means there is a dollar of equity for every 15 cents of debt. This will give some financial buffer in rough times like the one being experienced now in the beef business. The swine herds would be at greater risk with a higher reliance on debt to finance their farms.

Unfortunately, cow-calf operations also tend to be low margin. An average operating profit margin of 2.5 percent for 2006 falls short of the 15 per cent target. But 11 farms, through cost control and good marketing strategies, had operating profit margins greater than 15 per cent.

The average farm in the study had over one million dollars in farm assets. The asset turnover ratio gauges whether the business is using those assets as effectively as it could be. A low asset turnover leads to questions like 'Is custom work for idle machinery an option?' or 'Are there under productive assets that could be sold and funds invested elsewhere?' or 'If I switched to intensive rotational grazing would this reduce my pasture requirement and free up land to grow other crops?'

A low operating profit margin and asset turnover lead to low return on assets (ROA). ROA brings marketing efforts, cost control and capital investment levels together into one measure. All three of these areas should be investigated further if ROA is consistently low. Although the average ROA for the study group of cow calf farms was ⅓ of a per cent, there were nine herds with ROA's over four per cent and five topped five per cent.

It is important to keep in mind that looking at one year provides only a single snapshot of financial performance. The financial results for 2007 and 2008 will look different for livestock sectors with high feed costs and low market prices. What will remain the same is the fact that there will be variation in the results; some producers will do better than others. A look over several years would provide a clearer picture of the management traits that contribute to this difference in financial results.

The 2006 financial summaries for the cow calf, dairy and swine benchmarking studies are available at the Ontario Farm Management Analysis Project section of the OMAFRA Agricultural Business Management website: www.omafra.gov.on.ca/english/busdev/download/ofmap.htm

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Water Requirements for Beef Cattle

Brian Lang, Veal Specialist, OMAFRA

It has often been said that water is the most important nutrient. Water is the main component of the animal's body, constituting 50 to 80 per cent of the liveweight, depending on age and amount of body fat. An animal can lose almost all of its fat and about 50 per cent of its body protein and survive. However, the loss of 10 per cent of its body water can be fatal.

The four main functions of water in the body are:

- regulating body temperature through evaporation of water from the respiratory tract and from the skin's surface
- helping in the elimination of the waste products of digestion (feces of healthy cattle often contain 75 to 85 per cent water)
- regulating blood osmotic pressure
- a major component of milk and saliva

Water consumption requirements depend on a number of factors including:

- size of animal
- air temperature and relative humidity
- rate and composition of gain
- level of dry matter intake
- moisture content of the ration
- pregnancy
- lactation
- level of activity
- access to shade

Figure 1: Water is the most important nutrient

Table 1 estimates the water requirements of various classes of beef cattle and at different temperatures. The total water requirement includes both water intake from feeds plus that consumed as free water choice.

Rapidly growing cattle consume large amounts of feed. Table 2 estimates the water requirements of cattle based on feed consumption and air temperature.

To ensure optimal performance of cattle, we must make sure their requirements for water are met. The water provided must be clean and fresh to encourage the cattle to drink to fulfill their needs.

Table 1: Approximate Total Daily Water Intake of Beef Cattle in Litres*

Cattle Class	Weight		Air Temperature in °C					
	kg	lb	to 4°C	10°C	14°C	21°C	27°C	32°C
Growing Cattle	180	400	15	16	19	22	25	36
	275	600	20	22	25	30	34	48
	365	800	23	26	30	35	40	57
Finishing Cattle	275	600	23	25	28	33	38	54
	365	800	28	30	34	41	47	66
	455	1,000	33	36	41	48	55	78
Wintering Pregnant Cows	410+	900+	25	27	31	37	-	-
Lactating Cows	410+	900+	43	48	55	64	68	61
Mature Bulls	635	1,400	30	33	38	44	51	72
	725	1,600+	33	36	41	48	55	78

*Adapted from: Nutrient Requirements of Beef Cattle: Seventh Revised Edition: Update 2000, National Research Council

Table 2: Water Consumption Estimates for Beef Cattle Based on Air Temperature and Dry Matter Intake**

Air Temperature	Water Requirements per kilogram of Dry Matter Intake
25 to 35°C	4 to 10 litres
15 to 25°C	3 to 5 litres Young and lactating animals require 10 to 50% more water.
-5 to 15°C	2 to 4 litres
Below -5°C	2 to 3 litres Increases of 50 to 100% occur with a rise in temperature following a period of very cold temperatures, e.g. a rise from -20° to 0°C.

**Adapted from Effect of Environment on Nutrient Requirements of Domestic Animals, 1981, NRC.

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