fed mid-oleic vs high-linoleic or high-oleic sunflowers (quadratic; $P < 0.05$). Intensity of beef flavor and off-flavor intensity responded quadratically ($P < 0.001$) to dietary oleic acid; steaks from cattle fed mid-oleic sunflowers had greater intensity of beef flavor and lower intensity of off-flavor than steaks from cattle fed high-linoleic or high-oleic sunflowers. Steaks from cattle fed soybeans had more C18:2 fatty acids than steaks from steers fed sunflowers. Oleic acid content of steaks increased and linoleic acid decreased (linear; $P < 0.001$) as oleic acid content of sunflowers was increased. Dietary lipid source and fatty acid profile of lipid sources can influence flavor intensity and fatty acid profile of beef.

Key Words: Vegetable Oil, Tallow, Fatty Acid

456 Effects of source of lipid on finishing cattle performance and carcass characteristics. E. R. Loe*[1], J. S. Drouillard[1], and F. N. Owens[2], [1]*Kansas State University*, *Manhattan*, [2]*Pioneer Hi-Bred International, Inc.*, *Des Moines, IA*.

Crossbred steers (n = 376; 340 ± 21 kg) were fed for 132 d to evaluate effects of lipid source on feedlot performance and carcass merit. Steers were blocked by BW and allotted randomly to diet (9 pens/diet). Diets included 1) control - no added fat; 2) tallow; 3) dry-rolled soybean; 4) whole high-linoleic sunflower seed; 5) whole mid-oleic (66.7% of oil) sunflower seed; 6) whole high-oleic (86.8% of oil) sunflower seed; dietary fat concentrations were 3.2, 6.6, 6.5, 6.8, 7.1, and 6.0% (DM basis), respectively. Diets contained steam-flaked corn (mean = 72%) and 6.3% ground alfalfa hay (DM basis), and were formulated to contain 14% CP, 0.8% Ca, 0.75% K, and to provide 300 mg monensin and 90 mg tylosin daily. For the randomized complete block design, pen was the experimental unit; data were analyzed with PROC MIXED of SAS. Compared to steers fed rolled soybeans, steers fed sunflowers consumed 6% more feed ($P = 0.007$, DM basis), 7% more lipid ($P < 0.001$), and gained 7% faster ($P = 0.02$); steers fed tallow were intermediate; as oleic acid content of the sunflowers increased, DMI increased linearly ($P = 0.001$) but lipid intake decreased linearly ($P = 0.02$) and quadratically ($P < 0.001$). Steers receiving lipid were 9% more efficient ($P < 0.001$) and had more KPH fat ($P = 0.01$) than steers not receiving lipid. Steers fed tallow had fewer USDA Standard carcasses ($P = 0.03$) and tended ($P = 0.06$) to produce more USDA Choice carcasses than steers fed vegetable oils. Compared with those receiving mid-oleic sunflowers, steers fed high-oleic or high-linoleic sunflowers had greater 12th rib fat thickness, more KPH fat, higher USDA Yield Grades, and fewer USDA Yield Grade 1 carcasses (quadratic response; $P < 0.02$). Marbling linearly increased with oleic acid content of sunflowers ($P = 0.03$; marbling scores of Slight 53, Slight 47, and Slight 74 ± 12). Lipid source and fatty acid profile can influence feedlot performance and carcass characteristics of yearling steers.

Key Words: Vegetable Oil, Tallow, Fatty Acid

457 Effects of ractopamine-HCl (Optaflexx) and protein source on performance and carcass characteristics of feedlot heifers. B. E. Depenbusch*, D. K. Walker, E. C. Titgemeyer, E. R. Loe, M. E. Corrigan, M. J. Quinn, A. S. Webb, and J. S. Drouillard, *Kansas State University*, *Manhattan*.

Crossbred heifers (n=72; 475 ± 6 kg initial BW) were used in a 28-d finishing study with a 2 × 3 factorial arrangement of treatments. Factors consisted of protein source (with increasing UIP concentrations) and level of ractopamine-HCl (0 or 200 mg/heifer daily). Heifers were implanted with Revalor-H 60 d prior to starting the study. After allotment to treatments (12 heifers/treatment), heifers were placed into individual feeding pens (10 m^2). Flaked corn finishing diets were formulated to 14% CP (dry basis) using 1.5% urea (UREA); 0.5% urea + 6.6% solvent extracted soybean meal (SBM); or 0.5% urea + 7.9% expeller process soybean meal (EXSBM), and provided 300 mg monensin, 90 mg tylosin, and 0.5 mg melengestrol acetate per heifer daily. DMI were not different among treatments ($P > 0.21$). There was an interaction between ractopamine and protein source for live weight gain and gain efficiency ($P < 0.05$). Gains and efficiencies for heifers fed no ractopamine increased as dietary UIP increased (1.37, 1.53, 1.81 kg/d and 0.156, 0.179, 0.198 gain/DMI for UREA, SBM, and EXSBM, respectively). Conversely, gains and efficiencies for cattle fed 200 mg/d ractopamine increased in response to higher DIP concentrations (1.71, 1.80, 2.06 kg/d and 0.205, 0.202, 0.223 gain/DMI for EXSBM, SBM, and UREA, respectively). No interactions existed for carcass-adjusted ADG or carcass-adjusted efficiencies ($P > 0.61$). Heifers fed ractopamine gained more weight and were more efficient than controls ($P < 0.01$). Heifers fed ractopamine tended ($P < 0.10$) to have greater carcass weights compared to controls (318, 316, and 319 kg for UREA, SBM, and EXSBM in cattle fed no ractopamine; and 328, 324, and 323 kg for UREA, SBM, and EXSBM in cattle fed 200 mg/d ractopamine). Marbling score and fat thickness were not different among treatments ($P > 0.30$). These data suggest that additional UIP supplementation is not required to optimize response to ractopamine in heifers.

Key Words: Ractopamine, Heifers, Protein

458 Effects of ractopamine and days on feed on performance and carcass traits of yearling steers. J. P. Hutcheson*[1], W. T. Nichols[1], C. D. Reinhardt[1], R. S. Swingle[2], and K. J. Karr[2], [1]*Intervet, Inc.*, *Millsboro, DE*, [2]*Cactus Research, Ltd.*, *Amarillo, TX*.

Two-thousand two hundred fifty English × Continental cross yearling steers (avg. 313 kg) were used in a randomized complete block study to evaluate the effects of ractopamine and days on feed on performance and carcass traits. Steers were blocked by arrival time at the research facility. On each arrival day cattle were processed and randomly allotted to 6 pens of 91 to 97 head each. Within each block, three pens were randomly selected to receive ractopamine (RAC) and the remaining three were controls (CON). Within each block and within each treatment, pens were randomly assigned to be fed for either 150, 171, or 192 days. RAC was fed at 200 mg/hd/d for the final 28 days on feed. When measured over the entire feeding period, feeding RAC increased ADG 4.6%, increased final weight 11 kg, improved G:F 3.4%, and increased HCW 8.2 kg (P<.01), and tended (P=.12) to reduce percent YG 4+5. All other carcass measurements were similar. Additional days on feed had a significant (P<.10) effect on final wt, ADG, DMI, G:F, dressing percentage, HCW, Yield Grade distribution, and Quality grade. There was an interaction between treatment and days on feed for G:F (P=.09) and carcasses weighing >431 kg (P<.01) with greater differences between RAC and CON at 192 than at 150 or 171 days on feed. Feeding RAC improved performance regardless of days on feed. Increasing days on feed decreased performance but increased dressing percentage and carcass weight.

Key Words: Ractopamine, Feedlot, Steers

Breeding and Genetics: Beef Cattle Breeding and Genetics

459 Educating beef cattle breeders on the use of genomic technology for quantitative traits. W. Shafer*, *American Simmental Association*, *Bozeman, MT*.

Individuals with little or no technical expertise make the majority of beef cattle breeding decisions. Even so, due to an extensive educational effort and the technology's effectiveness, the decidedly technical EPD has become common currency in beef cattle breeding—evolving into the primary tool for affecting additive change in a population. Traditional EPDs have shortcomings, however. Specifically, Mendelian sampling relegates non-parents to low-accuracy evaluation and some economically important traits are not suited to the large-

scale data collection required to achieve high-accuracy prediction. Though genomic research has the potential to help us prevail over these shortcomings, the industry is in a precarious position in regards to the application of DNA information to selection decisions. Given their widespread acceptance, EPDs provide the most rational format to deliver DNA test results to breeders. Before melding marker genotypes into the industry's existing genetic evaluation infrastructure, however, mechanisms to fully account for pleiotropy and interaction among alleles should be developed. Unfortunately, for the foreseeable future, the expansion of commercially available DNA tests will likely outstrip the development of analytical approaches and infrastructure capable of handling the burgeoning database. Understandably, with developmental costs to underwrite and a profit objective to achieve, companies offering DNA tests are not waiting until the infrastructure is in place to merchandise their products. Though the resultant database is certain to be integral to infrastructure development, the incessant exposure of cattle breeders to the promise of DNA technologies, combined with a lack of understanding makes them prone to placing undue emphasis on raw test results at the expense of EPDs—ultimately undermining genetic improvement. Consequently, educational efforts should emphasize the importance of breeder contribution in developing a DNA database, while discouraging the use of test results until integrated into an adequate infrastructure.

Key Words: Beef Cattle, Education, Genomics

460 Using appropriate genetic evaluations to make better selection decisions. D. Garrick*, *Colorado State University*, *Fort Collins*.

Genetic change is easy to achieve by selection. Selection on EPDs provides a predictable response in the characteristics described by the EPDs. Genetic improvement is more difficult to achieve than genetic change as selection typically results in simultaneous change in a number of characteristics. Some of the characteristics for which EPDs are available (marbling score, calving ease) are economically relevant traits (ERTs) that directly influence income or expenses. Other EPDs are available for traits that are not directly economically relevant (ultrasound intramuscular fat %, birth weight) but are correlated with ERTs. These are known as indicator traits and are useful when the corresponding ERT does not have an EPD. Phenotypic measures on indicator traits are best used in multi-trait prediction of EPDs for ERTs. When this occurs, selection considering the ERT and indicator trait will be less effective than selection on the ERT EPD alone. For example, suppose selection was practiced using the EPDs of sires with 50 offspring with observed birth weight and calving ease scores. After a generation of selection on calving ease the proportion of difficult calvings among bull calves born to 1st calvers could be reduced from 20 to 12%. The correlated reduction in birth weight would be about 1 kg. In contrast, if selection had been on (reduced) birth weight EPD, it would take twice as many years for the same reduction in calving difficulty and the birth weight would have been reduced by 4 kg. Simultaneous selection for birth weight and calving ease can only produce a response in calving ease that is intermediate to the above examples. Alternatively, suppose a bull has his own ultrasound (u/s) observation and performance measured on 15 u/s and 20 carcass progeny. One s.d. of selection on sire EPDs for u/s IMF% would increase IMF% by 0.36 and marbling EPD by 0.48. In contrast, selection on the carcass EPD would get a 20% greater response in marbling (+0.57) with a slightly lower reduction (+0.3) in IMF%. Selecting directly on ERTs will more rapidly increase profit than selection that takes account of indicator traits that have been used in multi-trait assessment of the ERT EPD.

Key Words: EPD

461 Postweaning performance of purebred Angus and Romosinuano steers. W. A. Phillips*[1], S. W. Coleman[2], D. G. Riley[2], C. C. Chase, Jr.[2], and H. S. Mayeux[1], [1]*USDA,ARS, Grazinglands Research Lab.*, *El Reno, OK*, [2]*USDA,ARS,SubTropical Agricultural Res. Station*, *Brooksville, FL.*

The objective of this study was to compare stocker and feedlot performance of purebred Angus and Romosinuano steers born and reared in a subtropical environment (Florida) and shipped to a more temperate environment (Oklahoma) for growth and finishing. A total of 160 steers were evaluated over two production cycles. Steers were born (January through March) and reared in central Florida, weaned in the fall and shipped (1900 km) for growth and finishing in central Oklahoma. Steers grazed annual cool season grasses (primarily Triticum aestivum) and were managed as a single group during the winter (125 d) and spring (84 d) stocker phases. Angus and Romosinuano steers had similar BW upon arrival (193 kg ± 3.5). During the winter stocker period, Romosinuano steers gained less ($P < 0.05$) BW than Angus steers (75.9 vs 102.2 kg). Gains in BW during the spring grazing season were similar between the two breeds, but Romosinuano steers had lower ($P < 0.05$) total stocker gains (118.3 vs 143.8 kg) than Angus steers. In June of each year, steers were blocked by breed and randomly assigned to a conventional confinement or a grain-on-grass (GOG) finishing system. In the GOG system, steers were finished on bermudagrass pasture using a combination of an intensive stocking rate (9 steers/ha) and ad libitum access to a high energy diet in a self-feeder. Under the conventional system, carcass marbling scores and quality grades were not different ($P > 0.10$) between the two breeds. However, the GOG Angus steers produced carcasses that had higher ($P < 0.01$) marbling scores and quality scores than Romosinuano GOG steers. Under conventional confinement feeding, Romosinuano steers had lower ($P < 0.10$) DMI than Angus steers, but feed efficiencies were similar. When compared to Angus steers, Romonsinuano steers had lower ADG during the stocker phase, but were as efficient as Angus steers during the finishing phase when fed under a conventional confinement feeding system.

Key Words: Wheat Pasture, Stocker Calves, Tropically Adapted Breeds

462 Strategies to optimize feed intake recording capacity for performance evaluated beef bulls. S. Miller*, *University of Guelph*, *Guelph, Ontario, Canada*.

Deterministic simulation using SAS proc IML compared five strategies (S1-S5) to use limited (200-head) capacity for feed intake recording for a company performance testing 1000 bulls to sell 500. Comparison was accuracy of index selection, considering feed intake and weight gain. Economic weights were $76 and $–9.5 per kg of 112-d test growth and feed intake, respectively. Reference strategies 1 and 2 measured feed intake on none or all bulls, respectively. Strategy 3 measured a random subset of 200 for feed intake. Strategies 4 and 5 consider pre-selection based on growth up to 56d on test. Strategy 4 selected 200 on growth up to 56d and measured these for feed intake during 57-112d. Strategy 5 split the 1000, staggering start of test dates by 56d to move 2 groups through the feed intake facility (after 56d growth) for a 176-d time span. All sources of information pertaining to different stages of selection were translated into accuracy of the selection index. Compared to not measuring feed intake (S1) the percent increase in progress ranged from 9% to 47% in S3 and S2, respectively. A 47% increase (S2) in response is then the upper limit of the advantage to measuring feed intake. Although the accuracy of pre-selecting bulls based on 56-d growth is low and the accuracy of evaluating feed intake is compromised because of this reduced (56d) measurement period, the response in S4 achieved 76% of S2. Strategy 5 increased response to 86% of S2. Alternatively, 600 bulls could be selected with S5 with the same mean genetic level as 500 bulls with S1. Genetic mean of the top 25 determined the advantages to measuring feed intake, where elite bulls were selected. Top 25 selected under S5 were 99% of S2, indicating feed intake measurement may have greatest relevance within a nucleus breeding scheme. Splitting groups of bulls and staggering test start dates can be effective for utilizing equipment more efficiently but advanced genetic evaluation programs are required for implementation.

Acknowledgements: Beef Improvement Ontario

Key Words: Beef Cattle, Feed Efficiency, Genetic

463 Associations between markers in the leptin gene and carcass traits in commercial feedlot steers and heifers. B. W. Woodward*[1], J. Li[2], Z. Zhang[3], R. L. Quaas[3], and E. J. Pollak[3], [1]*Merial Limited*, *Duluth, GA*,, [2]*Institute of Animal Science, CAAS*, *Beijing, PRC*, [3]*Cornell University*, *Ithaca, NY*.

A number of SNP have been discovered in the leptin gene. The objective of this study was to evaluate four leptin SNP (UASMS1, UASMS2, UASMS3, and Exon2) in a large commercial feedlot population with carcass trait measurements. A total of 1,633 steers and heifers were fed at a single feedlot and harvested between August and November at the same commercial abattoir. These data were analyzed using three different models, 1) regression on genotype, 2) allele substitution, and 3) haplotype. Contemporary groups were fit as a fixed effect and formed from source or owner of the cattle plus sex; breed type was essentially confounded with source. Multiple harvest dates within contemporary groups were determined by optimal economic endpoint, primarily fatness. Results indicated that UASMS1 and UASMS3 were in complete linkage disequilibrium. Results of Model 1 showed significant (P<.05) associations between UASMS1 and HCW, calculated live weight (CLW), and plant backfat (BFAT); between UASMS2 and HCW and dressing percentage (DP); and between Exon2 and ribeye area (REA), BFAT, and yield grade (YG). The combination of UASMS1 and UASMS2 was associated with HCW, REA, CLW, days on feed (DOF), BFAT, and YG. UASMS2 and Exon2 were associated with HCW, HCW value, REA, CLW, DOF, DP, BFAT, BFAT deposition rate (BFDR), and YG. Model 2 results showed the same significant associations as Model 1 for each SNP individually plus REA and YG for UASMS1; REA for UASMS2; and HCW and CLW for Exon2. Model 3 showed the same significant associations as Model 1, except YG, for the UASMS1 and UASMS2 combination plus DP and BFDR. Model 3 significant associations for UASMS2 and Exon2 were HCW, REA, DP, BFAT, BFDR, YG, and marbling score (MBS). The three SNP combination also showed significant associations for Model 1: HCW, REA, CLW, DP, BFAT, YG, and MBS; and Model 3: HCW, REA, DOF, ADG, DP, BFAT, BFDR, and YG. Not all of the statistically significant associations presented represent biological significance. Based on these results, these leptin SNP will be evaluated in additional populations with known sire and breed type.

Key Words: Leptin SNP, Carcass Traits, Feedlot Cattle

Extension Education: Environment and National Animal Identification System

464 Agricultural-environmental programming in Pennsylvania: making connections, building capacity, increasing credibility. V. Ishler*[1], A. Dodd[1], R. Meinen[1], B. Mikesell[1], C. Abdalla[1], G. Martin[1], and J. Weld[2], [1]*Pennsylvania State University*, *University Park*, [2]*USDA Agricultural Research Service*, *University Park, PA*.

Environmental protection is one of the most critical and complex issues facing our nation. Many audiences have questions about impacts of animal agriculture on water quality and air quality; farm-level management requirements and options; and changing environmental policies. In response to this educational need, the Penn State Cooperative Extension Dairy and Livestock Nutrient and Environmental Education Days (NEEDs) program was held in seven locations across the state from September 2003 through March 2004.

The NEEDs program is unique for several reasons. First, it aims to increase the understanding of linkages among phosphorus and water quality impairment, air quality, changing federal and state policy, and farm-level management tools to reduce environmental risk. Second, the program provides time-sensitive information as Pennsylvania's nutrient management and water quality regulations change. Third, the program is specifically targeted to conservation district and USDA-NRCS staff, a non-traditional audience for extension. Finally, the comprehensive program was developed in cooperation with the PA Environmental Agricultural Conservation Certification of Excellence, USDA Agricultural Research Service, and the departments of Dairy and Animal Science, and Agricultural Economics and Rural Sociology at Penn State.

To document knowledge changes, participants were asked to answer a 15 question pre and post questionnaire. A follow-up post-card, sent to participants three months after the program, was used to document actions taken as a result of the program. Evaluation results suggest the interdisciplinary and collaborative effort increased the visibility, credibility, and relevancy of extension's mission throughout the state.

Key Words: Environmental Protection, Water Quality, Education

465 Development of an on-farm feed management assessment tool for use with dairy comprehensive nutrient management plans. L. VanWieringen[1], J. Harrison*[1], R. Kincaid[1], A. Hristov[2], R. Sheffield[2], M. Gamroth[3], P. French[3], T. Downing[3], and A. Sutton[4], [1]*Washington State University*, *Puyallup*, [2]*University of Idaho*, *Moscow*, [3]*Oregon State University*, *Corvallis*, [4]*Purdue University*, *West Lafayette, IN*.

A requirement of the US EPA guidelines for concentrated animal feeding operations (CAFO) in 2003 is to develop a nutrient management plan. One form of a nutrient management plan is a comprehensive nutrient management plan (CNMP) that is described in the NRCS Field Office Technical Guide. There are six components of a CNMP: 1) Feed Management, 2) Manure and Wastewater Handling and Storage, 3) Nutrient Management, 4) Land Treatment, 5) Record Keeping, and 6) Other Manure and Wastewater Utilization Options. Feed represents the largest import of nutrients to the farm and feeding management practices and diet modification techniques currently exist to reduce imports of nutrients to the farm. These technologies and approaches to achieve nutrient reductions vary in their degree of economic feasibility and environmental impact. The NRCS has a practice standard called Feed Management Code 592 which outlines the expectations of the consideration of feed management. In order to document that feeding management has been considered at the CAFO for nutrient management planning, we developed an assessment checklist that is intended to be completed by the CAFO operator with the assistance of an adviser who is informed about feed management practices. The assessment checklist was developed based on feeding management categories of: targeting nutrient requirements, forage management practices, ration management practices, ration balancing, production aids and enhancers, and monitoring tools. For each category, the operator will check the following considerations: was it considered, will it be economical, will it be implemented, and will it be considered in the future. The checklist is a 3-page, 20 question document in paper format. The assessment checklist could be implemented by Professional Animal Scientists (PAS) or those with substantial knowledge of dairy feed management considerations.

Key Words: Feeding Management, Nutrition, Nutrient Management

466 Evaluation of whole-farm nutrient balances on a commercial dairy operation. T. Nennich*[1], J. Harrison[2], D. Davidson[2], J. Werkhoven[3], and A. Werkhoven[3], [1]*Texas A&M University*, *Stephenville*, [2]*Washington State University*, *Puyallup*, [3]*Werkhoven Dairy*, *Monroe, WA*.

Evaluations of whole-farm nutrient balances are an important part of understanding nutrient management on dairy operations. Whole-farm nutrient balances supply specific information as to the flow of nutrients on dairy operations and provide data as to whether or not dairy operations are net importers or exporters of nutrients. The objective of this project was to estimate the whole-farm nutrient balance on a commercial dairy with various methods of calculating nutrient imports and exports from the dairy operation. A 600-cow dairy in northwestern Washington was used to determine the amounts of N, P, and K that were imported and exported from the dairy over the period of a year. Feed imports were determined using both formulated diets and actual feed receipts. In addition, feed samples were collected and analyzed to determine imports of nutrients to the farm. Nutrients exported via milk were determined using daily tank weights or monthly averages. Nutrients excreted in manure were estimated