2001 Beef Report Summaries

Gene H. Deutscher, Extension Beef Specialist

Reports on recent beef research are briefly summarized.

Cow-Calf

A Comparison of Beef Cattle Crossbreeding Systems Assuming Value-Based Marketing. A study simulated total life-cycle expenses and income to arrive at predicted net returns for crossbreeding systems. Study evaluated 14 breeds and their crosses from data collected at MARC in Nebraska. Optimal use of beef breeds and crossing systems depends on total-industry net returns, not just value of carcasses. Level of feed requirements, milk production and other performance characteristics are important in determining industry value.

June Versus March Calving for the Nebraska Sandhills: Production Traits. Study evaluated if labor and purchased inputs could be reduced and profitability improved by matching calving date with nutrient content of grazed forages. By moving March calving to June, about 2 tons of harvested feed/cow was replaced by grazing. Feeding and calving labor of mature cows was 61% lower for the June versus March system. Weaning rates were similar for both systems; however, June calves were 70 lbs lighter when weaned in January, at same age as March calves.

June versus March Calving for the Nebraska Sandhills: Economic Comparisons. Costs and returns of June and March calving systems were compared at four production phases. Financial costs of the June system to calf weaning were lowest. Post-weaning financial and economic costs at each phase were nearly identical. Net returns for June-born steers sold at January weaning were greater than for March-born steers sold at October weaning due to lower costs and higher market prices. Net returns were highest for June steers retained as yearlings and finished, and highest for March steers finished as calf-feds.

June versus March Calving for the Nebraska Sandhills: Economic Risk Analysis. Price risk analysis of economic and financial net returns from June and March calving systems was used to rank preferred production/sale strategies according to risk preferences of producers. In economic analysis, selling a June-born steer at weaning in January was preferred. Post-weaning, selling a June-born finished yearling steer was ranked highest. Analysis of financial net returns identified selling a June-born yearling steer prior to summer grazing as preferred.

Protein Supplements and Performance of Cows and Calves in June-Calving Production Systems. June calving cows that received protein supplement while lactating during January through March maintained a lower body condition than dry June cows. June-born steers wintered at a low rate of gain had higher daily gains on sub-irrigated meadow during May, than June-born steers wintered at a higher rate of gain. Supplemental protein fed during summer grazing on range increased gains for steers.

Performance and Economics of Winter Supplementing Pregnant Heifers Based on the Metabolizable Protein System. During two years, pregnant, March calving heifers (2,375 head) on a cooperating ranch were used to evaluate production and economics of supplementation (September to February) to meet metabolizable protein or CP requirements. In three out of four experiments, heifers fed metabolizable protein had higher pregnancy rates and expected profitability, than CP heifers. Supplementing metabolizable protein may improve 2-year-old cow pregnancy and profitability.

Forage Intake and Nutrient Balance of Heifers Grazing Sandhills Winter Range. During two years, pregnant, March calving heifers (2,375 head) on a cooperating ranch were used to evaluate production and economics of supplementation (September to February) to meet metabolizable protein or CP requirements. In three out of four experiments, heifers fed metabolizable protein had higher pregnancy rates and expected profitability, than CP heifers. Supplementing metabolizable protein may improve 2-year-old cow pregnancy and profitability.

Summer Grazing and Fall Grazing Pressure Effects on Protein Content and Digestibility of Fall Range Diets. In 1997 and 1998, four paddocks of Sandhills range were used to examine summer and fall grazing pressure effects. In 1997, diet protein and digestibility declined with increasing grazing pressure. In 1998, there were no effects of grazing pressure on fall diet protein or digestibility. July grazing reduced fall diet protein compared to June grazing. Summer grazing reduced fall diet protein compared to no grazing.

Annual Forage Production and Quality Trials. Two-year forage trials showed higher dry matter yields for winter triticale than for winter wheat while forage qualities were similar. A spring triticale had higher dry matter yields than spring barley or oats with similar forage qualities. Forage
crude protein, digestibility and available energy in small grain and sorghum forages will vary significantly with maturity at harvest. Sorghum hybrids containing the brown midrib trait have higher digestibility.

Growing

Compensatory Growth and Slaughter Breakevens of Yearling Cattle. A two-year summary of growing/finishing systems indicated that steer calves wintered at 1.5 lb/day had lower slaughter breakeven costs compared to animals wintered at 0.5 lb/day. Restricting animal gain over the winter resulted in 25-32% compensation on grass. Comparison of growing/finishing systems showed steers wintered at 1.5 lb/day profited $28.85/hd compared to steers wintered at 0.5 lb/day at loss of $30.24/hd or calf finishing at loss of $20.87/hd.

Undegradable Intake Protein Supplementation of Compensating, Grazing Steers. Trial was conducted to evaluate previous winter gain on response to undegradable intake protein (UIP) supplementation during summer grazing. Steers wintered at FAST gain had greater response to UIP supplementation than steers with SLOW gain. Maximum response for FAST cattle occurred at 150 g/d of supplemental UIP. Forage DM intake was similar for FAST and SLOW cattle. Increased gains from supplementation were not maintained during the finishing phase.

Undegradable Intake Protein Content of Corn Steep Compared to Soybean Meal. Thirty calves were used in a growth trial to evaluate protein efficiency of corn steep compared to soybean meal. Calves were individually fed a base diet plus soybean meal or corn steep at graded levels replacing urea. In vitro ammonia release analyses showed the protein in both corn steep and soybean meal to be about 30% undegradable in the rumen. Protein efficiency was similar for calves in both groups.

Utilization of Bt Corn Hybrids in Growing Beef Steers. Two trials evaluated the efficacy of Bt corn hybrids for growing steers. Trial 1 evaluated Bt and non-Bt corn fields for grazing performance. Trial 2 compared Bt and non Bt corn hybrids in corn silage-based growing diets. No differences in performance or grazing preference were observed between N7333 Bt or non-Bt residue. Steers fed corn silage from hybrids N4242 gained 11% faster than those fed N7333 hybrids. The feeding value of corn residue or silage is similar between Bt and non-Bt corn hybrids.

Wet Corn Gluten Feed Supplementation of Calves Grazing Corn Residue. Incremental levels of wet corn gluten feed were fed to calves grazing corn residues. Economic analysis indicated wet corn gluten feed will increase weight gain and stocking rate on corn residue and reduce winter costs. Wet corn gluten feed should be fed at 3.5 to 6.0 lb DM/day. Feeding 6.0 lb DM/head/day can result in 1.8 to 1.9 lb/day gain.

Impact of Grazing Corn Stalks in the Spring on Crop Yields. A two-year experiment evaluated grazing corn residue during the spring on subsequent soybean yields. Tillage treatments of ridge-till, fall-till, spring-till and no-till were evaluated to alleviate compaction. In general, grazing treatments increased yields and specifically in the ridge-till and no-till systems. Residue cover was more sensitive to tillage than grazing and both decreased residue.

Finishing

Economic Returns of Wet Byproducts as Cattle Feed. Research at UNL and other institutions has demonstrated the feasibility of feeding corn sweetener/ethanol industry byproducts directly to cattle in wet form, rather than as dried feeds. Using experimental results, survey data and market prices, the average value of these wet feed products is about $130 per ton of DM compared to their value as dried feed of $93 per ton. Over a million tons of wet byproducts are now being fed in Nebraska, with net benefits of $42 million per year.

Urinary Allantoin Excretion of Finishing Steers: Effects of Grain Adaptation and Wet Milling Byproduct Feeding. A metabolism trial investigated microbial protein supply. In Phase I, cattle were adapted to a dry-rolled corn diet. Urinary allantoin excretion was positively correlated with TDN supply. In Phase II, cattle were fed diets including corn steep liquor or distillers' solubles. Steep liquor and distiller solubles did not stimulate microbial crude protein supply, as measured by allantoin excretion. Rumen pH correlated with microbial crude protein supply.

Programmed Gain Finishing Systems In Yearling Steers Fed Dry-rolled Corn or Wet-Corn Gluten Feed Finishing Diets. Yearling steers were used in a programmed gain finishing system. The 100-day programmed gain phase of a 161-day finishing period reduced daily gain, hot carcass weight, fat thickness and marbling score in diets with and without wet corn gluten feed. Programming gain improved efficiency but reduced net return per animal compared to ad libitum feeding.

Economic Evaluation of Corn Processing for Finishing Cattle. A finishing trial on steers determined that high-moisture corn and steam-flaked corn had 100% and 108% the value of dry-rolled corn, respectively. Estimated costs of corn processing ($/ton) were about $1.50 for dry-rolled corn, $2.20 for high-moisture corn, and $7.00 for steam-flaked corn. Economics of high-moisture corn are dependent on the discount at purchase to dry corn. Economics of steam-flaked corn are attractive at corn prices common in Nebraska.

Effect of Corn Processing on Degradable Intake Protein Requirement of Finishing Cattle. Three finishing trials evaluated diets consisted of 82% processed corn which were either dry-rolled, high-moisture, or steam-flaked. Degradable intake protein levels were achieved by adding urea. Estimates of degradable intake protein requirement were about 6.3% of dietary DM for a dry-rolled corn diet, about 10% of dietary DM for high-moisture corn diet and about 8% of dietary DM for steam-flaked corn diet.

High Moisture and Dry Rolled High Oil Corn for Finishing Feedlot Steers. Finishing steers fed diets containing dry-rolled, high-oil corn had a 2.5% reduction in dry matter intake and 4.2% better feed efficiency than steers fed diets containing dry-rolled, normal corn. Carcass traits did not differ between treatments. Steers fed high-moisture, high-oil corn
had larger ribeye area and greater internal fat than steers fed high moisture, normal corn. No differences in performance or efficiency were detected between these two treatments.

**Corn Processing Method in Finishing Diets Containing Wet Corn Gluten Feed.** Two trials determined effects of corn grain diets differing in degree of processing and containing wet corn gluten feed. Generally, more intensive processing methods such as fine-grinding, high-moisture ensiling, and steam-flaking resulted in lower daily feed consumption compared to feeding rolled or whole corn. Feed efficiency and dietary net energy available for gain tended to be improved by more intensively processing corn in finishing diets containing wet corn gluten feed.

**Implant Programs for Feedlot Heifers using Synovex® Plus™.** Two commercial feedyard experiments evaluated implant strategies. In both experiments, implanting heifers with Synovex Plus increased ADG compared to heifers implanted with Finaplix-H and fed MGA. In one experiment, implanting heifers with Synovex Plus improved feed conversion and increased live basis net returns; and the use of MGA with Synovex Plus increased carcass basis net returns compared with Finaplix-H and MGA.

**Effect of Feeding Pressed Sugar Beet Pulp in Beef Cattle Feedlot Finishing Diets.** Two trials evaluated feeding pressed beet pulp as the roughage. Steers were fed 8.5% corn silage, 8.5% beet pulp, or 12.5% beet pulp in a dry-rolled corn and supplement diet. Average daily gain was highest in the corn silage treatment; but feed to gain conversions were not different among treatments. Beet pulp can serve as a substitute for corn silage with equal feed efficiency.

**Effects of Feeding Regimen on Performance, Behavior and Body Temperature of Feedlot Steers.** Charolais x Angus steers (n=144) were used to evaluate different feeding regimens under environmental heat stress. Treatments were: 1) ad libitum fed at 0800 hr; 2) fed at 1600 hr with bunks empty by 0800 hr; 3) fed 85% of DMI at 1600 hr. Treatments were imposed for 23 days. Over-all performance was not affected by treatment. Altering feed time and amount reduced tympanic temperature and altered eating pattern, thus decreasing risk of heat related losses.

** Restricted Feeding Strategies for Reducing Heat Load of Yearling Steers.** Crossbred steers (n=84) were used to investigate effects of level and duration of limit feeding cattle in a hot environment. Restricting feed intake to 70 to 80% of ad libitum for 21 days or for 42 days reduced tympanic temperature when compared with ad libitum feeding under both thermoneutral and hot conditions. Limit feeding feedlot cattle will enhance animal comfort during periods of heat stress.

**Managing Heat Stress in Feedlot Cattle Using Sprinklers.** Crossbred steers were used to determine effect of water application to feedlot mounds on performance, behavior, and tympanic temperature of steers. Twelve treatment pens were subjected to no water application or water applied in AM or water applied in PM. Water applications lowered soil temperatures of mounds with little effect on temperature-humidity index. Tympanic temperatures of steers were lowered by water treatments. Performance variables were not affected.

**Relationship of the Characteristics of Feedlots Pens to the Percentage of Cattle Shedding Escherichia coli O157:H7 Within the Pen.** Study investigated feedlot pens and percentage of cattle shedding *E. coli* O157:H7. Twenty-nine pens from five feedlots were each sampled once during summer of 1999. Feces were collected from all cattle. *E. coli* O157:H7 was isolated from feces of 23% of 3162 cattle tested, including at least one animal from each pen. Pen prevalence did not differ between feedyards, but vary widely within feedyards; and muddy pens had more prevalence.

**Diagnostic Strategy to Classify Pens of Feedlot Cattle by Prevalence of *E. coli* O157:H7 Fecal Shedding.** Study evaluated two testing strategies to predict percentage of cattle in a pen shedding *E. coli* O157:H7. Culture of a composite fecal sample detected pens with 37% or more cattle shedding *E. coli*. A new test device detected pens with 16% or more individuals shedding. This diagnostic strategy can be used in food-safety research or in monitoring animal production programs to classify pens by percentage of cattle shedding *E. coli* O157:H7.

**Influence of Restricted Intake and Reduced Dietary Starch on Colonic pH and *E. coli* Prevalence.** Ninety feedlot steers were used to test effects of reducing dietary starch and intake on total and acid-resistant coliform and *E. coli* populations, and *E. coli* O157:H7 shedding. Corn bran and wet corn gluten feed diet reduced acid-resistant *E. coli* shedding. Restricting intake increased colonic pH and decreased VFA concentration, but did not affect acid-resistant *E. coli* shedding. Prevalence of *E. coli* O157:H7 was not affected by diet or intake.

**Phosphorus and Nitrogen-Based Beef Cattle Manure or Compost Application to Corn.** Annual or biennial manure or compost application resulted in corn grain yields similar to those with chemical fertilizer application. P-based manure or compost application resulted in similar corn grain yield but significantly less soil P build-up than N-based treatments. Estimated N availability was 40% for manure and 15% for compost in the first year and was 18% for manure and 8% for compost in the second year after application.

**Composting of Feedlot and Dairy Manure: Compost Characteristics and Impact on Crop Yields.** Since 1993, about 17,600 tons of beef feedlot and dairy compost have been spread on 1100 acres. Crop yields were measured to determine the impact of a one-time compost application by using no-compost check strips. Adding compost to irrigated corn, irrigated soybeans and dryland corn acres significantly increased yields, with 4-year average increases of 2.3, 1.5 and 2.7%, respectively. The increased yields from compost applications offset spreading costs.

**Beef Products**

**Consumer Acceptance and Value of Strip Steaks Differing in Marbling and Country-of-Origin.** Consumers visually preferred low marbled steaks. However, high marbled steaks were rated more juicy, tender and desirable in flavor and overall acceptability. Consumers in Chicago (but not San Francisco) were willing to pay more for high marbled steaks.
than low marbled steaks. Domestic steaks were rated higher than Argentine steaks, and consumers were willing to pay more for domestic steaks.

Physical and Chemical Properties of 39 Muscles from the Beef Chuck and Round. Twenty-seven chuck muscles and 12 from the round were analyzed for color, moisture, emulsion capacity, pH, collagen, heme-iron and proximate composition. Physical and chemical properties showed a vast range of results within and among muscles. Knowledge of this variation can lead to proper usage, thereby increasing value of the beef chuck and round. Quality grade had the most effect, whereas yield grade and weight showed fewer effects on these traits across all 39 muscles.

Fiber Type Composition of the Beef Chuck and Round. Fiber type composition of 38 muscles of the beef chuck and round was studied to facilitate optimal muscle use in value-added products. Select grade chucks and rounds were used. Muscles were classified as having either red, white, or intermediate fibers. Nine of 12 round muscles were white, while chuck muscles were equally dispersed between red, intermediate, and white. This variation among muscles of the chuck would create different processing characteristics and influence optimal muscle use.

Effects of Post-Harvest Time and Temperature on Glycolytic Potential of Beef Muscle. Study evaluated post mortem temperature affects and sampling time on glycolytic potential in muscle. Beef longissimus muscles entered rigor mortis at two different temperatures and were sampled at 45 minutes post mortem, rigor mortis and 24 h post mortem. Post mortem temperature had little effect on the glycolytic potential of beef muscle. Glycolytic potential values from samples removed early post mortem were underestimated when compared to samples taken at 24 hour post mortem.

The Role of Muscle Glycogen in Dark Cutting Beef. Dark cutting beef occurs when muscle glycogen levels are depleted prior to slaughter. Without glycogen, lactic acid is not produced in post-mortem muscle, causing a higher than normal muscle pH. This study identified the threshold level of glycogen where the dark cutting condition is likely to occur. Pre-slaughter glycogen levels need to be greater than 80 mmol/kg to prevent the dark cutting beef condition.

New Technology

Dietary Conjugated Linoleic Acids (CLA) and Body Fat Changes. Dietary CLA caused a reduction of body fat in mice approaching 50% but did not cause a loss of total body weight. Mice also experienced programmed cell death of fat cells. Certain CLA isomers are natural components of beef and dairy products but not other foods. Therefore, these observations prompt speculation of an additional health benefit, reduced body fat in humans that eat beef.

Changes to the Purine Assay Improve Purine Recovery and Assay Precision. Experiments tested modifications of purine assay used to estimate micorbial crude protein supply. Changing hydrolysis conditions from 12 normal perchloric acid to 2 normal increased purine recovery. Phosphate buffer yielded greater recovery of purines than acetate buffer and using the extraction solution as a wash was less variable than silver nitrate in .005 molar hydrochloric acid.

Urinary Allantoin Excretion as a Marker of Microbial Crude Protein Supply for Cattle. Two metabolism trials evaluated urinary allantoin excretion as a noninvasive marker of microbial crude protein flow from the rumen. Both urinary allantoin excretion and duodenal pure flow increased as alfalfa intake increased. Markers had a positive linear relationship. An increase in metabolizable energy to the animal did not increase urinary allantoin excretion. Urinary allantoin excretion was an effective marker of microbial crude protein supply.

Evaluation of 1996 Beef Cattle NRC Model and Development of Net Energy Modifiers. Data from 325 treatment means in 35 previous beef cattle feeding studies were used to evaluate the 1996 NRC model for accuracy of gain predictions and to develop predictions of net energy adjuster to use with the model. The model inaccurately predicted gain of cattle fed diets varying in ingredients and energy density. Net energy adjusters were used to achieve accurate prediction of gain for each observation and then new gain prediction equations were developed.