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2008 Nebraska Beef Cattle Report Summaries

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Reports on recent beef research are briefly summarized. The full reports are available in the 2008 Nebraska Beef Report, available from University of Nebraska–Lincoln Extension at <http://www.ianrpubs.unl.edu/e-public/live/mp91/build/mp91.pdf>.

Cow/Calf

Effect of Pre-breeding Weight and MGA Supplementation on Heifer Performance. Net costs to produce a bred yearling heifer and 2-year-old cow were lower when heifers were developed to 50% rather than 55% of mature body weight, regardless of breeding season length. Administration of an oral progestin to heifers developed to 50% of mature body weight prior to breeding did not affect reproductive performance during the first breeding season when heifers were exposed to bulls 13 days after the end of progestin treatment.

Effect of Wintering System and Nutrition Around Breeding on Gain and Reproduction in Heifers. Replacement heifers were developed utilizing cornstalks, winter range, or a dry lot with or without a high energy supplement around breeding. Cornstalk development reduced ADG and percentage pubertal prior to breeding; however, neither first service conception nor pregnancy rates were affected. Cornstalk development does not appear to negatively impact reproduction, although it resulted in lighter calf birth weight compared to winter range.

Pre- and Peri-pubertal Feeding of Melengesterol Acetate (MGA) Alters Testis Characteristics in Bulls. Bulls were fed 1 mg/head/day of MGA from 5.5 to 6.5 months of age; 6.5 to 9 months of age; or fed a control diet. Body weight, scrotal circumference, combined testis weight, testis composition, and testosterone concentration were measured. Feeding MGA prior to puberty increased scrotal circumference and decreased testosterone concentration at 12 months of age compared to controls.

Effects of Summer Climatic Conditions on Body Temperature in Beef Cows. A model was developed to predict daily patterns for internal body temperature of a cow as a function of ambient temperature. Panting scores were recorded and differed across days as cows experienced changes in ambient temperature and humidity. Vaginal and tympanic temperatures were positively correlated, thus tympanic temperature may be used to predict internal body temperature.

Supplementing Beef Cows Grazing Cornstalk Residue with a Distillers Based Cube. Supplementation using a cube that is 2/3 dried distillers grains did not influence calf birth and weaning weights, cow body weight prior to calving, and calving interval. Cow body condition score and percentage of cows cyclic prior to breeding increased for supplemented cows.

Comparison of Crude Protein and Digestibility of Diets of Grazing Cattle at Different Sandhills Range Sites. Diet

samples were collected May - Sept. (2003) and May - Nov. (2004) using esophageally fistulated cows at ranches in the Sandhills and Southwest Nebraska. Differences in CP between the two locations were significant. Diets collected in May and June had higher CP than those collected in Aug.-Nov. Diet digestibility was similar for southwest Nebraska and Sandhills diets.

Determination of Diet Protein and Digestibility of Native Sandhills Upland Range. Samples collected from 2003-2005 at the Gudmundsen Sandhills Laboratory indicated during drought years (2003 and 2004) cows selected plants which were higher in CP and lower in digestibility. High levels of grazing pressure decreased diet IVOMD compared to diets from ungrazed and moderately grazed pastures.

Evaluation of Storage Methods for Wet Distillers Grains Plus Solubles (WDGS) with Added Forages. Six experiments indicated minimum amounts of dry feedstuffs for storage of WDGS in a silo bag, with a constant pressure of 300 psi, were 15% grass hay, 12.5% wheat straw, 22.5% alfalfa hay, 50% dry distillers grains or 60% wet corn gluten feed (WCGF) with the remaining percentage as WDGS (DM basis). For storage of WDGS in bunker silos, recommended levels are 40% grass hay, 30% wheat straw or 30% cornstalks (DM basis).

Growing

Use of Dried Distiller's Grains to Extend Range Capacity. At Gudmundsen Sandhills Lab from mid-June to mid-August for 2 years (2005 and 2006), 24 paddocks were randomly assigned to one of three treatments, control (CON) recommended stocking rate and no supplementation, double stocked (2X) or double stocked with 5 lb of DDGS daily (SUP). There was no difference in ADG between CON and 2X calves; however, SUP calves gained more than unsupplemented groups. Forage utilization was not different between SUP and 2X; however, utilization was lower for CON group. Distillers dried grains supplementation increased ADG; however, DDGS did not replace grazed forage.

Dried Distillers Grains (DDG) Supplementation to Yearling Cattle Grazing Smooth Bromegrass: Response and Performance Profile Summary. Four years of data were summarized to evaluate yearling performance on smooth bromegrass when supplemented with DDG. Daily gains were increased 0.55 lb/day for the entire grazing season. The response to DDG supplementation increases with increasing grazing days.

The Effects of Supplementing Wet Distillers Grains Mixed With Wheat Straw to Growing Steers. Wet distillers grains, dried distillers grains, and a mix of 66% wet distillers grains and 33% wheat straw were evaluated as supplements to a forage based diet. Wet distillers grains and dried distiller's grains produced higher final body weight and dry matter intake compared to the mix. Increasing levels of distillers grains

increased performance in forage based diets and wet grains mixed with straw reduced forage intake.

Forage Quality and Grazing Performance of Beef Cattle Grazing Brown Mid-Rib Grain Sorghum Residue. The grain sorghum hybrid A Wheatland x RTx430 (CON) and its near-isogenic brown midrib counterpart (BRM) were utilized in a residue grazing experiment. ADG increased from 0.75 lb in CON to 1.23 lb in BRM treatments over the grazing period. NDF digestibility increased 6-12% units in leaf fractions in BMR over CON. NDF digestibility of stem fraction increased 14-19% units in BMR over CON. NDF digestibility of the stem fractions remained constant over time.

Beef Feedlot

Meta-Analysis of UNL Feedlot Trials Replacing Corn with Wet Corn Gluten Feed (WCGF). Meta-analysis of UNL feedlot trials evaluated effects of replacing dry-rolled or high-moisture corn with WCGF on feedlot cattle performance and carcass characteristics. Feeding value of WCGF was dependent on ratio of steep to corn bran of the WCGF. Performance of cattle fed WCGF composed of wet bran and steep was similar to corn fed cattle. Feeding and carcass performance of cattle fed WCGF composed of dry bran, steep, and germ improved linearly as dietary inclusion increased.

Meta-Analysis of UNL Feedlot Trials Replacing Corn with Wet Distillers Grains Plus Solubles (WDGS). Meta-analysis of UNL feedlot trials replacing dry-rolled or high-moisture corn with WDGS indicated WDGS fed between 15-40% of diet DM was 130% the feeding value of corn. In most cases, performance estimates and carcass characteristics improved up to 30-40%, then gradually decreased. Feeding WDGS up to 40% of diet DM improved performance and quality grade.

Effect of Inclusion Level of Modified Distillers Grains plus Solubles in Finishing Steers. Modified distillers grains plus solubles (MDGS) was fed at 0, 10, 20, 30, 40, and 50% of the diet (DM basis) replacing dry rolled corn and high moisture corn. The feeding value of MDGS is 123-109% the value of corn as MDGS inclusion increases from 10-50% (DM basis). Except for hot carcass weight and calculated yield grade, no differences in carcass characteristics were observed between treatments.

Effects of Corn Processing and Wet Distillers Grains (WDGS) on Nutrient Metabolism. Intakes were greater while digestibility was reduced for DM and organic matter in ruminally cannulated steers fed 40% compared to 0% distillers grains in diets consisting of dry-rolled, high-moisture, or steam-flaked corn. Average and maximum pH were less for steers fed 40% distillers grains, but pH change and variance were also less for 40% compared to 0% WDGS. Starch intakes were equal whether 0% or 40% WDGS were fed.

Effect of Distillers Grains Fat Level on Digestibility. Forage based diets were supplemented with distillers grains with differing fat levels (6.9% or 13.3% dry matter). Intake and digestibility of DM and organic matter did not differ between treatments. Neutral detergent fiber intake was less and digestibility tended to be less in steers supplemented with high fat distillers grains.

Cattle CODE: An Economic Model for Determining Byproduct Returns for Feedlot Cattle. Four scenarios were evaluated to illustrate how Cattle CODE, Coproduct Optimizer Decision Evaluator works and to show sensitivity to corn price and distance from the ethanol plant. The model predicted positive returns for feeding WDGS, Sweet Bran, or DDGS up to 50% of diet DM and under 100 miles distance from the ethanol plant to the feedlot. The model can be found at beef.unl.edu under the byproduct feeds tab.

Economics of Modified Wet Distillers Grains plus Solubles (MDGS) Use in Feedlots. An analysis was conducted for feeding different levels of MDGS using the economic model, Cattle CODE. Marginal returns to feeding were greatest when feeding MDGS at 30-40% when MDGS was 95% the price of corn, and trucking was 60 miles from the feedlot. When trucking increased to 100 miles, optimum inclusion of MDGS was 20-30%. When MDGS was priced at 75, 85, or 95% of corn price, optimum inclusion was 30-40% with marginal returns of \$38.57, \$26.20, or \$13.83, respectively. Optimum inclusion levels also appeared to be at 30-40% of diet when corn is priced at \$4.70, \$3.70, or \$2.70/bushel.

Influence of Corn Hybrid, Kernel Traits, and Growing Location on Digestibility. Commercially available corn hybrids (n=132), grown in 2 field replications within 3 locations, were evaluated for effects of corn hybrid, kernel traits and growing location on digestibility. A significant hybrid by location interaction occurred for most kernel traits. Results indicated hybrids may be selected for DM digestibility, but digestibility shows no consistent relationship with other kernel traits.

Influence of Corn Hybrid and Processing Method on Finishing Performance and Carcass Characteristics. Five commercially available corn hybrids were evaluated for finishing cattle performance and carcass characteristics when fed as high-moisture (HMC) or dry-rolled corn. Corn hybrid did not affect ADG or DMI, but did have a minor influence on F:G. Results suggest processing as HMC had a greater effect on cattle performance than hybrid.

Influence of Corn Hybrid and Processing Method on Ruminal and Intestinal Digestion. Using the mobile bag technique, 5 commercially available corn hybrids harvested as either dry-rolled or high-moisture corn were evaluated for site and extent of DM and starch digestion. Total-tract DM digestibility was improved 7-16 percentage units, and total-tract starch digestibility was improved 9-18 percentage units among hybrids when processed as high-moisture corn compared to dry-rolled corn.

Nutrient Mass Balance and Performance of Feedlot Cattle Fed Wet Distillers Grains. Replacing corn with WDGS increased ADG response and HCW in two experiments. Feeding WDGS balanced for MP (15%) or in excess of requirements (30%) resulted in more OM in the manure but only more manure N in the winter experiment. Percentage N loss was not different among WDGS level but the amount of N lost was increased when WDGS were fed. Increasing dietary P with WDGS resulted in more phosphorus in the manure.

Aerobic Composting or Anaerobic Stockpiling of Feedlot Manure. Manure stockpiled anaerobically or composted aerobically for 104 days was evaluated. Nitrogen recovery was 85.7, and 56.4% for stockpiled and composted manure, respectively. Organic nitrogen concentrations were greater for composted manure while ammonium nitrogen concentrations were greater for stockpiled manure. Simulation of hot, dry conditions during field application indicated amount of ammonia nitrogen lost from stockpiled manure was not great enough to offset the total nitrogen recovery advantage of this method.

Effects of Distillers Grains and Manure Management on Nutrient Management Plans and Economics. Feed Nutrient Management Plan Economics software (FNMP\$ available at cnmp.unl.edu under software resources) was used. Including distillers grains in diets resulted in greater nutrient excretion, land requirements, and manure hauling distances. Increased cost of manure management from feeding byproducts has potential to be offset by manure fertilizer value. Changing from N-based to a P-based application rate increased amount of land required and costs to apply manure.

When manure was applied at a 4-year P-based rate, spreading costs and application time were reduced compared to a 1-year P-based rate.

Total and Water Soluble Phosphorus Content of Feedlot Cattle Feces and Manure. Manure P from cattle fed feedlot diets containing 0.30 to 0.50% P was 28% water soluble P. The percentage water soluble P of feedlot feces and manure was 41% (not accounting for additional soluble P from urine) and 24%, respectively. Increasing dietary P level increased manure P concentration and water solubility of manure. The water solubility of P in feedlot feces and manure is an indicator of the potential for P runoff from feedlots and fields receiving manure.

Climate Conditions in Bedded Confinement Buildings. Summer season temperatures and THI levels were greatest at the front of the building. In winter, the building (with a curtain) maintained greater temperature, when compared to outside conditions, by decreasing wind speed through the building. Wind speeds through the building were reduced regardless of curtain use.

Modeling Daily Water Intake in Cattle Finished in Feedlots. Simple regression and multiple regression analyses were conducted to estimate factors affecting daily water intake (DWI) of finishing cattle. Seasonal simple linear regression equations were very poor predicting DWI. Best results were obtained with the overall simple regression. The multiple regression analysis showed that daily minimum temperature (or THI), solar radiation, and dry matter intake were the most important factors affecting DWI in cattle finished in feedyards.

Sorting Steers by Weight into Calf-Fed, Summer Yearlings and Fall Yearling Feeding Systems. Sorting steers into feeding periods as calf-feds, summer yearlings and fall yearlings resulted in no differences in performance or average carcass characteristics. Sorting decreased the amount of variation in hot carcass weight and carcasses over 950 lb.

Performance and Economics of Two Calf Wintering Systems. Two wintering systems, cornstalk grazing plus 5 lb/head/day of wet corn gluten feed (WCG) and cornstalk grazing followed by dry lot where steers were fed hay and supplemented 5lb/head/day of WCG were evaluated. While there were no statistical differences in cost of gain, breakeven, or profitability, economics numerically favored steers grazing cornstalks.

Evaluation of Calf-fed and Long Yearling Production with Increasing Corn Price. An economic comparison of calf-fed and long yearling production was conducted to determine the impact of increasing corn price on steer profitability. Profitability of yearlings versus calf-feds increased \$4-6 for each \$1/bu increase in corn price.

The Effect of Delaying Initial Feedlot Implant on Performance and Carcass Characteristics of Calf-fed Steers. Steers in two, 2-year experiments (n=409) were either given an implant at feedlot arrival or implanted 30 days after feedlot entry. In Exp. 1, steer calves were not implanted at branding and in Exp. 2 calves were implanted at branding. There was no difference in feedlot performance for either experiment. However, in Exp. 1 a year by treatment interaction for marbling score suggested delaying implant in calves may affect quality grade.

Effect of Backgrounding Gain, Grazing Length and Dry Distillers Grain (DDG) Consumption on Performance and Carcass Traits of June Born Cattle. June-born cattle were unable to fully compensate during summer grazing for restricted gain during backgrounding. Higher costs associated with increased gain was offset by heavier sale weights. Cattle grazing meadow regrowth had improved feedlot performance and heavier finished weight. Supplementing with DDG during summer grazing decreased forage intake and increased gain, with 1.8 lb/head/day being more cost effective than 5 lb/head/day.

Price Discovery in North and West Central Nebraska Livestock Auction Markets. Price data were used to determine the price discovery and information flow patterns between weight-gender cattle classes using time series analysis and directed acyclical graphs. Steers weighing 400-600 lb were the point of price discovery; the price change of each weight of steers impacted the price of the next heavier class of steers. Price movements for 600-700 lb heifers impacted prices of many other classes including the price of heavier heifers and steers.

The Cattle Price Cycle: Revisited Again. New statistical techniques were applied to historical data to determine if changes in the sector had altered the length of the cattle price cycle. The price cycle was shown to be constant, despite changes in the industry. Feeder cattle prices continued to follow an approximate 10-year cycle. The model demonstrates the consistency of the cycle but shows that unexplained price variations occur suggesting caution be employed when it is used as a marketing guide.

Effect of Excede[®] administered to Calves at Arrival in the Feedlot on Performance and Respiratory Disease. Cattle were given Excede or not on arrival. ADG increased and F:G was improved for cattle that received Excede compared to control cattle. The incidence of bovine respiratory disease for the 32 days of the study was 4.4% for cattle that received Excede at arrival and was different compared to the control cattle (12.2%). The correlation (-0.157) between DMI and morbidity was not significant.

Vaccination for *Escherichia coli* O157:H7 in Feedlot Cattle. A clinical trial evaluated effects of two- and three-dose regimens of an *Escherichia coli* O157 vaccine on probability of detecting *E. coli* O157:H7 in feces and on colonization of the terminal rectum. The three-dose regimen significantly reduced probability for cattle to shed *E. coli* O157:H7 in feces by 63% compared to placebo treated cattle.

Beef Products

Mapping Tenderness of the Serratus ventralis. Serratus ventralis muscles from USDA Choice and Select carcasses were obtained. Samples were enhanced with a marination or left as controls, then blade tenderized once as whole muscles and cut into steaks. Enhanced steaks were then blade tenderized individually. Tenderness was found to vary sporadically throughout the muscle with the posterior end being the most tender, regardless of grade. Enhanced samples produced lower Warner Bratzler values than controls. The serratus ventralis does respond to enhancement techniques, and steaks could especially be fabricated from the posterior end.

Factors that Influence Consumers's Overall Sensory Acceptance of Strip Steaks. Multivariate analysis was used to determine demographic, knowledge, habits, and sensory preferences that influence a consumer's opinion about the acceptability of strip steaks from corn-fed, barley-fed, and grass-fed beef. Most consumers' final opinions about types of steaks were based on how they perceive the flavor, tenderness, and juiciness of the beef.

Effects of Aging on Veal Shoulder Muscles. Muscles were attained from paired veal shoulders and assigned to one of six aging comparisons. After aging, muscles were cooked and evaluated using Warner Bratzler shear force. The largest decline in shear force occurred during comparison of 3 and 10 days aging with additional improvements found up to 24 days. The m. infraspinatus was the most tender muscle; m. supraspinatus was the toughest. The m. serratus ventralis had the greatest response to aging and the m. pectoralis profundus (brisket) had the least.

Analysis of Veal Shoulder Muscles for Chemical Attributes. This study characterized the chemical properties of muscles from the veal shoulder for the potential to upgrade their value. The m. infraspinatus and m. rhomboideus fell in the intermediate or desirable groups for all traits. All nine muscles show promise in the ability to increase value.

Tenderness, Sensory, and Color Attributes of Two Muscles from the Beef Knuckle. Quadriceps muscles were fabricated traditionally or the seams it shares with the top and bottom round were separated pre-rigor to test effects of pre-fabrication on product quality. Results from this study indicated treatment had minimal effects on quality attributes. The proximal portions of the knuckle were more tender, lighter in color, and more red compared to the distal portions, although all were reasonably tender. Pre-fabrication will not decrease product quality.

Characteristics of Beef Finished on Wet Distillers Grains with Varying Types and Levels of Roughage. Beef knuckles were obtained from cattle finished on 30% wet distillers grains plus solubles with varying levels of alfalfa hay, corn silage, or cornstalks. Data from this study indicate type and level of roughage inclusion and cattle location have minimal effects on fatty acid profiles and sensory properties of the M. Rectus femoris. However, individual fatty acids of subcutaneous and intramuscular fat were significantly correlated with liver-like off flavor.

Influence of Feeding Wet Distillers Grains on Fatty Acid Composition of Beef. Ribeye slices were obtained from steers finished for 133 days with corn-based diets and varying levels (0, 15 or 30%, DM Basis) of wet distillers grains plus solubles (WDGS) Total lipid, unsaturated and saturated fatty acids were not different. However, values of 18:2 9t,12t, total polyunsaturated fatty acids, total amount of trans fatty acids, conjugated linoleic acid and the omega 6:omega 3 ratio were elevated with wet distillers grains plus solubles finishing diets.

Wet Distillers Grains Plus Solubles (WDGS) Affect Lipid Oxidation and Objective Color of Beef Steaks. Strip loins (M. Longissimus lumborum), tenderloins (M. Psoas major) and top blades (M. Infraspinatus) from calf-fed steer carcasses, were used to test effects of WDGS finishing diets on beef shelf life. After 7 days of display, inclusion of WDGS in the diet caused higher levels of oxidation on top blades and strip loins and negative effects on color of top blade and tenderloin steaks after 3 days of retail display.

Effects of Wet Distillers Grains (WDGS) Finishing Diets on Fat Content and Marbling Score in Steers. Steers were allocated to three finishing diets consisting of different amounts of WDGS (0, 15 or 30%, DM basis). Steers were fed for 133 days to test the relationship between marbling score and fat content, as well as effects on marbling texture and marbling distribution. Results suggest feeding up to 30% of WDGS had no detrimental effects on marbling in beef.

Analytical Methods: New Technology

Sampling Wet Distillers Grains Plus Solubles (WDGS) to Determine Nutrient Variability. Dry matter, protein, fat, P, and S were measured on WDGS samples (100/plant from 6 ethanol plants). Coefficients of variation were 1.5 to 4.5% for DM within plant. Fat in WDGS averaged 11.8% and ranged from 10.7 to 13.1% across plants, with ranges of 2-5 percentage

units within plant. Coefficients of variation were 5-8% and as great as 36% within plant for S. The variation in protein and P were minimal.

Evaluation of Methods for Dry Matter Determination of Ethanol Byproducts. Traditional wet distillers grains plus solubles, modified distillers grains, Dakota Bran Cake, and distillers solubles were sampled and replicates tested using oven drying at 105°C and 60°C, vacuum oven drying and toluene distillation process. Two replicates were evaluated using Karl Fischer titration. Oven drying was compared to toluene distillation as the standard. Oven drying at 60°C for 24 hours was similar to toluene distillation for wet byproducts.

Ruminal Methane Production Following the Replacement of Dietary Corn with Dried Distillers Grains. *In vitro* substitution of corn with DDGS increased the amount of methane produced per milligram of DM digested. Likewise, *in vivo* methane production was increased by 44% when corn and corn oil were replaced with DDGS. The greater energy value of DDGS relative to corn in a concentrate-based diet is not due to decreased methanogenesis.

Relationship Between Metabolizable Protein Balance and Feed Efficiency of Steers and Heifers. Two individual feeding experiments were analyzed for the relationship between metabolizable protein (MP) balance and feed efficiency. In both experiments there was a negative relationship within treatment between MP balance and G:F. These results were not expected, and three potential causes were proposed: conversion of MP to net protein; ruminal pH; and/or residual feed intake.

Microbial Characteristics, Microbial Nitrogen Flow, and Urinary Purine Derivative Excretion in Steers Fed at Two Levels of Feed Intake. Ruminally and duodenally fistulated Holstein steers were fed at 40% and 85% of ad-libitum intake. Microbial purine:N ratio did not differ between intake levels. Urinary purine derivatives (PD):creatinine (PD:C) ratio and microbial CP flow estimated from the duodenum increased with higher feeding level. Results indicated urinary PD:C ratio can be used to estimate relative differences in microbial CP flow.

Predicting Aged Beef Tenderness with a Hyperspectral Imaging System. A hyperspectral imaging apparatus was developed to predict, at 2 days postmortem, the 14 day aged tenderness of beef. USDA Choice and Select grade longissimus steaks from between the 12th and 13th ribs were scanned at 2 days postmortem, vacuum packaged, aged to 14 days, and frozen. The model predicted 3 tenderness categories (tender, intermediate, tough) with 77.1% accuracy, and 2 tenderness categories (acceptable, tough) with 93.7% accuracy. This hyperspectral imaging system was effective in predicting 14 days aged beef tenderness from 2 day scans.

Reference to commercial products or trade names is made with the understanding that no discrimination is intended of those not mentioned and no endorsement by University of Nebraska–Lincoln Extension is implied for those mentioned.

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