Beef Growing/Finishing Unit

Providing leading edge research in beef production

The beef cattle research area at the ARDC that focuses on growing and finishing beef cattle is often referred to as the feedlot, but research focuses on methods of raising weaned calves to market, which includes growing and finishing beef cattle. The unit purchases approximately 2,500 weaned steer calves in the fall that include private producer cattle and steers from the cow-calf herds at the ARDC.

The unit has 148 research pens that house between 8 and 25 steers each, a 120 Calan gate individual feeding facility, and approximately 400 acres of research pasture. The unit has required Department of Environmental Quality (DEQ) permits for runoff control and nutrient management, and is approved for housing 3,000 head at one time in confinement. Cattle that are grazing either pasture or corn residue fields do not require permitting as they are not confined.

Each winter, approximately 1,500 acres of corn residue fields are grazed, including off the ARDC site on local producer’s fields. It is a pleasure to work with many neighbors and the patience of surrounding landowners for use of their residue is appreciated. The arrangement is generally a win-win situation where a portion of their residue is used for cattle feeding which in turn removes some excess residue from their fields and provides a small stipend in rent.

The beef nutrition unit at the ARDC is utilized to test new feeds, new management, and research emerging issues that are important to beef producers. Research includes byproduct utilization (such as distillers grains and Omega-3 fat), nutrient management, preharvest food safety studies, grain utilization, optimal growing and finishing systems, and growth promoting agents.

The individualized feeding barn is also used for beef nutrition research with both growing and finishing cattle (see page 2 for more information). Steers are either fed in the winter/spring as calf-feds, or grown into yearlings on different forage-based studies, and then used in feedlot experiments for finishing studies in the summer or fall. Carcass performance is also measured on all cattle. A brief description of the main research areas follows.

Byproduct utilization: Research focuses on methods to use wet distillers grains plus solubles, dry distillers grains plus solubles, modified wet distillers grains plus solubles, distillers solubles, and Sweet Bran, or combinations of these. Impacts of removing oil from distillers grains are also of interest. The goal of this research is to optimize the amount of ethanol byproducts in cattle diets, determine the impact of drying on energy values, optimize diet ingredients such as corn processing, roughage amounts, and feed additives when byproducts are fed, and determine the economic optimum amounts in the diet.

- Continued on Page 2

SUPER Loop System Comes to the ARDC

Integrating Agricultural, Algal, and Bioenergy Systems for Nebraska

A new facility is undergoing construction at the ARDC. The SUPER Loop was designed to integrate existing industries in Nebraska, add value from waste streams, and generate energy output. This closed loop system recycles nutrients and byproducts from ethanol, cattle, crop, and algae production. This system fits well for Nebraska as cattle, corn, and ethanol industries are already well established.

Construction of this facility has been ongoing over the past year and is nearing completion. A facility that was constructed in the 1980s has been retrofitted to meet current needs. The site includes a 5,000 gallon anaerobic digester fed with manure from the individual feeding barn at the research feedlot. A greenhouse will be used to scale up algae production to fill the 11 algae ponds (over 12,000 gallons). This system combines several novel concepts and research will be conducted to determine feasibility of the entire system as well as improve efficiencies within the system.

Construction was completed by the ARDC Facilities Operations crew. Daily operation of the site will be managed by ARDC personnel and students from both UNL Departments of Animal Science and Biological Systems Engineering. Funding for the SUPER Loop was provided by the Nebraska Environmental Trust and Nebraska Center for Energy Sciences Research.

- Continued on Page 2

Quick fact... In a state known for grain production, why study algae? Algae has potential as a cattle feed, can be used as a bioenergy source, and some companies are marketing pharmaceutical products produced by algae.

ALGAE

UNL beef production research includes: byproduct utilization, crop residue utilization, production systems, environment-nutrition interaction, starch utilization, growth and feed efficiency enhancement, and E. coli O157:H7 reduction.

Learn the lingo... beef production terms

Yearling – calf that is 1-2 years old

Calf-fed – calves fed in a feedlot after weaning

UNIVERSITY OF NEBRASKA-LINCOLN  *  INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
Recent and expected changes in land use are expected to be extremely valuable in evaluating the impacts of new systems. The resources available at the ARDC are in animal nutrition, soil science, crop production, and livestock production systems. While integrating crops and cattle is not a new idea, management changes facilitating an increase in diversity among cropping systems and efficiency of forage use will be key to the success of these systems. The resources available at the ARDC are in animal nutrition, soil science, crop production, and livestock production systems. While integrating crops and cattle is not a new idea, management changes facilitating an increase in diversity among cropping systems and efficiency of forage use will be key to the success of these systems.

Production systems: Research focuses on optimizing production systems and comparing yearlings to finishing cattle as calf-feds. Interests include determining the optimum rate of gain during the growing season and the time of year. The system also includes a focus on the impact of dietary management on the growth and efficiency of cattle. The research includes studies of cattle on pasture or backgrounded as part of a winter forage-based system. Use of byproducts for growing cattle is an important aspect to this research area. Research has concluded that grazing production systems can be very profitable when grain prices are high, but a decrease in feeding costs are critical to how profitable this system may be.

Environment-nutrition interaction: Numerous research projects focus on increasing nitrogen (N) lost into the air and increasing the amount of manure (N) lost into the soil. A single pass corn residue harvesting system is being evaluated for the effect of supplementation on growth and feed efficiency. Research focuses on quantifying the quality of available forage, developing supplementation and grazing strategies to efficiently utilize the residues, and working with agronomists and soil scientists to evaluate the effects of grazing on subsequent crop production. Treating the residue with calcium oxide and pelleting to improve the feeding value of harvested residues is an additional research focus. In this same area, corn silage is an option for many beef producers and we are exploring new and exciting ways for use of corn silage with growing and finishing cattle.

Growth and feed efficiency enhancement: Research is being conducted to improve cattle performance when fed different corn hybrids with different kernel characteristics, as well as evaluating genetically-enhanced hybrids when fed as grain or as silage. The individualized feeding barn is being used to measure eructated (belched) methane entering packing plants. Our research focus has been on a vaccine developed in Canada that decreases shedding of E. coli O157:H7 by approximately 65%, a direct-fed microbial product that contains lactobacillus acidophilus that decreases shedding by 35%, and different diet strategies that impact shedding such as use of distillers grains. More current research has focused on other pathogenic E. coli called STEC that are normally found in cattle digestive systems. Research also includes development of methods to decrease nitrogen (N) lost into the air and increase the amount of manure (N) lost into the soil.

For more information, research is published annually in the Nebraska Beef Report which can be accessed online at http://beef.unl.edu.

Research support is provided by numerous sources but include industry grants, Nebraska Corn Board, Nebraska Beef Council, the Nebraska Center for Energy Sciences Research, and federal grants. - Galen Erickson, Professor, University of Nebraska–Lincoln Department of Animal Science and Nebraska Extension Beef Specialist

The SUPER Loop system concept consists of five stages: a. Distillers grains and solubles produced by the ethanol plant recycling between each:
1. Crop production (corn)
a. Grain is harvested and used by the ethanol plant
b. DOE-funded research projects focus on evaluating the impact of crop residues on animal nutrition, soil health, crop production, and economics to take a fresh look and integrated production systems. The resources available at the ARDC are extremely valuable in evaluating the impacts of new management tools on various segments of cropping and livestock systems.
Meet the Beef Nutrition Research Team

The faculty involved with research on beef nutrition at the ARDC include: Galen Erickson (faculty supervisor), Jim MacDonald, Terry Klopfenstein (emeritus), Andrea Watson, and Mary Drewnoski. Many faculty collaborate on projects that are managed in this unit include: Samodha Fernando, Rick Rasby, Matt Spangler, Terry Mader (emeritus), and Rick Funston. In addition, research is coordinated with the other beef growing/finishing research being conducted at the Panhandle Research and Extension Center with Matt Luebbe and Karla Jenkins. Approximately 20 graduate students annually have projects focused on beef nutrition and management. Full-time staff that work at the beef nutrition unit implement the research trials in their daily work and do all the feeding and care for the cattle. The beef nutrition unit crew consists of full-time employees that ensure cattle are cared for every day which focus on feeding, health management, and facility maintenance. The crew also works with graduate students in Lincoln to ensure research data are collected with accuracy and precision. The full-time crew includes: Gene Andersen (Mead), Ken Cejka (Weston), Henry Hilscher, manager (Yutan), Mark Kraeger, assistant manager (Avoca), Allison Miller (Yutan), Ken Rezac (Fremont), Tyler Rodman (Wahoo), Matt Sullivan (Prague), and Keith Street (Yutan). Additionally, the feedlot employs undergraduate students and future graduate students that attend class in Lincoln. The crew ranges from 1 to 38 years of service with the University. The seasoned crew members bring a wealth of knowledge and expertise to running the unit efficiently and conducting research to the best of their abilities. Without the full-time crew, the beef nutrition unit would not be as productive as it is nor would the research data collected be of value. At any given time, there are 8 to 12 experiments being conducted and there will normally be between 20 and 30 experiments conducted per year at the beef nutrition unit at the ARDC.


Learn more about ruminant nutrition research and the people involved in the research at: animalscience.unl.edu/ruminant-nutrition
Cover crops have become a popular option to improve soil health, but very little information is available on the effects of removing a portion of cover crop as grazed or harvested forage. Research conducted at the ARDC is evaluating the use of cover crops as a grazed forage resource in different production systems. Three treatments (no cover crop, cover crop without forage removal, and cover crop with forage removal) are being evaluated following wheat harvest, silage harvest, and corn harvest. Animal performance, subsequent crop yields, and soil characteristics are being monitored.

- Galen Erickson, Professor and Nebraska Extension Beef Specialist and Jim MacDonald, Associate Professor -- University of Nebraska–Lincoln Department of Animal Science

Forage yield is measured from cover crop plots following wheat harvest.

### Drylot Cow/Calf Research

About 4 years ago, Dr. Kenneth Eng approached the University of Nebraska about conducting research on using open feedlot pens to "dry lot" cows during part of the production year. Eng spent most of his professional career in the cattle industry in Texas, but is a Nebraska native. To honor his late wife, Caroline, he has donated funds to go towards research on how to increase cattle efficiency in times of stress.

Research on this project has been collaborated with the Godmundsen Sandhills Lab conducted by University researchers Don Adams, Rick Funston and Aaron Stalker with traditional production utilizing grazing and little or no harvested feed.

For the dry lot research, cows are kept in feedlot pens for continuously over three years. The goal is to determine if there are any critical periods in the production cycle where drylot feeding would be a problem. Two potential problems were anticipated—calf-health and rebreeding.

Nebraskans know there is a great difference between Eastern and Western Nebraska. Therefore, the research team chose to replicate the research at the ARDC and the University of Nebraska Panhandle Research and Extension Center research feedlot near Mitchell. There is certainly less mud and humidity and more night cooling in the Panhandle.

Because it is typically muddy in March and April, researchers chose to buy cows bred to calve in June and July. That alleviated the mud issue, but did raise the concern about temperatures at calving. Bred cows were purchased from the Middox Ranch in April 2012 and replacement bred cows in March 2013, 2014 and 2015.

The primary treatment applied has been early weaning (90 days of calf age). The research objectives were to determine if early weaning affected efficiency of feed utilization by the cow/calf pair if and reproduction was impacted. All cows and calves were fed the same diet—60% wet distillers and 40% corn stall or wheat straw.

Cover crops are grazed at least part of the year. Many producers have expressed that the feedlot and stall grazing offer opportunities to increase cow herds in Nebraska.

Cornstalk residues represent a valuable forage resource for fall/winter grazing and may complement an intensive cow-calf production system because areas with fewer traditional forage resources also tend to favor grain crop production. Results from economic analyses of alternative cow-calf systems suggest that incorporating cornstalk grazing may decrease production costs.

During the fall of 2014, two new treatments were applied, drylot vs. stalk grazing from October to April. The pairs grazed an irrigated field and were supplemented with about 5 lbs. of distillers grains. Cows and calves gained more weight when kept in the feedlot than those grazing corn residue. However, the calves that grazed stalks with their dams still gained 1.44 lbs/day and weighed 538 lbs at weaning. The feed cost in drylot was about $1.70 per day while that on stalks were about $.90.

- Karla Jenkins, Associate Professor and Cow-Calf and Range Management Specialist; Terry Klopfenstein Professor Emeritus; Rick Rasby, Professor and Nebraska Extension Beef Specialist; and Jason Warner, graduate student -- University of Nebraska–Lincoln Department of Animal Science

### Integrated Cropping and Livestock Systems

- Steers graze double crop annual forages (cover crops) following wheat production.

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