

PROJECT ABSTRACT

Title of proposal: Evaluation of ecosystem models for beef cattle production

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This project will examine current ecosystem models designed to simulate weaned calf production in cow-calf/pasture operations and feedlot cattle production in confined cattle operations. A primary objective is to develop modules to address deficiencies in existing models and couple or merge these modules with components of known beef cattle/forage production models, which have been proven to be valid, together to strengthen overall model(s) capabilities.

Model development will take place at the University of Lincoln (UNL), Institute of Agricultural and Natural Resources Campus, Lincoln, Nebraska. Related animal studies will be conducted at the UNL Haskell Agricultural Laboratory, Concord, NE and the UNL Dalbey-Hallack Research Station, Virginia, NE.

Hypotheses tested include: 1) Ecosystem models fail to adequately simulate effects of weather parameters on animal production, therefore, these models are deficient when predicting animal output, particularly under adverse climatic conditions and when predicting direct physiological effects of environmental conditions on the animal, and 2) Existing models have limitations for simulating both forage/pasture and beef production, therefore newly developed algorithms and/or modules can be incorporated into these models to address deficiencies.

Thermal indices will be developed which incorporate temperature, other weather elements (e.g. humidity, thermal radiation, and wind) into a model that closely mimics thermal challenges experienced by the animal and related thresholds which indicate an increase in energy expenditure is required to maintain animal homeostasis. Thermal challenges will be identified in the animal based on the animal's metabolic and/or physiological parameters. Physiological indicators of environmental stress will be incorporated into a model to enhance predictive capabilities of the model. The on-going research will continue to develop a grass-growth model, which can be coupled with the NRC model to better simulate performance of cattle grazing pastures. Through testing against existing databases, model deficiencies will be corrected by merging strong components used in existing models, or by developing algorithms to overcome the deficiencies. Actual versus modeled production will serve as a basis for evaluating effectiveness and comparing various production strategies.

This project will provide a basis for developing management strategies for cattle producers in the Great Plains. Other deliverables will include a set of much needed algorithms incorporating physiological indicators of animal stress into beef production models and a beef production model based on nutritional inputs as defined by a grass-growth sub-model. Additional deliverables include national and international abstracts and symposium papers and one or more referred journal articles.