UNIVERSITY OF ALBERTA

Rangeland Research Institute

‘Precision Ranching’ of Beef Cattle

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Contemporary beef production relies heavily on grazing lands for a significant portion of the cattle production cycle, including in western Canada. Profitable and environmentally sustainable production requires the alignment of forage use across diverse rangeland landscapes with the inherent tolerances of vegetation to grazing. Balancing this forage use in time and space by ensuring the **“right animal is in the right place at the right time”** is the goal of Precision Ranching.

Alignment of forage resources with forage use can be attained two ways. The first involves strategies to physically control where, when, and how often animals graze, such as through the tactical use of mineral or salt placement, controlling water access, manual herding, or the use of physical fencing to confine animals. The second approach is to identify and select cattle with behavioral adaptations that better align ongoing forage use with available resources (habitat types and dietary plants), and in the process optimize cattle weight gain (and that of their calves) while reducing undesirable environmental outcomes (such as over- or under-grazing.

Typical mosaic of habitats used by cattle during the grazing season within the Aspen Parkland region of western Canada.

The University of Alberta ‘Precision Ranching’ project is an ambitious undertaking addressing both of these strategies to improve the sustainability of beef production. The specific objectives of this project are to: 1) Quantify the selection patterns of cattle within complex foraging environments containing multiple habitats (wetlands, grasslands, shrublands, and aspen forest) and evaluate how these patterns vary from summer (during optimal foraging conditions)

through fall (during declining forage quality), 2) Develop and apply novel and cost-effective tools for characterizing the diets of free-ranging cattle having access to diverse pastures, 3) Characterize the energy budgets of free-ranging cattle in space and time, 4) Identify genomic markers for habitat selection, diet selection and cattle activity, and relate these to key economic (e.g., weight gain) and environmental (e.g., enteric methane emission) traits while on pasture, 5) Assess the relationship of the rumen microbiome to diet composition, methane emissions, and cow/calf weight gain, and 6) Explore the utility of virtual fencing for the flexible control of cattle distribution on pasture (as an alternative to permanent fencing).

The integrated dataset from this project has the potential to greatly transform the beef industry. While previous studies on feed efficiency are common, many of these have been done under drylot conditions where diets are standardized and behavioral responses of animals are muted, at least compared to those foraging on open pasture. The technology utilized and applied here will have significant implications for 1) Understanding the inherent behavioral adaptations of cattle to western Canadian grazing lands, including their impact on economic and environmental outcomes, 2) Developing selection tools to allow beef producers to screen their cattle to better align their behavioral activity and forage use with intended outcomes, 3) Providing novel tools and methods to facilitate more widespread screening of cattle behavior in the field, and 4) Exploring alternate technologies to improve beef production efficiency, either using genomic selection, or non-invasive, low-cost tools such as virtual fencing.

Cattle grazing within the University of Alberta Kinsella Research Ranch and fitted with various technologies (GPS collars, GPS eartags, and leg-mounted pedometers) enabling the assessment of habitat selection patterns and activity budgets.

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