Under One Roof

Summer Field Day for Producers

June 18, 2019

Livestock and Forage Centre of Excellence
(facilities south of Clavet)

University of Saskatchewan

UNIVERSITY OF SASKATCHEWAN

Schedule

9:30 am	Coffee and tradeshow opens
10 am	Welcome and opening remarks
10:30 am	Under One Roof: Coordination and collaboration for the advancement of our industry Anne Wasko, Chair of the Canadian Roundtable for Sustainable Beef and a member of the Saskatchewan Agriculture Development Fund advisory committee
11:15 am	LFCE overview Kris Ringwall, Director, Livestock and Forage Centre of Excellence
11:30 am	Beef-on-a-Bun Lunch, compliments of the Termuende Trust Fund
12:30 pm	Pens, Plots and Paddocks Tour *See next page for a list of research presentations*
4:15 pm	Closing remarks
4:30 pm	Safe travels!

Agenda subject to change.

Please choose one of our four buses for the tour that will take you to each of the following research presentations.

Bovine tuberculosis and reproductive research in bison: Where we are and where we are going

Dr. Gregg P. Adams, Professor, Department of Veterinary Biomedical Sciences, Western College of Veterinary Medicine

Dr. Todd K. Shury, Adjunct Professor, Department of Veterinary Pathology, Western College of Veterinary Medicine, and Parks Canada wildlife veterinarian

Breeding to improve biomass yield and quality in forage barley and oat varieties

Dr. Aaron Beattie (PhD), Associate Professor, Department of Plant Sciences and Crop Development Centre, College of Agriculture and Bioresources, and Ministry of Agriculture Strategic Research Program (SRP) Chair in Barley and Oat Breeding and Genetics

The effects of sulphates in water on beef cattle performance and feed intake

Leah Clark (MSc, PAg), Provincial Cattle Specialist, Saskatchewan Ministry of Agriculture

Colby Elford (BSc, PAg), Livestock and Feed Extension Specialist, Agriculture Knowledge Centre, Saskatchewan Ministry of Agriculture

Evaluation of BRSV and BHV specific antibody responses between heterologous and homologous prime-boost vaccinated western Canadian beef calves

Dr. Nathan Erickson, Assistant Professor, Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine

Environmental monitoring at the LFCE

Dr. Terry Fonstad (PhD), Associate Dean Research and Partnerships, and Associate Professor, College of Engineering

Crystal Rinas (MSc, PEng), Research Engineer, Department of Civil and Geological Engineering, College of Engineering

Toe-tip necrosis: What we know and how to control the disease

Dr. Murray Jelinski, Professor, Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine

Forage systems: Managing soil, water, plant and animal interfaces

Dr. H. A. (Bart) Lardner (PhD), Professor, Department of Animal and Poultry Science, College of Agriculture and Bioresources, and Ministry of Agriculture Strategic Research Program (SRP) Chair in Cow-Calf and Forage Systems

Cow-calf management practice adoption in Western Canada and beyond

Kathy Larson (MSc, PAg), Extension Economist and Research Associate, Department of Agriculture and Resource Economics, College of Agriculture and Bioresources

Integrated management approach to optimize red clover seed production in Saskatchewan

Dan Malamura, Master of Science student, Department of Plant Sciences, College of Agriculture and Bioresources (supervisor Dr. Sean Praeger (PhD))

Improving beef cattle health and welfare through the study of animal behaviour

Dr. Diego Moya, Assistant Professor, Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine

Barley grain processing: How important is the method and severity?

Coleman Nixdorff, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (supervisor: Dr. Greg Penner (PhD))

Evaluation of triticale varieties compared to barley as silage in beef backgrounding programs

Brittany Ross, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (supervisor: Dr. Bart Lardner (PhD))

Manure and soil management research at the LFCE

Dr. Jeff Schoenau (PhD, PAg), Professor, Department of Soil Science, College of Agriculture and Bioresources, and Ministry of Agriculture Strategic Research Program (SRP) Chair in Soil Nutrient Management

The economics of extended forage backgrounding in conventional and non-conventional beef production systems

Janelle Smith, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (supervisors: Dr. John McKinnon (PhD) and Dr. Bart Lardner (PhD))

Bovine tuberculosis and reproductive research in bison: Where we are and where we are going

Dr. Gregg P. Adams, Professor, Department of Veterinary Biomedical Sciences, Western College of Veterinary Medicine

Dr. Todd K. Shury, Adjunct Professor, Department of Veterinary Pathology, Western College of Veterinary Medicine, and Parks Canada wildlife veterinarian

Adams

Shury

There is a critical lack of genetic diversity among herds comprising North America's meta-population of plains and wood bison. In addition, there are threats of ongoing loss as a result of endemic disease and stochastic events in small geographically isolated herds. One solution is the production of disease-free gametes and embryos (germ plasm) from genetically isolated and valuable herds. The use and transport of germ plasm, rather than live animals, minimizes the biosecurity risks associated with reportable diseases (e.g., brucellosis and tuberculosis), and will enable establishment of healthy seed-stock for replenishing herds threatened by genetic bottlenecks and endemic disease.

Successful establishment and use of a genome biobank for bison will benefit all levels of government by enabling more effective and efficient wildlife management, as well as protecting the agricultural livestock sector, food inspection, and human health and safety. The Bison Research Group – a consortium composed of federal, provincial and territorial governments, Canadian universities and zoological parks, commercial bison producers, and the World Wildlife Fund, was established at the University of Saskatchewan in 2006. The principal objective was to study the reproductive biology of bison and develop assisted reproductive techniques that would allow us to create and use a bison genome biobank—a world-class facility to store and preserve the bison genome. Through their work at the LFCE Goodale Farm, the Bison Research Group has produced the world's first bison offspring from frozen embryos and semen, documenting the feasibility of creating a bison genome biobank to address the barriers to species recovery.

Very little is known about how recently developed diagnostic tests for tuberculosis perform in bison, nor is much known about how vaccines against this disease developed in other species work in bison. Despite bison being infected with this bacteria for almost 100 years in the area around Wood Buffalo National Park, there are few available tools to manage the threat of transmission of this disease to surrounding cattle and disease-free bison herds in northern Alberta and the Northwest Territories. Both agriculture and conservation stand to benefit from this research. The bison industry needs diagnostic tests for bovine tuberculosis that utilize a single blood test, rather than multiple handlings using current skin test regimes. From a conservation standpoint, we hope this research will lead to science-based alternatives to manage diseased bison in northern Canada and prevent transmission of tuberculosis to cattle and non-infected bison herds.

This research is being led by Parks Canada and funded by the Canadian Bison Association and will develop an infection model for bovine tuberculosis in bison that will allow researchers at the Vaccine and Infectious Disease Organization - International Vaccine Centre (VIDO-InterVac) to test vaccines and develop and validate blood-based tests for TB in bison. The first bison infection trial is planned for early 2020, with subsequent trials in 2021. Elk Island National Park has provided both wood and plains bison for this research as well as for the reproductive research being conducted at the LFCE.

Research group: Gregg P. Adams, Todd K. Shury, Miranda Zwiefelhofer, J Manuel Palomino, Miriam Cervantes, Steve Yang, Muhammad Anzar, Robert B McCorkell, Gabriela F Mastromonaco, Jaswant Singh, Murray Woodbury

Breeding to improve biomass yield and quality in forage barley and oat varieties

Dr. Aaron Beattie (PhD), Associate Professor, Department of Plant Sciences and Crop Development Centre, College of Agriculture and Bioresources, and Ministry of Agriculture Strategic Research Program (SRP) Chair in Barley and Oat Breeding and Genetics

Barley and oat are widely used for green feed and silage production in Western Canada. Barley has been the crop of choice for swath grazing to reduce winter feeding costs and forage barley is generally higher in nutritional quality than oat. However, oat generally out-yields other cereal crops in high moisture environments such as the Black or Grey-wooded soil zones of Saskatchewan. The two crops are important for both backgrounding and finishing beef cattle, while barley is also a valuable feed source for dairy cattle in Western Canada.

The Crop Development Centre forage barley and oat breeding program is built on several unique attributes. The stay-green trait in oat varieties, such as "CDC Haymaker," keeps the straw green during grain-fill thus making the overall forage more palatable (especially as hay). Within the forage barley program, varieties such as "CDC Cowboy" perform well under drought conditions and newer varieties such as "CDC Maverick" also incorporate the smooth awn trait to reduce the incidence of mouth ulcers. Improvements to these varieties are focused on higher biomass yield, better nutritional quality and disease resistance. For example, FB209, which is currently in the final year of testing, has smooth awns along with 10 per cent higher biomass yield and lower neutral detergent fiber (NDF) than "CDC Cowboy."

Because the economic value of cereal forages for feeding ruminants is dependent not only on their biomass yield, but also their feeding value (e.g., nutritional composition and digestibility), several nutritional traits are being targeted for improvement including neutral detergent fiber digestibility (NDFD). For ruminants fed diets high in forages, increased NDFD corresponds to increased dry matter intake and milk yield in dairy cattle. Similarly, improved average daily gain (ADG) has also been reported for steers fed corn with improved NDF digestibility. Therefore, development of new forage varieties with higher digestible fiber is underway.

Another means to improve the nutritional value of these forages is to reduce acid detergent lignin. The brown-midrib (bmr) mutation in corn has been shown to produce lower lignin content and greater NDFD which results in greater average daily gain (ADG) and gain to feed efficiency (G:F) in steers. This characteristic is also being incorporated into future barley and oat forage varieties. Besides improving fiber digestibility, we continue to improve primary forage quality traits, such as acid detergent fiber (ADF), NDF, protein and starch. In particular, the crude protein content of barley and oat silage has an economic value due to reduced reliance on other protein supplements. To assist in the efficient and cost-effective evaluation of these traits in the breeding program, a NIRS prediction for these traits is being developed.

Finally, to protect the biomass yield potential and nutritional composition of future forage varieties, we are focusing more on incorporating resistance to leaf diseases such as oat crown rust and barley spot blotch, net blotch and scald.

Research group: Aaron Beattie, Bill Biligetu, Gregory Penner

The effects of sulphates in water on beef cattle performance and feed intake

Leah Clark (MSc, PAg), Provincial Cattle Specialist, Saskatchewan Ministry of Agriculture

Colby Elford (BSc, PAg), Livestock and Feed Extension Specialist, Agriculture Knowledge Centre, Saskatchewan Ministry of Agriculture


Clark


Elford

For many years, water quality for livestock has not received the attention it deserves. Recent events and extension initiatives around the province have sparked more interest and questions regarding livestock water quality. For example, in 2017 and 2018, the Ministry of Agriculture's Moose Jaw regional office alone handled 1,120 water samples for livestock producers.

One parameter that continually affects producer's water quality is dissolved sulphates. The issues around water quality, and in particular sulphates, are compounded in years where there is lower than average runoff and rainfall. Evaporation of surface water in the summer concentrates the minerals in the water and often makes the water unusable for livestock. Currently, there is not a cost effective way to remove sulphates at the volume that is needed for a cattle operation. It is well documented that high levels of sulphates in the water affect production by impacting fertility, feed intake, water intake, mineral and immune status and, in extreme cases, may cause animal death.

Sub-clinical production losses due to sulphates are significant and producers would be able to make more effective production decisions if research or demonstration projects could quantify these production losses. It has become clear that we need current research to make practical recommendations for sulphates in water used for cattle production.

This trial attempts to determine the effects of different levels of dissolved sulphates on heifer blood mineral levels, water intake, feed intake and weight gains. The information gained through this trial will directly affect recommendations to producers facing elevated levels of sulphates in their water.

Evaluation of BRSV and BHV specific antibody responses between heterologous and homologous prime-boost vaccinated western Canadian beef calves

Dr. Nathan Erickson, Assistant Professor, Department of Large Animal Clinical Sciences

Bovine respiratory disease (BRD) is an economically important cause of morbidity and mortality in beef calves. Control of BRD is most often addressed through "homologous" vaccination utilizing the same injectable modified-live viral (MLV) vaccines for both priming and boosting. Heterologous prime-boosting uses different routes and antigenic forms for priming and boosting. In this study, three vaccine protocols were compared:

- an injectable modified-live viral (IJ-MLV) group with IJ-MLV priming at approximately 45 days and boosted with IJ-MLV at weaning,
- intranasal modified-live viral (IN-MLV) group with intranasal priming IN-MLV at approximately 24 hours and boosted twice with an IJ-MLV, and
- intranasal killed viral (IN-KV) group, primed with an IN-MLV at approximately 24 hours and boosted twice with an injectable killed viral (IJ-KV).

Serum antibody concentrations determined by enzyme-linked immunosorbent assays (ELISA) were compared and the IN-KV group had significantly higher bovine respiratory syncytial virus (BRSV) specific antibody concentrations after boosting compared to the two homologous groups. No differences in bovine herpes virus (BHV) specific antibody concentrations were observed between any of the groups.

It is important to note that a portion of the calves in this trial were used as part of a BRSV challenge study. The challenge study results were consistent with the antibody concentration findings for BRSV. The IN-KV calves had fewer clinical signs of infection. Also, the challenge study observed arterial blood oxygenation (PaO2) as an indication of pulmonary function and the IN-MLV calves had significantly reduced PaO2, thus showing a more severe effect of BRSV infection.

Environmental monitoring at the LFCE

Dr. Terry Fonstad (PhD), Associate Dean Research and Partnerships, and Associate Professor, College of Engineering

Crystal Rinas (MSc, PEng), Research Engineer, Department of Civil and Geological Engineering, College of Engineering

The LFCE presents the opportunity to study any environmental impact of intensive cattle feeding operations on a greenfield site. Nothing like this has been completed to this extent in Canada. We will fill this considerable knowledge gap through environmental monitoring at the LFCE from its initial greenfield state through its entire life cycle. This will help us to develop best management practices designed to mitigate any associated environmental effects.

The intensive cattle feeding operations at the LFCE include a 1,500-head capacity beef cattle feedlot. The construction of this facility was completed in the spring of 2018. This project provided a unique research opportunity to collect baseline data before cattle were present at the site and to continue collecting data as the site undergoes changes through the first several cycles of cattle through the feedlot and throughout the life of the facility.

There is little to no information regarding the impact of intensive cattle feeding operations on the local hydrogeology (groundwater table and gradients). Intensive cattle feeding operations are generally permitted based on a site investigation and characterization completed prior to construction of the facilities. At the time of the site investigation, there may or may not be any cattle at the site and the water supply for the facility is often not developed or is not used to the extent it will be when the facility is operational. This means that both horizontal and vertical groundwater gradients, along with groundwater table elevations, may change significantly during operation compared to the time of initial investigation for permitting.

The baseline data component of the research included the installation of environmental monitoring equipment including borehole sampling, standpipe piezometers, vibrating wire piezometers, soil moisture and conductivity sensors, surface water sampling, and meteorological stations. Many of these sensors have the capability for real-time data collection. Over a multi-year period, we obtained baseline data on the pre-existing nutrient levels, the exchangeable and extractable water chemistry, and other characteristics of the soil, surface water, and groundwater. A local hydrogeological model was created to capture the baseline hydrogeological properties of the site.

Cattle were introduced to the facility in the summer of 2018. The environmental monitoring equipment will continue to collect data which will be used to evaluate changes in the soil, surface water, and ground water resulting from operation of the feedlot.

Toe-tip necrosis: What we know and how to control the disease

Dr. Murray Jelinski, Professor, Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine

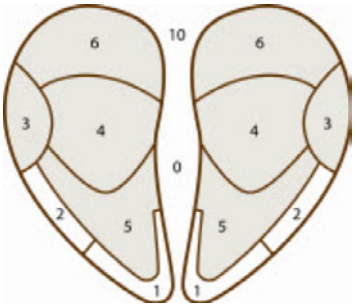


Figure 1

Figure 2

Toe tip necrosis syndrome (TTNS) is a lameness primarily of feedlot cattle, and is known by many other names: toe abscess, toe necrosis, toe tip necrosis, toe ulcer and P3 necrosis. Briefly, TTNS is primarily a hind claw disease and most cases develop within days to weeks of arrival at the feedlot. While random cases of the disease occur, we also see outbreaks in which 50 per cent of the animals are affected. The "abrasion theory" speculates that during shipping and handling the cattle abrade the apex or tips of the toes, resulting in a loss in the integrity of the white line. There are also reports of excessive foot trimming, particularly with hoof grinders that may cause TTNS.

Figure 1. This is a standardized "claw map" used by researchers to describe the location of lesions. Toe necrosis occurs in zones 1 and 2 along the apex or point of the claw. This is also where toe abscesses are located, and if the infection spreads then it may underrun the sole (zone 5). The white line is represented by zones 1 and 2 and is where separation occurs. (Graphic courtesy of Dr. Chad Paetsch)

Studies by our research group have shown that cattle with TTNS have a thinner white line than do cattle without the disease, suggesting that cattle develop excessive wear along the white line. It is also notable that the first published reports in the 1970s and 1980s suggested that abrasive flooring such as etched concrete might be associated with the disease. Furthermore, high-strung cattle and cattle coming off wet pastures were more likely to develop this disease. We would have to agree with all these proposed risk factors. It has been our experience that outbreaks of the disease are associated with high-strung cattle. We can all appreciate that agitated cattle in chutes will frequently push on the animals ahead of them. In doing so they generate tremendous forces with their heavily muscled hind limbs. At some point the claws lose traction and they rasp the tips of the toes on the flooring. This rasping is made worse if the flooring is abrasive such as brushed or etched concrete. Another factor is if the hoof tissue (horn) is soft, which is associated with moist pasture conditions. We have also found that there may be a relationship between mineral deficiencies and this disease; however, more work is needed.

Figure 2. This shows three different cases of TTNS, essentially from mild to extreme. The far right picture shows that the infection has reached the P3 bone and has caused extensive necrosis. Three photographs of toe tip necrosis syndrome with varying degrees of infection. (Photos courtesy of Dr. Chad Paetsch)

This is an extremely difficult disease to treat once the coffin bone is infected. This is almost exclusively a high limb lameness and hence this disease should be at the top of the list of consideration in animals that have been on feed less than a month and have a hind end lameness that is not associated with any other obvious source of the lameness (injury, foot rot etc). Diagnosis is confirmed by nipping the ends of the toes and looking for a black tissue and a dark discharge. While this nipping helps with drainage, antibiotics should also be given. Early diagnosis and treatment is critical.

Prevention is predicated on minimizing exposure to coarse flooring. Proper handling of cattle to ensure they are not pushing and slipping in the chutes is particularly important when handling fractious animals. Consideration should be given to using rubberized flooring or similar flooring that is relatively even and non-abrasive.

Forage systems: Managing soil, water, plant and animal interfaces

Dr. H. A. (Bart) Lardner (PhD), Professor, Department of Animal and Poultry Science, College of Agriculture and Bioresources, and Minstry of Agriculture Strategic Research Program (SRP) Chair in Cow-Calf and Forage Systems

GreenFeed Emission Monitor (GEM)

Limited multi-year studies exist in western Canada comparing novel annual and perennial legumes under grazing, as legumes can improve quality of pasture stands and reduce nitrogen (N) fertilizer rates. There is increasing scrutiny on the sustainability and efficiency of beef production. While perennials can sequester more carbon (C) than annual forages, it is known that cattle consuming forage-based diets tend to produce more methane (CH_4). Given that 85 per cent of feed required to finish ruminants to market comes from forages, there is need to study novel forages in systems where yield, animal performance and profit are not compromised, but additional benefits are derived (reduced CH_4 emissions and improved soil health). With increasing land values, producers using land to grow forages in rotation with annuals want options that may increase biomass and improve soil health, yet enhance nutrient cycling while maximizing water use efficiency in grazing systems. This research will provide Saskatchewan producers utilizing perennial or annual forage systems the necessary detailed information on when to integrate an annual or perennial forage to extend the grazing season with adequate biomass and quality while enhancing grazing animal performance, reducing emissions, sequestering C while preserving soil nutrients and moisture, and realizing the economic efficiencies of the system.

Objectives

- Evaluate animal performance, and kg beef per ha grazing either perennial or annual forage systems utilizing improved cultivars;
- Evaluate grazing dry matter intake (DMI) and forage persistence under grazing;
- Determine soil water balance under perennial or annual pasture systems under western Canadian growing conditions;
- Determine greenhouse gas (GHG) (CH_4, CO_2) emissions grazing either annual or perennial forage pasture systems;
- Determine C and N cycling, as well as biophysical and biochemical characteristics of soils;
- Determine systems costs and net returns for annual and perennial forage systems.

Materials and methods

A four-year study (2019, 2020, 2021, 2022) will be conducted at LFCE Forage and Cow-Calf Unit, Clavet, Sask. In each of the four years, about 100 stocker cattle (approximately 300 kg or 661 lbs) (n=8/replicate group) will graze either perennial or annual systems for approximately 90 days to determine average daily gain (ADG), backfat and body weight (BW) per hectare.

Perennial Forage Systems will include 45 acres (18 ha) each of either: (1) **AC Success hybrid bromegrass + PS3006 alfalfa** mixture [7+3 kg/ha seed rate]; or (2) **AC Armada meadow bromegrass + AC Mountainview sainfoin** mixture [7+16 kg/ha seed rate]. Perennial mixtures were established in 2018. All mixtures will be managed for weed pressure, persistence and biomass in 2019, 2020, 2021 and 2022.

Annual Forage Systems will include 45 acres (18 ha) each of either: (3) **AC Hazlet fallrye + Frosty Berseem clover** mixture [7+1 kg/ha seed rate]; or (4) **Winfred (kale/turnip) / Gorilla forage brassica + Performance 4010 forage pea + barley** mixture [2+2+6 kg/ha seed rate]. Annual mixtures are established each year and managed for weed pressure, persistence and yield biomass. Planned fertility (nitrogen (N) phosphorus (P) potassium (K) sulphur (S)) will be applied according to soil test results and industry standards. Treatments are arranged in a completely randomized block design with four replications (12 replicate paddocks).

Data collection

Data collection includes forage yield, botanical composition and quality, stocker intake and performance, and CO_2, CH_4 emissions using SF6 tracer gas and GreenFeed Emission Monitor (GEM) techniques. Data will also be collected on soil bulk density, soil carbon (C) and nitrogen (N), supply rates available N, C sequestration, soil moisture/water balance and system economics.

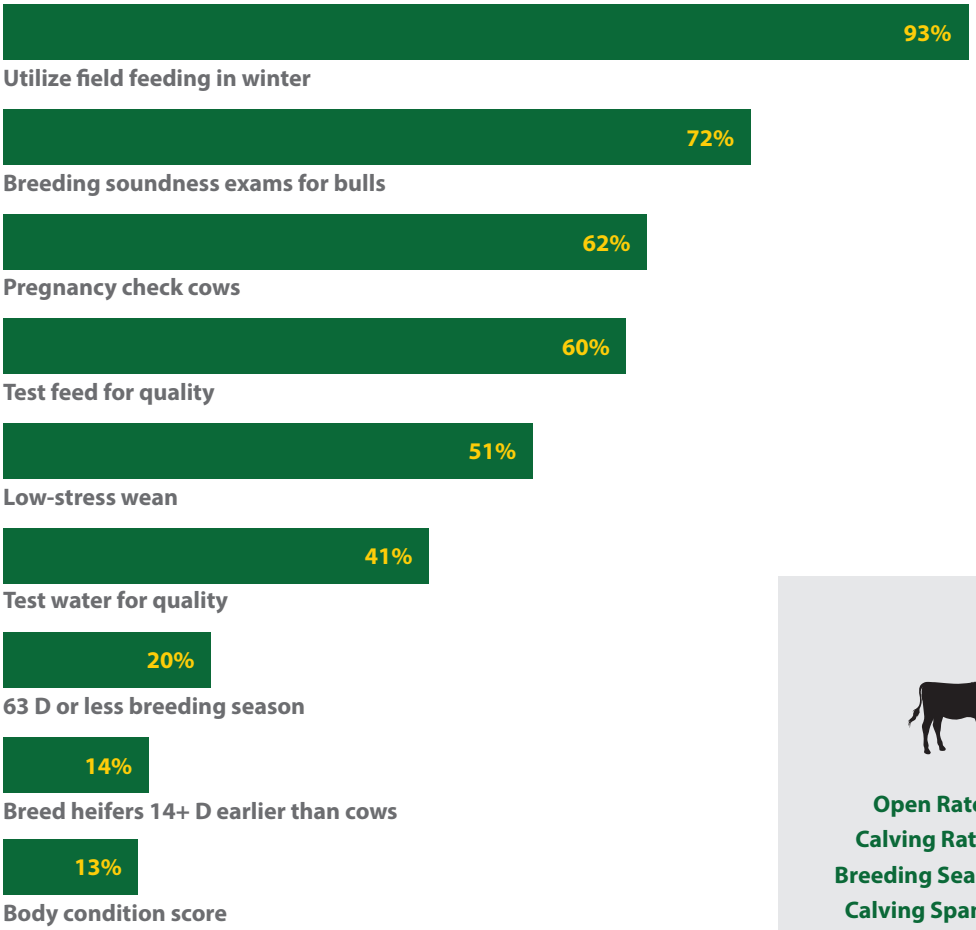
Research group: H.A. (Bart) Lardner, T. Fonstad, J. Schoenau, B. Biligetu, D. Damiran, L. Pearce, K. Larson

Cow-calf management practice adoption in Western Canada and beyond

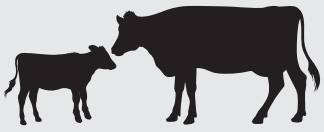
Kathy Larson (MSc, PAg), Extension Economist and Research Associate, Department of Agriculture and Resource Economics, College of Agriculture and Bioresources

In the winter of 2017-2018, the second Western Canadian Cow-Calf Survey was rolled out from British Columbia to Manitoba—more than 260 producers calving a total of 36,300 females completed the survey. The full report can be found at **www.wcccs.ca.**

The WCCCS was a collaborative effort by the provincial producer associations and provincial ministries of agriculture, the Beef Cattle Research Council, CanFax Research and the University of Saskatchewan. Similar surveys were conducted in Ontario, Quebec and Atlantic Canada in 2017 allowing the Beef Cattle Research Council to release a pan-Canadian report on the adoption of cow-calf management practices. That report can be found at www.beefresearch.ca.



Percent of WCCCS II survey respondents adopting recommended practices



Open Rate 8% (Cows) | 12% (Hfrs)
Calving Rate 87% (Cows) | 85% (Hfrs)
Breeding Season 91 d (Cows) | 86 d (Hfrs)
Calving Span 86.5 d (Cows) | 57 d (Hfrs)
Calf Death Loss 5.4% | Wean Rate 85%

Integrated management approach to optimize red clover seed production in Saskatchewan

Dan Malamura, Master of Science student, Department of Plant Sciences,
College of Agriculture and Bioresources (supervisor Dr. Sean Praeger (PhD))

Red clover (Trifolium pratense L.) is an important seed crop in Canada. Single-cut red clover is grown in Western Canada because of its winter-hardiness compared to double-cut red clover. Following alfalfa seed, red clover is the most important crop to Saskatchewan forage seed producers. Besides seed production, red clover is used as a cover crop in cropping systems or a nitrogen source in organic farm operations. There are multiple species of pest insect in red clover; however, lesser clover leaf weevil is one of the most severe. Management of this insect species is accomplished almost exclusively through the application of insecticides and currently deltamethrin (Decis and Poleci) is the single active ingredient registered for the suppression of the insect in Saskatchewan. Both insecticides are toxic to pollinators. In order to ensure a high seed set of red clover, the flowers must be pollinated by an adequate number of bees. To maximize seed production of red clover, we aim to evaluate integrated pest control and agronomic practices.

In this project, we evaluate impacts of seeding rate, insect control, and pollinator community on red clover seed production in Saskatchewan. We assess: (1) Effects of red clover seeding rate on nitrogen (N) fixation and seed production in subsequent years; (2) Effectiveness of insecticides in controlling lesser clover weevils; and (3) Impacts of chemical application (insecticides) on pollinator health in red clover seed production fields. These objectives are being evaluated simultaneously in two locations (Clavet and Melfort). In addition, two commercial locations in the Nipawin area are used exclusively to evaluate the effects of insecticides on lesser clover leaf weevil pressure and the pollinators community.

The primary fields (Clavet and Melfort) were planted using six different seeding rates (0.5, 2.5, 4.5, 6.5, 8.5, 10.5 kg/ha) with a single variety of red clover (cv. Altaswede). Additional grass plots were seeded as a reference crop to evaluate red clover nitrogen fixation in different seeding rates. As well, winterkill of red clover is being evaluated.

In order to compare the efficacy of insecticides on control of lesser clover weevil and its potential impact on pollinators, three different weevil control strategies are being compared (Decis, Exirel, and control). Due to Exirel's lower toxicity to pollinators and rapid protection from feeding damage along with extended residual control, it is essential to estimate its efficiency in red clover for seed production pest management. To estimate the effect of treatments on abundance and diversity of pollinators, the four most commonly used methods are applied: blue vane traps, bee bowls (blue, yellow, and white), yellow sticky cards, and sweep nets.

Improving beef cattle health and welfare through the study of animal behaviour

Dr. Diego Moya, Assistant Professor, Department of Large Animal Clinical Sciences, Western College of Veterinary Medicine

The beef industry is challenged to meet the increasing demand for meat by an exponentially growing population while fulfilling consumer expectations for improved animal welfare standards, reduced use of hormones and antibiotics, and environmental sustainability. The optimization of animal health is paramount to improve beef cattle well-being, reduce the use of antimicrobial treatments, and maximize the efficient use of resources.

The overarching goal of my research program is to provide a better understanding of the interactions between animal behaviour, stress physiology, and disease pathogenesis. Ultimately, I want to develop new strategies to manage high-risk cattle to reduce the incidence of diseases, maximize animal well-being, and therefore reduce the use of antimicrobials and promote an efficient use of resources by the beef cattle industry.

The specific objectives of some of my projects include:

- Study animal behaviours and temperamental traits associated with a higher risk of suffering stress and illness;
- Identify human and animal factors that influence the correct identification and decision-making of feedlot cattle with bovine respiratory disease (BRD);
- Assess the effects of feed flavours to increase diet palatability and stimulate intake of newly received feedlot cattle, with potential effects on growth performance, feeding behaviour, immune system, chronic stress and cattle temperament;
- Assess the effects of local anesthetic administered immediately before castration to improve the pain management for young calves post-castration;
- Develop and validate animal behaviour monitoring methodologies to identify high-risk cattle and their deployment in field situations.

The study of farm animal behaviour has evolved in the last decades from anecdotal observation overridden by performance parameters to a useful tool to evaluate animal health and welfare. As opposed to other livestock production systems, the beef cattle industry still heavily relies on the visual observation by a declining amount of pen checkers to evaluate cattle health and well-being. While peculiarities in farm logistics and profit margins could justify this gap, the improved versatility, functionality and pricing of the new generation of precision livestock farming technologies represent a great opportunity to study their applicability within the beef industry.

The cohesive element around all these experiments is a multidisciplinary team composed of researchers from the Western College of Veterinary Medicine and the College of Agriculture and Bioresources, integrating knowledge and skills from key fields of research for the program, including ethologists, epidemiologists and nutritionists. This holistic approach will allow us to identify connections between different biological systems, and hence develop comprehensive mechanisms of action and strategies to optimize animal health and productivity. Moreover, existing and prospective collaborations with stakeholders and industry partners including beef producers, precision technology manufacturers, and feed additives and drug companies will be strengthened over the length of the program.

Barley grain processing: How important is the method and severity?

Coleman Nixdorff, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (supervisor: Dr. Greg Penner (PhD))

Barley grain is a commonly used cereal grain for beef cattle in Western Canada. To ensure adequate digestibility, barley grain must be adequately processed. The two most common processing approaches are dry rolling and temper rolling. While temper-rolling requires more infrastructure than dry-rolling, tempering reduces risk of fines arising from rolling. However, even with adequately processed barley, fecal starch contents can be high indicating incomplete utilization. Steam-flaking is another process that can be used to process barley, but the required conditions for steam-flaking (steaming duration and flaking density) are not known. Moreover, it is not known whether altering flaking density affects starch availability, feed intake and rumen fermentation, and growth performance of finishing cattle fed barley-based diets.

With funding from the Saskatchewan Barley Development Commission and the Saskatchewan Cattlemen's Association Industry Development Fund, a series of experiments were initiated. Firstly, we tested how flaking conditions alter starch availability. Barley from five independent commercial sources were obtained and conditioned for five, 20, or 35 minutes and then flaked targeting 0.43, 0.34, and 0.25 kg/L flaking densities. Relative to unprocessed barley, flaking durations longer than five minutes did not further increase starch availability indicating that five minutes of flaking is sufficient. Increasing the severity of processing (decreasing flaking density) increased starch availability.

To evaluate feed intake and ruminal fermentation, we have initiated a metabolism study with cannulated cows to compare dry rolled barley to barley that has been steam-flaked for five minutes to produce a fine flake (0.25 kg/L), five minutes to produce a medium flake (0.34 kg/L), five minutes to produce a thick flake (0.43 kg/L), or 20 minutes to produce thin flake. This study has just recently been completed.

Ultimately, producers need information to assess economics of cereal grain processing strategies to determine if investment can be justified. We are currently conducting a growth-performance study to determine the effect of different processing methods (dry roll vs. temper roll vs. steam flaking for five minutes to produce either a medium (0.34 kg/L) or thick flake (0.43 kg/L). This study will provide information on dry matter intake, average daily gain, gain:feed ratio, fecal starch concentration, starch digestibility, carcass weight, yield grade, quality grade, and liver abscess score. These data will be used to generate information on the cost associated with steam-flaking and temper-rolling relative to the performance outcomes.

Research group: Coleman Nixdorff, Adam Shreck (Feedlot Health Management Services Ltd., Okotoks, Alta.), Greg Penner

Evaluation of triticale varieties compared to barley as silage in beef backgrounding programs

Brittany Ross, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (supervisor: Dr. Bart Lardner (PhD))

Backgrounding is a growing sector in the Canadian cattle industry. Backgrounding allows cattle producers to have greater flexibility of their marketable product, allowing them to sell or retain and feed weaned cattle based on the current market situation. Common production practices involve feeding cattle in a background drylot system, focusing on frame and lean tissue growth. Typical background rations consist of 60 to 70 per cent forage and as a result, the quality and cost of forage used can have major impact on a producer's profitability. In Saskatchewan, barley silage is the conventional forage typically used in backgrounding diets. However, recently there has been growing interest in evaluating new varieties of triticale as silage.

Bunker and Taza triticale are both awnletted (reduced awn) standard height varieties developed for use as forages. Bunker and Taza are related species that were developed for their high yielding characteristics and increased protein digestibility. Taza is a newer variety of triticale, and has shown to have higher relative feeding value, similar protein content, and lower acid detergent fiber (ADF) and neutral detergent fiber (NDF) values compared to Bunker. Additionally, triticale has shown to be competitive during drought, extreme temperatures, and extreme soil pH compared to other cereal grains. From a silage perspective, these varieties of triticale could be a competitive option in western Canada.

A three-year study compared forage yield, quality, intake, steer performance and system costs in drylot backgrounding system with diets containing either Taza or Bunker triticale silage compared to conventional barley silage, and evaluated triticale crop potential in the central Saskatchewan climate. Over three years, Taza and Bunker triticale had similar dry matter (DM) yield (6,750 kg DM ha-1 and 6,592 kg DM ha-1, respectively), but greater (probability (P) < 0.05) yield compared to barley (6,008 kg DM ha-1).

Over two years, steer performance did not differ (P > 0.05) for steer average daily gain, dry matter intake, or feed to gain. Cost per head per day was lowest for Taza triticale silage fed steers at $2.03 hd/d, followed by barley silage at $2.06 hd/d and Bunker triticale silage at $2.14 hd/day. Total cost of gain for Taza, Bunker and barley fed steers was $1.35, $1.40 and $1.34 per kg of gain ($0.64, $0.67 and $0.63 per lb of gain), respectively.

Study results suggest Taza and Bunker triticale varieties are viable alternatives for silage production based on steer performance, crop production, and feeding costs. Comparing the two varieties of triticale, Taza triticale performed slightly better than Bunker triticale, as Taza had higher DM yield and lower cost of gain compared to Bunker.

Manure and soil management research at the LFCE

Dr. Jeff Schoenau (PhD, PAg), Ministry of Agriculture Strategic Research Program (SRP) Chair in Soil Nutrient Management and Professor, Department of Soil Science, College of Agriculture and Bioresources

Manure

To ensure a sustainable livestock industry in Saskatchewan, information is needed to provide a sound, scientific basis for recommendations and guidelines for sustainable land application of the manure produced. The means to maximize benefits from feedlot cattle manure applied to cropland as a source of plant nutrients and organic matter, all the while minimizing impacts on water and air, is addressed through precision manure management research conducted on lands surrounding the LFCE Beef Cattle Research and Teaching Unit.

The general objective is to evaluate agronomic and environmental performance of cattle manure applications made at constant (traditional) and variable (precision) rates in comparison to commercial fertilizer alone. The study is conducted on a landscape/ watershed scale and involves researchers and students from departments of soil science, animal science, environmental engineering, and the National Water Research Institute.

We are investigating agronomic nutrient response and loss mechanisms, along with impacts on soil and water quality, greenhouse gas production and carbon storage and cycling. We are also evaluating the suitability of beneficial management practices in enhancing the benefits from cattle manure and nutrients. In 2018, we selected replicate watersheds within treatment zones and took measurements of baseline properties of the soil, crop and water within each of the watersheds. In 2019, the first applications of manure from the BCRTU feedlot are made, with measurements to continue for the following three years.

Forage/grazing systems

The impact of novel forage and cover crop systems on economics, animal performance, forage yield and intake, and soil fertility and quality is examined in multi-disciplinary research involving collaboration between animal science, plant science and soil science researchers. Work at the LFCE Termuende Ranch is evaluating how bloat-free legumes affect feed efficiency, enteric methane production, carbon and nitrogen inputs and soil carbon sequestration. In another collaborative study, the impacts of polycrop mixtures versus traditional monoculture (barley) used for extended grazing are evaluated, including effects on soil carbon and nitrogen stores and cycling. At the LFCE Forage and Cow-Calf Research and Teaching Unit, new studies comparing novel grass-legume mixture performance, including salt-tolerant species, will begin in 2019. A component of this work is to assess the effects of the different forage mixtures on soil properties including carbon, nutrients and salinity over time.

The economics of extended forage backgrounding in conventional and non-conventional beef production systems

Janelle Smith, Master of Science student, Department of Animal and Poultry Science, College of Agriculture and Bioresources (Supervisors: Dr. John McKinnon (PhD) and Dr. Bart Lardner (PhD))

Calf weight at weaning is a critical factor when determining the finishing management program. Larger calves at weaning can transition successfully directly to a high-grain finishing ration. However, lighter calves at weaning show better performance at slaughter when first backgrounded on high- forage diets previous to finishing. Increasing the forage component of diets can potentially reduce feeding costs and improve slaughter performance.

As well, in recent years there has been increased consumer and retailer interest in the non-conventional or natural beef market. Natural beef, while not formally regulated, generally involves omitting all growth promotants: hormone implants, antibiotics and feed additives. Removal of these technologies will have negative effects on growth and feed efficiency, but there has been little research in Western Canada to quantify the performance differences of natural versus conventional post-weaning management. This project examines economic and production differences under modern post-weaning management systems with or without the use of growth promotant technology to aid producers in profitability maximization.

This research study has three objectives. First, it aims to compare three methods of raising cattle post-weaning : direct finishing, backgrounding as a short yearling for spring feedlot entry, or backgrounding as a long yearling on grass for fall feedlot entry. This is to determine the effects of expanded forage feeding on overall system performance and return. Secondly, the study aims to determine differences in performance in terms of growth, days on feed, carcass quality and economic return on cattle raised under conventional versus natural management. Lastly, the information obtained from the study will be used to determine an economic premium required to raise natural cattle profitably in Western Canada.

Year one of the study has been completed, with 240 steers total being fed from weaning in fall to slaughter. Steers were allocated to their three management regimes based on weight, with 80 animals in each treatment: Heavy (650 lb average), medium (550 lb average) and light (450 lb average). Half the animals were allocated to conventional and half to natural management within each treatment. Conventional animals across all treatments received the appropriate hormone implants for receiving, backgrounding, grazing and finishing. On arrival, antibiotics were administered as a preventive measure. Throughout the drylot feeding period, monensin and tylosin were included in the diet for feed efficiency and liver abscess prevention. Natural animals did not receive any growth promotion technologies throughout their feeding period, but were otherwise fed and managed similar to the conventional counterparts.

Heavy animals were put directly on a finishing diet at a high rate and fed to 1,400 lb final weight. Medium animals were backgrounded on high-forage diets at a slow gain to approximately 800 lb, then put on a finishing diet to 1,400 lb final weight. Light animals were backgrounded over the winter and then grazed over the growing season on a combination of annual fall rye and perennial pastures, then finished similar to the other treatments. After year one, results indicate that there are considerable differences in terms of feed: gain, days on feed and carcass characteristics between natural and conventional animals. Whole-system economic analysis will be presented at the 2019 LFCE field day.

Livestock and Forage Centre of Excellence Grand Opening

October 9, 2018

Thank you to our Under One Roof sponsors

Special thanks to the Termuende Trust Fund, our Beef-on-a-Bun lunch sponsor

Gold Sponsors

Blair's family of companies

BrettYoung DISTINCT BY DESIGN

DATAMARS

Highline MANUFACTURING LTD.

LALLEMAND LALLEMAND ANIMAL NUTRITION

Saskatchewan Angus Association

ANGUS CANADIAN ANGUS ASSOCIATION

SCA SASKATCHEWAN CATTLEMEN'S ASSOCIATION

SASKATCHEWAN STOCK GROWERS Association

THE WESTERN PRODUCER

Silver Sponsors

Boehringer Ingelheim

JWW 600

FBC We make life less taxing

FenceFast

FPGenetics

Lamb Acres Electric Fencing

Masterfeeds an Alltech company People Advancing Animal Nutrition

MERCK Animal Health

NEOGEN Canada

SCA Saskatchewan Charolais Association

UNION FORAGE

Bronze Sponsor

Saskatchewan Simmental Association

Notes:

Livestock and Forage Centre of Excellence
lfce.usask.ca **@LFCE_usask**
#UnderOneRoof

Kris Ringwall, Director
kris.ringwall@usask.ca
306-966-2381

Lana Haight, Outreach and Engagement Specialist
lana.haight@usask.ca
Office: 306-966-1934, Cell: 306-371-1934

UNIVERSITY OF SASKATCHEWAN