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The Challenge of Feeding Beef Cows in Ontario Winters
Part 1: Cows and Their Thermal Environment

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Ontario winters are great for ice fishing, snowmobiling and skiing, but they can be tough on beef cows (and beef farmers). Even with advanced grazing management to stretch the pasture season, cows will be on costly stored forage for most of the winter. We want to ensure nutrient requirements are met and that the cattle are not being overfed or underfed, while minimizing wastage [1]. We know that the cows will need more feed energy to compensate for cold temperatures – but how much? Determining this can be very challenging, since several animal, environmental and feed-related factors impact on both energy requirements and feed consumption. In Part 1 of this series we'll look at the effects of various environmental factors on cow heat loss. In Part 2, we'll combine these and other effects to calculate the dietary energy needs of beef cows during winter, and how that translates into feeding management.

Thermal Energy Exchange Between Cows and Their Environment
While air temperature is the most common measure of the thermal environment, it can be a very inaccurate means of assessing how the environment actually impacts on livestock outdoors. In addition to gaining or losing heat from the air surrounding them, animals exchange thermal energy with their environment through a number of different mechanisms, including:

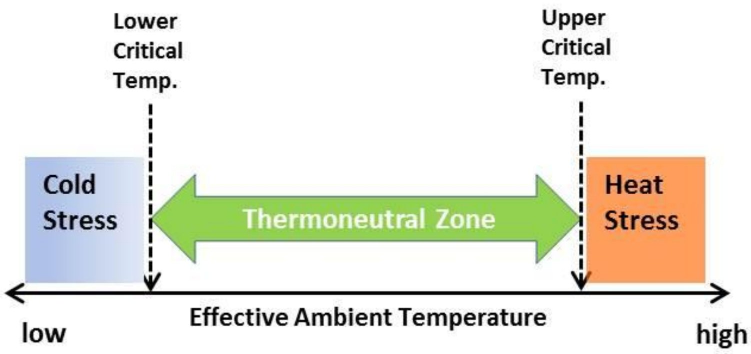
- **Air movement** - a wind blowing across an animal increases the rate of heat loss when the air is cooler than the animal's surface, or increases the rate of heat gain when the air is warmer than the animal's surface
- **Contact with surfaces** – ie. an animal laying down on cold concrete loses heat energy rapidly to the concrete
- **Thermal radiation** [energy flow between 2 objects which are not touching] ie. the warming effect of the sun's rays; radiative flow from the animal to a surface which is colder than it is, or radiative flow from a warmer surface to the animal
- **Evaporation** – sweat or water evaporating off of an animal carries away a large amount of heat as liquid turns into vapour

In order to better account for all of these factors, the concept of **Effective Ambient Temperature** (**EAT**) was developed. This estimates the combined effect of two or more thermal factors and calculates what the equivalent temperature of calm air, dry air would be. The most common uses of the EAT concept are "**Wind Chill Factor**", used in winter to express the cooling effect of wind, and summer's "**Humidex**", which quantifies the impact that high humidity levels have on limiting the evaporation of sweat, thus decreasing an animal's ability to cool itself. In this article, we will use a simple **EAT** based on air temperature and wind speed, and address the other factors separately. In Part 2, we will combine several factors to estimate the net effect on cows, and predict what changes are required to their feeding program.

The Thermoneutral Zone
Cattle, like all mammals (and birds) need to maintain a constant core temperature for body systems to operate normally. For healthy cattle, this corresponds to a rectal temperature of 38 ^{o}C. Cows living outdoors are exposed to a large variation in EAT. However, they have the ability to maintain a stable core temperature over a range of EAT, using behaviour and other means, without having to expend additional metabolic energy, this is called their **thermoneutral** zone (**TNZ**). The high end of this zone is called the **upper critical temperature** (**UCT**), while the bottom end is the **lower critical temperature** (**LCT**). When temperatures move outside of the TNZ, the animal has to start expending extra energy to either cool down (heat stress) or warm up (cold stress) (see Fig.1).

[1] for more on wastage and utilization see previous *Virtual Beef* article: http://www.omafra.gov.on.ca/english/livestock/beef/news/vbn1014a3.htm

Figure 1. Schematic of Relationships of Temperature and Thermal Zones[1]



[1]Adapted from: NRC, 1981, Effect of Environment on Nutrient Requirements of Domestic Animals

An animal's thermoneutral zone can shift over time. For example, shedding a winter hair coat and losing body fat would cause a cow's TNZ to shift to the right on the diagram, making the animal more comfortable in hotter temperatures but less able to cope with cold.

Adaptation to Cold Weather

As temperatures decline during fall, beef cows adapt by growing a thick hair coat. This increases the insulation value of the layers between the body core and the environment. This extra insulation helps them better conserve body heat, and shifts their thermoneutral zone down the temperature scale. Their LCT drops from a summer value of around 15 ^{o}C to a winter value of about -5 to -10 ^{o}C.

Other important cow factors are body condition score and hide thickness. Cows in better body condition have a thicker insulative layer of subcutaneous fat which helps to slow core heat loss to the environment. Hide thickness is also important, with thicker hides improving insulation (see Fig. 2). Cows with dairy breeding have thin hides, most European origin breeds have moderate hide thickness, and most British origin breeds have thick hides.

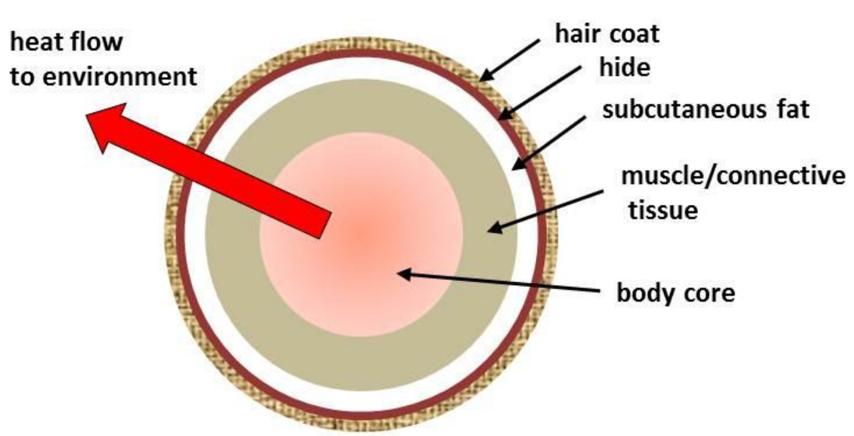


Figure 2. Schematic cross section of a beef cow showing body layers and heat flow to a cold environment

As the effective ambient temperature drops below their LCT, cows respond by increasing their basal metabolic rate to generate more heat – heart rate, blood flow, respiration and cellular activity are all elevated. When temperatures get really cold, they go into short term shivering phase to generate heat from muscular contractions. If the cold stress continues, they switch over to a phase where muscles generate heat without movement, efficiently converting the energy in nutrients into heat. This is called non-shivering thermogenesis (thermo = heat, genesis = origin). All of these responses require additional metabolic energy, which must come either from the diet or from the cow's fat reserves.

Wind Chill

Animals are surrounded by a thin layer of air molecules, called the “boundary layer” that “sticks” to their outer surface. This layer warms up to about the same temperature as the outer surface of the animal and helps to slow heat loss to the surrounding air. Even a low wind speed of 5 km/hr disrupts this layer and accelerates the loss of heat. Heat loss increases with increasing wind speed, and this effect is proportionally larger at lower air temperatures (Table 1). The amount of protection cows have from the wind is an important factor in determining their dietary energy requirements.

Table 1. Effective ambient temperature (EAT) for various air temperatures and wind speeds (°C eqivalent)[1]

Wind speed (km/hr)	Air Temperature (°C)									
0	**0**	**-5**	**-10**	**-15**	**-20**	**-25**	**-30**	**-35**	**-40**	**-45**
5	*-2*	*-7*	*-13*	*-19*	*-24*	*-30*	*-36*	*-41*	*-47*	*-53*
10	*-3*	*-9*	*-15*	*-21*	*-27*	*-33*	*-39*	*-45*	*-51*	*-57*
15	*-4*	*-11*	*-17*	*-23*	*-29*	*-35*	*-41*	*-48*	*-54*	*-60*
20	*-5*	*-12*	*-18*	*-24*	***-30***	*-37*	*-43*	*-49*	*-56*	*-62*
25	*-6*	*-12*	*-19*	*-25*	*-32*	*-38*	*-44*	*-51*	*-57*	*-64*
30	*-6*	*-13*	*-20*	*-26*	*-33*	*-39*	*-45*	*-52*	*-59*	*-65*
40	*-7*	*-14*	*-21*	*-27*	*-34*	*-41*	*-48*	*-54*	*-61*	*-68*
45	*-8*	*-15*	*-21*	*-28*	*-35*	*-42*	*-48*	*-55*	*-62*	*-69*
50	*-8*	*-15*	*-22*	*-29*	*-35*	*-42*	*-49*	*-56*	*-63*	*-69*
50	*-8*	*-15*	*-22*	*-29*	*-35*	*-42*	*-49*	*-56*	*-63*	*-69*
55	*-8*	*-15*	*-22*	*-29*	*-36*	*-43*	*-50*	*-57*	*-63*	*-70*
60	*-9*	*-16*	*-23*	*-30*	*-36*	*-43*	*-50*	*-57*	*-64*	*-71*

[1] Data from Environment Canada Wind Chill Calculator

Example: with an air temperature of -20°C and a wind speed of 20km/hr, heat loss is equivalent to a still air temperature of -30°C.

Effect of Precipitation

The insulative value of the hair coat is based on the many tiny air pockets which it traps. Still air is a good insulator. If the coat gets wetted by rain and slicked down, the pockets get reduced in number and filled with water, which is a good conductor of heat. This dramatically reduces the insulative value of the coat, increasing heat loss from the animal. If the precipitation is in the form of snow, and conditions are fairly cool, it usually has little effect as it doesn’t melt on the cows.

Applying Environmental Factors to Beef Cow Feed Requirements

In the next edition of *OMAFRA Virtual Beef*, Part *2* of this series will quantify the effects outlined in this article and use them to calculate the dietary energy needs of beef cows and ration adjustments for various winter scenarios.

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Advanced bull test evaluation: bridging superior feed efficiency with optimal reproductive development and semen quality

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Introduction

Testing bulls for productive performance provides crucial information to be used to select superior breeding stock. Traditionally, commercial bull test evaluations focused on average daily gain and scrotum circumference. A more comprehensive performance test could also include measurement of feed intake, ultrasound for body composition and an in-depth evaluation of their reproductive capacity. Productive performance traits are used to determine feed efficiency (i.e. residual feed intake, RFI), which is a tool to improve profitability of the beef industry. Additionally, appropriate reproductive evaluation is important for a successful cow-calf sector. Our studies suggest [i,ii] that measures of fertility in young bulls were negatively related with improved feed efficiency.

Consequently, there is a need to identify bulls with both improved feed efficiency and desirable reproductive capacity. To achieve this goal, a series of complementary assessments of feed efficiency and reproductive capacity are being tested at the Elora Beef Research Center (University of Guelph), including:

- testis ultrasound images
- infrared imaging of the scrotum
- blood plasma analysis

These assessments are aimed to more precisely assess sexual development and also evaluate the viability of decreasing the duration of the productive performance evaluation through the indirect assessments of feed efficiency.

Testicular Ultrasound

Testicular ultrasound can be used to assess testicular development and scrotum skin thickness. As a bull matures the cellular content of the seminiferous tubules (area of sperm formation) increases, and the fluid content decreases. As a result, the pixel intensity of the testes increases, indicating that the bull is approaching sexual maturity. Our results are indicating that bulls with improved feed efficiency have lower testes pixel intensity (delayed sexual maturity) than bulls with lower feed efficiency[ii] (Figure 1). Testicular ultrasound can also be used to measure scrotal skin and fat thickness, which are associated with thermoregulation of the testes, influencing semen quality.

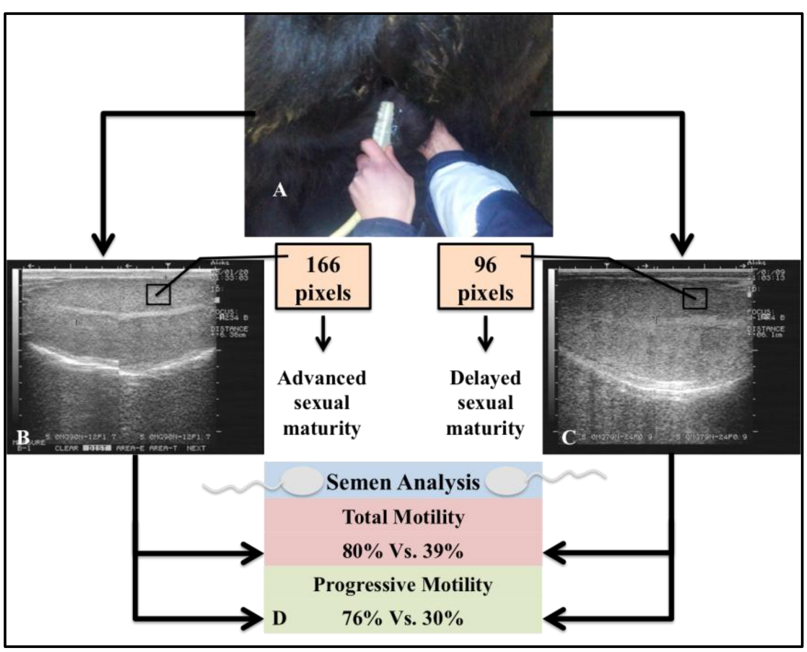

Figure 1. Testes ultrasound and semen quality evaluation. A: Ultrasound probe placed on the testis for scanning. B: High-pixel intensity testis ultrasound image. C: Low-pixel intensity testis ultrasound image. D: Semen motility corresponding to sexual maturity.

Infrared Imaging of the Scrotum

Uniform temperature gradation of the scrotum is crucial to ensure good semen quality. Temperature patterns of the scrotum are evaluated using infrared imaging that allows visualization of the scrotum thermal profile. Abnormal scrotal temperature patterns are associated with reduced sperm quality (Figure 2). Less feed efficient bulls had larger temperature variation at the base of the scrotum, suggesting a better capacity for thermoregulation and subsequently reduced sperm abnormalities.

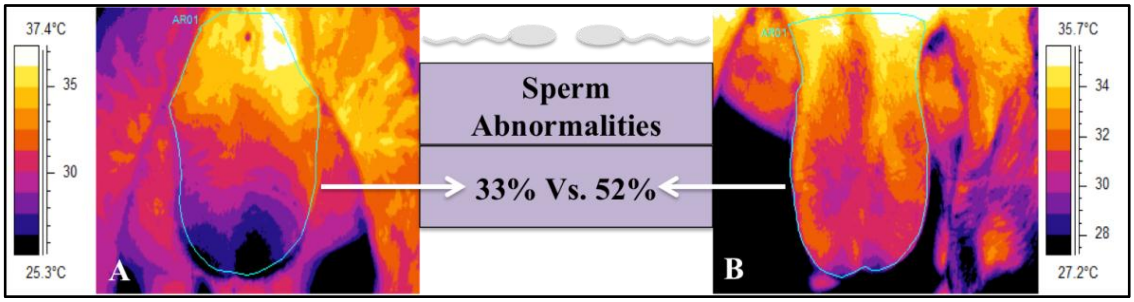

Figure 2. Infrared imaging patterns of the scrotum. A: Scrotum with normal patterns as noted by the gradual (layered) cooling observed from the top towards the base of the scrotum. B: Scrotum with abnormal temperature patterns as noted by the random temperature distribution. The thermographically normal scrotum has lower abundance of sperm abnormalities.

Semen Evaluation

Semen is collected using electro-ejaculation and evaluated for sperm motility patterns (total motility and progressive motility) using computer-assisted sperm analysis. Total motility is defined as sperm that display any type of movement and progressive motility refers to sperm that swim forward in a straight line. Semen evaluation also includes assessment of sperm morphology abnormalities, Figure 3.

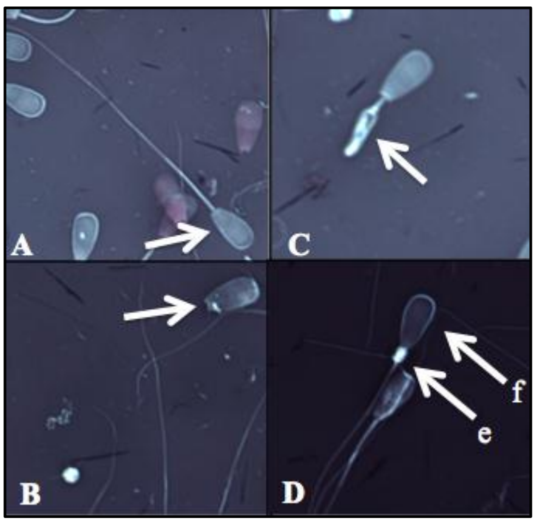

Figure 3. Sperm abnormalities associated with decreased fertility. A: Normal sperm B: Detached head. C: Midpiece defect. D: e. Proximal droplet, f. Pyriform head.

Blood Plasma Analysis

Blood levels of sexual hormones change across the sexual development in bulls. Immature bulls have high levels of gonadotropin releasing hormone (GnRH) and Anti-Müllerian Hormone (AMH), and low levels of luteinizing hormone (LH), follicle stimulating hormone (FSH) and testosterone. As the bull matures, AMH production decreases and LH and FSH levels increase, stimulating testosterone production by the testes. In addition, triiodothyronine (T_3) and osteocalcin are involved in the male reproductive function. T_3 is involved in testosterone production by the testes.

Our preliminary results indicate that bulls with improved feed efficiency had lower T_3 levels, suggesting an association between T_3, fertility, and feed efficiency in bulls. Osteocalcin is a bone-derived hormone found to regulate energy metabolism and male fertility in mice. Osteocalcin stimulates production of testosterone by the testes. Apparently, T_3 favors osteocalcin production, suggesting that osteocalcin may act as an indicator of both reproductive function and feed efficiency in bulls (Figure 4). This remains to be confirmed in beef cattle.

Blood analytes can also be useful for indirectly assessing feed efficiency, which could facilitate the assessment of feed efficiency in situations where the actual measurement of feed efficiency is not possible. We observed that levels of specific blood analytes differ in cattle diverging in feed efficiency, such as higher aspartate-aminotransferase and lower carbon dioxide in cattle with improved feed efficiency[iii].

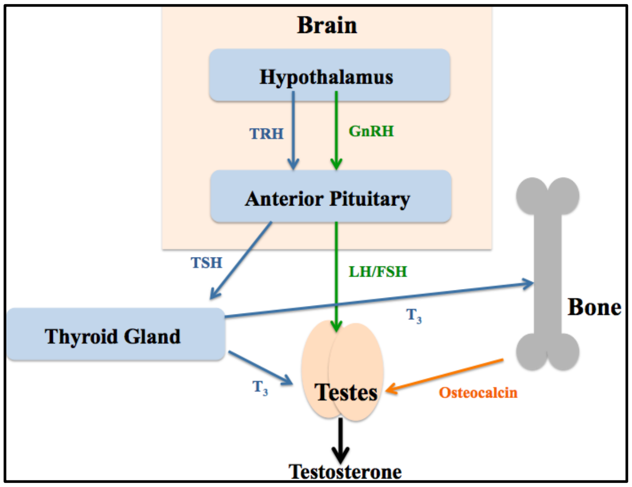

Figure 4. Sexual development and maturity of a bull. Suggested mechanisms of action of key hormones on testosterone production. FSH: follicle stimulating hormone, GnRH: gonadotropin releasing hormone, LH: luteinizing hormone, T_3: triiodothyronine and TSH: thyroid secreting hormone.

Implications

This study will provide information to support the implementation of complementary assessments to the breeding soundness evaluation of bulls, and indirect assessment of feed efficiency. This will contribute to the ultimate goal of ensuring the competiveness of the Ontario beef industry.

Next Steps

A future project at the Elora Beef Research Center will use bulls sourced from the Elora herd, the New Liskeard Agricultural Research Station and Ontario beef producers to expand on this work. Stay tuned!

Acknowledgments

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Genetic Improvement in Beef Cattle Makes Major Strides
Sharper tools reveal more progress being made than predicted

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The beef industry, just like any other, wants to sustain profitability while decreasing costs. Beef producers are provided with genetic selection tools such as expected progeny differences (EPDs) and estimated breeding values (EBVs), but it is ultimately up to them to determine the economic importance of each trait. Although economic breeding objectives and selection indexes have long been developed, the widespread use of these tools in the beef industry has recently gained momentum. A study done by Enns and Nicoll [i] (2008) observed the long-term genetic change in a commercial beef breeding program due to a selection index designed for a specific economic breeding objective. A nucleus Angus seedstock herd located in New Zealand was used for the study. This particular herd was ideal since data was available for the entire length of the breeding program and the breeding objectives did not change over a 17 year period. The goal of this breeding program was to produce bulls for distribution and to use in the company's commercial breeding herds in order to genetically improve profitability.

Figure 1: Stabilizer seedstock herd from Southern Ontario

In 1976, a breeding objective was developed for the herd and was used up until 1993. This economic breeding objective took into account harvest weight of surplus progeny at 30 months of age, dressing percentages of harvest progeny and culled cows, the net fertility of the cow measured by calves weaned/cow exposed, and the body weight of the cow at disposal. Feed intake was not included because the developers felt there was not enough information available on the correlations between feed intake of cattle on pasture and the traits likely to be included in the selection index. Therefore, they adjusted gross income to account for the extra feed cost associated with larger animals, using a standard relationship between body size and feed intake.

The traits used in the selection index were:

- fertility of the dam
- average lifetime body weight of the dam
- weaning weight
- yearling weight.

These traits were weighted by the number of progeny the cow had produced at the time the index was being calculated for an individual. Unlike previous selection indexes, this index includes traits that do not directly affect profitability such as, weaning weight and yearling weight. The modern analysis which were used by Enns and Nicoll to reinterpret the data included additional techniques such as calculating direct, maternal, permanent environment and residual effects separately. The current computational technology also allowed the use of procedures such as best linear unbiased predictions (BLUP) to calculate more accurate estimations.

The study found that direct weaning weight, post-weaning gain, harvest weight, and yearling weight all have average EBVs that increased significantly over the 1976-1993 time period. No significant difference in the EBV for maternal weaning weight (MWW) was observed. This is most likely due to the fact that MWW was found to be negatively correlated to direct weaning weight (DWW), and since DWW was more heavily weighted within the selection index there would not be much of a change in the average EBV for MWW. The average EBV for mature body weight also did not change significantly. This was most likely due to the fact that the developers were accounting for feed intake cost by adjusting the gross income associated with larger carcass weights. This adjustment meant that selection pressures were indirectly resulting in smaller mature body weights to avoid the cost penalty associated with a larger carcass weight.

The **realized genetic response** for **number of calves weaned** almost **doubled** what was **predicted** back in 1976. This is most likely due to the fact that the developers were using an assumed heritability of 0.05 while the actual estimated heritability obtained from the recent data analysis was 0.20. The estimates obtained from the recent analysis would cause an increase in the response to selection due to an increase in accuracy.

Figure 2: Cow-calf pair from a Stabilizer seedstock herd.

Previously, selection indexes were created using least squares adjustments and deviations of adjusted records from contemporary group means. These records included the individuals own records, the dams records, and the repeated records of the progeny of the dam. Presently, selection indexes are created using all the available data including the different components associated with the traits such as its direct, maternal, permanent environment and residual components. These, along with pedigree information, were fully accounted for in the 2008 analysis. It would therefore be reasonable to say that the response to selection calculated in 1976 would be less accurate compared to the response calculated at the time of this study.

The main limitation of the breeding objective developed in 1976 was the lack of computational technology. The technology present today allows us to work with larger data sets in order to get more statistically significant results. In addition, the lack of information on genetic parameters would also limit the breeding objective. As previously mentioned, the developers did not directly incorporate feed intake in the breeding objective. Now we have more estimations for genetic parameters, and with present technology these estimations are even more accurate, which will in turn result in faster genetic change. There are more estimates and fewer assumptions which, as seen in the results, can drastically change the outcome of a breeding program. The breeding objective can be more precisely defined by directly accounting for costs such as feed intake. This allows traits such as feed intake and body weight to be incorporated independently, which then allows selection for moderate to high body weight while maintaining or decreasing the cost of feed.

Currently, the beef industry has "generalized" breeding objectives and selection indexes developed on a national production system. Future research should be done on the rate of genetic change of systems using these generalized breeding objectives and selection indexes in comparison to the rate of genetic change from specific breeding objectives and selection indexes designed for specific production of marketing sectors.

Functional Traits

A more recent study was conducted in 2012 by Aby [ii] et. al. looking at the inclusion of functional traits in a bio-economic model in addition to regular production traits. Examples of such functional traits would be:

- herd life of cow
- age at first calving
- calving interval
- stillbirths
- twinning frequency

- calving difficulty
- limb and/or claw disorders

The results were that functional traits were just as economically important as production traits within the model. For this reason, it is equally important to include functional traits in a bio-economic model in addition to production traits.

In conclusion, an economic breeding objective developed in 1976 along with a multi-trait selection index resulted in long-term genetic gains in the beef cattle industry. The simple economic breeding objectives and selection index such as the ones developed in 1976 built a solid foundation on which to improve. This was apparent when looking at the 2008 reanalysis of the 1976-1993 data using modern techniques, as more accurate estimations were calculated due to increased knowledge, power of technology, and BLUP estimations. Improvements in genetic selection for economic breeding objectives continues, as in 2012 it was shown that functional traits would be as economically important as production traits. As research continues moving forward, new ideas will come to light providing a stronger foundation in order to make more effective selection decisions.

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Constructing Flooring for Ease of Cattle Movement

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Flooring seems to be an afterthought in many beef barns. It is a necessity of course, but it often isn't constructed with cattle movement in mind. Floor surfaces need to have a finish with enough texture to provide traction for cattle to move but smooth enough to clean properly. In some cases, floors are so smooth that cattle slip and injure themselves and in other cases the floors are so rough that cattle develop feet and leg problems. There is a fine balance between traction and cleanability.

Pen floors need to be strong and durable to resist manure acids and repeated cleaning. Start by using a minimum of 25 MPa[1] concrete with 6% air entrainment. Air entrainment is a concrete additive that makes the concrete more durable.

A good floor finish combines surface texture and grooves to provide traction. There are two primary ways of producing this combination. One way is to finish the concrete and form grooves in the surface while it is still wet. The other is to cut grooves in the floor after it has cured.

Broom Finish - The surface of the concrete should be finished with a texture. A stiff broom can be used to produce a "broom" finish.

Textured Finish – An alternative textured finish can be produced with an expanded metal roller, referred to as a "Jitterbug" or "Rollerbug" to imprint the surface (Figure 1). When concrete is first poured and levelled with a bull-float it is glossy and dries to a matte finish before hardening. When the matte finish is observed, tap your fingers on the concrete, if you leave fingerprints and your fingers stay dry it is the right time to use the roller to produce a textured surface. This finish is difficult to do well without experience. If improperly done it can result in a very abrasive surface which will damage cattle hooves.

Figure 1. Jitterbug for Producing Textured Surface

Grooving to Reduce Slippage - Cattle will still slip even on a floor with a good textured finish. Grooving the floor provides edges for cattle to catch their hooves to keep them from slipping too far and falling. There is some debate on what is the best groove pattern.

Longitudinal Grooves – One approach is to make grooves parallel to the feed manager ¾ in. wide by ½ in. deep, spaced 3 ¼ in. on centre (Figure 2). The ¾ in. groove is a relatively new recommendation. The wider groove allows the manure to displace easier under the hooves of the cattle to allow for better contact with the concrete.

Diamond Pattern – The traditional approach has been to make the grooves in a diagonal pattern ½ in. wide by $^{3}/8$ in. to ½ in. deep spaced 4 in. to 6 in. apart (Figure 3). Longitudinal grooves are easy to form, but in areas where cattle must make sharp turns, it is a good idea to cross-cut the grooves at an angle spaced 4 in. to 5 in. to create a diamond pattern to improve traction.

Figure 2. Longitudinal Grooves for Improving Traction

Figure 3. Diamond Grooving for Improving Traction

Wet Grooving - It is an art to form the grooves in wet concrete. If they are formed when the concrete is too wet, the grooves will not hold their shape. If the concrete becomes too dry, it will be difficult to form the grooves, and the surface finish may be harmed. Be careful to maintain a flat surface when grooving. Grooving when the concrete is wet displaces concrete, and it is important that the surface does not become curved between grooves. A curved surface will cause cattle to roll their hooves and stumble.

It may be necessary to remove the initial roughness of freshly poured concrete floors that have been wet-grooved. One method is to drag several concrete blocks over the surface until the sharp edges are worn off the concrete. Another method is to use a steel scraper blade on the surface. Either method will remove sharp edges, and help “age” the floor surface and reduce the chance of causing sore feet.

Cutting Grooves - The other method of forming the grooves is to finish the concrete with a broom finish and let it harden for at least 14 days. After the concrete has cured, cut the grooves into the floor. It is easier to obtain more consistent results with this method.

Surface Treatment

Cattle may also experience problems if they are put on concrete before it has finished curing. High surface alkalinity may irritate the skin of the feet, causing pain and possibly making cattle more susceptible to foot infection and lameness. To avoid this problem, allow the concrete to cure properly for 28 days. After this time the concrete is almost totally cured. Hydration, the chemical reaction that takes place during curing, will have slowed down. The concrete can be washed off and cattle can be put on it with little or no effect on their feet. If cows have to be put on before 28 days, allow the concrete to cure for at least 7 days, then wash it with a solution of 40 parts of water to 1 part of Muriatic acid. The acid will neutralize the alkalinity of the floor. The floor should then be thoroughly washed with water to remove the residue.

Some producers have found that spraying the concrete surfaces with linseed oil helps to seal the surface, and prevent foot injuries. A 50:50 mixture of boiled linseed oil and diesel fuel can be used for this purpose.

Treating Worn Floors

Concrete floors can become too smooth from repeated scraping for manure removal. Traction on slippery floors can be improved by cutting grooves into the floor, if it had not been done originally. Another method is to grind or mill small grooves into the entire surface to improve traction (Figure 4).

Some finishing barns use slatted floors for raising cattle. Slatted floors can become slippery over time leading to injuries and lameness. Rubber coverings can be installed on the slats to reduce injuries. Rubber coverings on slats have also been shown to increase the average daily gain in the early feeding period. Cattle also stayed cleaner as they neared slaughter weight.

Figure 4. Surface Milling Improves Traction

Handling Facilities

It is also important to have good tractive flooring in and around handling facilities. Cattle are often nervous during processing and can easily slip if the floor doesn’t provide sufficient traction. Again, a good broom finish and diamond grooving can help in these areas. A liberal use of sand can also provide extra traction if the surface isn’t the best and can’t be accessed to improve it. It is always a good idea to have a ready supply of sand available when cattle are being moved through areas that may be slippery.

The loading ramp is another critical area of the handling system that requires good traction for moving cattle. First of all a loading ramp with stair steps with a rise of 3 ½ ” (height of a 2” x 4”) and a run of 12” is best for moving cattle. If it is a sloped ramp, 1" x 2" cleats spaced 8" apart will improve traction. It is also a good idea to remember that cattle will naturally move to a lighted area, so shining a light into the truck will encourage the cattle to move up the ramp. The light must shine into the area where you want the cattle to move to, and not back into the eyes of the cattle moving up the ramp. Once again, the use of sand will aid in cattle movement if the ramp is slippery.

SUMMARY

Floor finishes are important for safe movement of cattle. Pen floors need to be strong and durable, while providing good traction for cattle. Surface texture and grooving can be used on concrete to provide the traction necessary to keep cattle from slipping and injuring themselves. Floors that are too slippery from repeated cleaning can be grooved or have the surface milled to improve traction. The liberal use of sand can also help where floors are imperfect. Make sure that cattle can move confidently on your floors.

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NEW! AgMaps Portal and Agricultural Information Atlas Application Help Tutorial Series

Just launched!

The Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has a new series of tutorials to help you use the Agricultural Information Atlas (AIA), an online application that allows you to create custom maps and find agricultural information for Ontario. You can find the AIA link on the AgMaps Geographic Information Portal at ontario.ca/agmaps, the ministry's single access point for geospatial data.

The AgMaps Portal and AIA Application Help Tutorial Series provides step-by-step instructions on how to use the AIA for your farm or business. The audio/visual series helps with a range of topics – from navigating the application and creating layers on your custom maps, to creating tile drainage maps and nutrient management strategy farm sketches.

Find the 13 tutorials on the OMAFRA website (www.omafra.gov.on.ca/english/landuse/gis/agatlas-help.htm).

For more information, contact the Agricultural Information Contact Centre at 1-877-424-1300 or ag.info.omafra@ontario.ca.