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

by three methods: 1) sample analyses and mass volume flow, 2) ASAE manure excretion standards, and 3) the Dairy WFNBNET model (J. Dairy Sci. 86(Suppl. 1):163). In 2004, the dairy operation exported approximately 8 million kg of milk and 39,000 kg of milk N. Estimates for export of P and K in milk were 7200 and 12,000 kg of P and K, respectively. Estimates of imported nutrients were approximately 10% greater when calculations were made from purchased feed as compared to formulated diets. This study provided insights into what information was most valuable in order to make an estimate of whole-farm balance, and emphasized that feed and manure sampling, as well as accurate record keeping, are important to determine nutrient balances for an operation.

Key Words: Nutrient Management, Whole-Farm, Dairy

467 Sampling strategies to determine nutrient flows 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*.

Continued emphasis on nutrient management will require livestock producers to increase the number of manure samples that are collected and monitored on livestock operations. Sampling at strategic points within a manure handling system may prove to be of value for estimating whole-farm nutrient balance. Sampling protocols were developed on a commercial dairy operation to determine the best strategy for taking samples from various points within the manure handling system. The manure handling system on the dairy is a flush system with sand bedding. Flumes and flow meters were installed at strategic points in the manure handling system. A flume was installed prior to the sand-settling basin to determine the volume of manure and sand-laden water entering the settling basin. An in-line flow meter was installed between the sand-settling basin and the solids separator, and a second flume was installed after a screen solids separator and solids settling basin. Manure flow from the second flume directly entered a storage lagoon. Flow rates through the flumes and the flow meter were recorded electronically. Samples were taken from the large flume, from the solids separator, and the second flume to determine nutrient contents of manure at each of the individual points in the manure handling system. Samples were collected to determine if the timing of sample collection varied within a flush cycle. Samples were also taken to determine if flushes originating from various pens altered the composition of the manure through any of the sampling points in the manure handling system. The pen sampled and the sampling time within each flush cycle had little affect on N and P contents, but there was some variation in the solids contents within a flush cycle. Evaluations of sampling strategies are important to determine how and when samples should be taken on commercial operations to provide accurate information for nutrient management decisions.

Key Words: Nutrient Management, Manure Sampling, Dairy

468 Implementing the NAIS. K. Olson*, J. Mattison, G. Marrs, D. Sheldon, and B. Dokkebakken, *NDHIA*, *Columbus, OH*.

The objective of the NAIS is to identify all animals and premises in the US so a complete traceback can be completed within 48 hours of discovering an animal disease outbreak. Animal and premises ID, along with records of all animal movement will be required. Full use must be made of existing data collection programs to minimize multiple reporting by producers and maximize efficiency. The DHIA system has collected and used animal and premises ID for 100 years. It currently includes approximately half the dairy cows in the US. The combination of identified animals, a large field force trained to collect and verify ID information, established databases and IT staff experienced in data management and transfer, make the DHIA system a valuable partner in implementation of the NAIS. Similar information is collected throughout the system; however, multiple organizations provide field services, several platforms are used for data entry and four DRPCs provide computing services. To fully meet the needs of NAIS DHIA must collect animal movement data prior to entry to the milking herd and verify movement from the herd. NDHIA is working with the Pennsylvania Department of Agriculture, through a cooperative agreement funded by USDA APHIS, to enter DHIA data into PA HERDS, the state NAIS data repository. The objective of the dairy portion of the project is to identify 50000 animals with RFID tags, enter them in PA HERDS and begin tracking animal movement. Lancaster DHIA and Dairy One provide DHIA field services in the state and DRMS provides data processing for both. Dairy One will use an intermediate platform to transfer data to PA HERDS and DRMS will provide the interface for Lancaster. A major meat processor is equipped with RFID readers and will be linked to PA HERDS to capture terminal movement. DHIA will begin to collect and transfer movement data from birth until entry to the milking herd. The project will provide experience working with multiple service providers and data transfer platforms as a part of the NAIS as well as in collection of new information. Successes and challenges will be shared as we work to make DHIA a valued partner in the NAIS.

Key Words: ID

469 The effectiveness of collecting and delivering RFID data to meet requirements of NAIS. J. S. Clay*[1], P. A. Dukas[1], J. L. Mylin[2], J. A. High[2], P. E. Knepley[3], and R. Miller[3], [1]*Dairy Records Management Systems*, *Raleigh, NC*, [2]*Lancaster DHIA*, *Manheim, PA*, [3]*Pennsylvania Dept. Of Agriculture*, *Harrisburg, PA*.

Approximately twenty-five thousand dairy animals in approximately 275 herds will be chosen by Lancaster DHIA to receive RFID tags as part of a project managed by Pennsylvania Dept. of Agriculture (PDA) and funded by USDA/APHIS to develop and test delivery mechanics and systems to meet requirements of the National Animal Identity System (NAIS). Herds will be chosen as being representative of Pennsylvania's dairy industry and will receive ISO compliant tags. Although most herds will be DHIA members, a subset of producers will not be current participants in DHIA. DHIA technicians will use ISO-compliant handheld tag readers and will coordinate the field application of the tags and tag reading by scanners connected by Bluetooth technology to handheld computers using PocketDairy. Subsequently, RFID and farm premises information will be transferred to PCDART and then via the Internet to DRMS where automated servers will deliver the data within minutes via the Internet to servers at PDA. DRMS servers will use NAIS-specified protocols and file formats in their delivery. The NAIS-compliant system will be delivered as a component of a full-featured RFID-based herd management system. Usage of the management-oriented features will permit insight into potential deployment in the absence of mandated RFID usage. The project's success will be measured by the level of completeness of tags delivered to the PDA servers compared with the number of tags applied to animals. For some herds, the project will measure the effectiveness of the technology and staff ability to meet the long-term goal of delivering data from scanned tags to the PDA database within 48 hours of application. Comparisons of effectiveness of the system in DHIA vs non-DHIA herds will provide insight to the potential of the system to collect data during non-routine or upon-demand interaction with producers. Producers will be surveyed on level of satisfaction with the tagging and reading process.

Key Words: RFID, Bluetooth, NAIS

470 Utilizing RFID technology to enhance accuracy of identification and data entry in herd recording. M. Tomaszewski*[1], J. Clay[2], and P. Dukas[2], [1]*Texas A&M University*, *College Station*, [2]*North Carolina State University*, *Raleigh*.

Soon, federal regulation will require all livestock to have radio frequency identification (RFID) tags. Anticipating that regulatory requirement, Dairy Records Management Systems has developed procedures using wireless wand, bluetooth, and hand held computer technologies to integrate collected data into the on-farm herd management system, PCDART. During management activities, animals with ISO-compliant RFID eartags are identified using a wireless wand reader. Bluetooth technology is used to transfer data from the wand to the handheld computer and then to the herd management database either through a

cable or again using bluetooth technology. Applications enable the user to wand an animal and if a management option is needed for that animal, the information is visually displayed and an audible alert is sounded. Additionally, a milk weight input program has been developed utilizing these same technologies. In a 450 cow herd in Texas, results show that misidentification of animals has been eliminated. On days that milk weights are obtained, time required to identify animals has been reduced by 70%. New applications, such as routine verification of cows in designated groups, are accomplished by passing the wand past each cowâ•™s ear in a particular management group. This application was not previously feasible with visually read eartags. RFID eartags facilitate advancements to herd recording by providing an inexpensive, accurate devise for animal identification that has been incorporated into the herd management system.

Key Words: Herd Management, RFID, Bluetooth

471 Use of radio frequency identification (RFID) eartags and barcoded labels for identification of laboratory submissions. S. Stewart*[1], C. Clobes[2], B. Dokkebakken[2], and S. Eicker[3], [1]*University of Minnesota*, *St. Paul*, [2]*Minnesota DHIA*, *Buffalo, MN*, [3]*Valley Ag Software*, *Tulare, CA*.

The National Animal Identification System (NAIS) is a system of premises and individual animal identification currently under development. The system will allow rapid traceback of animals in the case of an animal disease outbreak or a bioterrorism attack. Details are still being determined, but producer acceptance and adoption will be critical for the overall success of the program. Producers will be more likely to adopt these identification systems if there were additional uses for management. While other forms of identification may also be utilized, one leading candidate for individual animal identification is radio frequency identification (RFID) eartags. A project was designed to utilize electronic recording of RFID eartags to produce barcoded labels for milk and blood samples for diagnostic testing. At the lab, barcoding should greatly lessen manual entry, improve tracing of samples, and help integration of results. During this project, RFID eartags were placed in 3369 animals on 9 premises. Blood was drawn from 2575 of these animals. These samples were placed in ultracold storage after being labeled with the date, visual ID, RFID, and premise ID embedded in the barcodes. Milk samples were obtained from 229 additional animals for mastitis culture. The milk samples were labeled at the time of collection with a label containing the visual ID, RFID, premise ID, date, and the DHIA herdcode in both human readable text and barcodes. Equipment utilized included a handheld computer communicating via BlueTooth to a battery operated RFID reader and also communicating via 802.11b (WiFi) to a portable barcode printer. Software (PocketDC) was developed for data recording and transfer to herd management software as well as the BlueTooth and WiFi communication protocols.

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Key Words: RFID, Dairy, Barcode

Extension Education: Training Programs, Program Evaluation, and Economics

472 Competency acquisition of workers participating in the Penn State Dairy Production Skills Certificate. S. S. Costello*, L. A. Holden, A. J. Heinrichs, E. P. Hovingh, M. O'Connor, V. A. Ishler, R. E. Stup, and B. J. Hilty, *Pennsylvania State University*, *University Park*.

High performing dairy workers must effectively apply key production competencies in their work. The Penn State Dairy Production Skills Certificate (DPSC) is intended to improve job competencies of new employees. DPSC consists of six 2-day modules taught on a commercial dairy. To obtain a certificate, workers must successfully complete the General Production module and 3 additional electives. Choices include Reproduction, Herd Health, Calf-Heifer, Feeding, and Milking Management. The study objective was to evaluate module effectiveness toward enhancing job competencies. Pre and post-training instruments were administered and a score of 70% or above indicated successful competency. An evaluation was used to measure training effectiveness and document plans for 1 to 3 months post-training. Results from Reproduction, Herd Health, and General Production are presented here. A mean of 10 workers attended each module. Pre-training scores ranged from 2 to 95% demonstrating diverse prior knowledge. Mean pre-training scores for Reproduction, Herd Health, and General Production were 46, 50, and 53%, respectively. Mean post-training scores were 89, 76, and 83%, respectively. Competency improvement from highest to lowest was 43% for Reproduction, 30% for General Production, and 26% for Herd Health. Of 28 employees participating in three modules, 89% scored 70% or above on post-training assessment. Based on survey instrument and paired t-test, students made significant improvement within each production area ($p<0.005$). Most common plans for change included: practice improved listening, 77.7%; improve time management, 66.7%; improve breeding timing, 44%; use estrous synchronization differently, 44%; improve heat detection, 44%; use new herd tools for diagnosis, 44%; and improve safety hazard awareness, 44%. Results from individual modules will be used to enhance DPSC and develop advanced and management certificates. Post-training scores indicate competency improvement for workers participating in DPSC.

Key Words: Dairy, Worker, Training

473 Calf sense: Learning to manage newborn dairy calves. R. E. Stup*, A. J. Heinrichs, R. Van Saun, and D. Wolfgang, *Pennsylvania State University*, *University Park*.

Calf morbidity and mortality continues to be a large problem on dairy farms across the United States. Although mortality rates of less than 2% are achievable, the average rate in the U.S. in 2001 was 8.7%. Calf management practices at birth and in the first hours immediately thereafter can have a profound impact on health and survivability. Management is more than simply understanding the science behind calf health and survival; it also involves taking steps to ensure that effective practices are consistently used in the workplace. Calf Sense is a one-day farm owner and employee training program designed to combine scientific knowledge with practical management schemes in a learning experience that helps participants transfer effective calf management to the workplace. Calf Sense includes presentation of scientific and background material along with small-group, hands-on workshops where participants practice what they have learned. Presentations are held in the morning; topics include newborn calf health, colostrum absorption and management, and achieving consistent calf care. Participants divide into small groups for afternoon workshops and rotate through four, one-half hour sessions focusing on: conducting a basic newborn health exam, testing colostrum quality using a colostrometer and understanding rumen physiology, testing for transfer of antibodies from colostrum to blood, and applying standard operating procedures and record-keeping systems. Evaluation results were overwhelmingly positive. Participants rated the usefulness of presentations and workshops on a scale from 1 to 5 with 1 = "not useful" and 5 = "extremely useful." Results from 75 participants on five separate workshops have been summarized. All presentations scored between 4 and 5, except immunity transfer which scored 3.9. On a scale from 1 = "strongly disagree" to 5 = "strongly agree," participants indicated that they would use the training (4.55) and equipment (4.44) they received to improve newborn calf management at their farm.

Key Words: Calf, Management, Labor