physico-chemical, proteolysis and rheological analyses. Each technological factor was studied at two levels, except the factor *salting conditions* which had three levels: *milk, curd, brine*, differing by stage of addition and concentration of salt used. Salting conditions followed by curd washing had the most pronounced effects on the formation of textural quality. These factors had a dominant effect on the cheese characteristics at each ripening time through their effect on the formation of cheese basic structure, especially on the interactions between proteins - minerals - water. Starter dose and coagulant type and dose influenced cheese properties but their effects were less intense and more dependent on ripening time. The results suggest that calcium addition and pressing time could modulate the effects of salting, curd washing and coagulant dose, through compensatory effects on basic cheese structure. Finally, the effects of the technological factors on characteristics and variability of product are been modulate by the ripening phenomena. The experimental design allowed to estimate the main linear effect of the technological factors on the characteristics of cheese. The multidisciplinary approach applied in this study and the integrated interpretation of results contribute to improve knowledge of the mechanisms that determine the development of cheese texture.

Key Words: Textural Quality, Cheesemaking conditions, Ripening time

433 An empirical method for cheese yield prediction. C. Melilli[1], J.M. Lynch[2], S. Carpino*[1], A. Cappa[3], G. Licitra[1], and D.M. Barbano[2], [1]*Consorzio Ricerca Filiera Lattiero-Casearia, Ragusa, Italy* , [2]*Northeast Dairy Foods Research Center, Cornell University, Ithaca, NY,* [3]*Associazione Provinciale Allevatori, Vicenza, Italy.*

Theoretical cheese yield can be estimated from the milk fat and casein or protein content of milk using classical formulae, such as the Van Slyke formula. These equations are reliable predictors of theoretical or actual yield based on accurately measured milk fat and casein content. Many cheese makers desire to base payment for milk to dairy farmers on the yield of cheese. However, in small factories accurate measurement of fat and casein content of milk by chemical methods or infrared milk analysis are too time consuming and expensive. Therefore, an empirical test to predict cheese yield was developed using simple equipment (i.e., low-speed room-temperature swinging bucket centrifuge, analytical balance, and forced air oven). Weigh 10 ml of milk into a centrifuge tube. Add 0.1 ml of an acetic acid solution to achieve a pH of about 5.9, mix and incubate at 30°C for 10 min. Add 0.1 ml of the diluted chymosin to the tube, stopper, mix immediately for 15 seconds, and incubate at 30°C. At 30 min a firm coagulation should form. Centrifuge for 30 min at 1625 x g. There will be a curd pellet at the bottom and the sides of the tube should be free of curd and the clear whey should be particulate free without free fat at the surface. Decant the whey and quantitatively transfer the curd to a dry, tared, total solids pan. With a metal spatula, cut and spread the curd in the pan. Dry for 4 h in a 100°C forced air oven. Weigh the pan plus residue and calculate the dry curd weight as a percentage of the milk weight. A linear regression of calculated theoretical versus dry weight yields for milks of known fat and casein content was calculated. A regression of equation of $y = 1.26x + 1.58$, where y is theoretical yield and x is measured dry solids yield ($r^2 = 0.974$), for Cheddar cheese was developed using milks with a range of theoretical yield from 7 to 11.3 kg per100 kg. The standard deviation of the difference (SDD) was 0.193 and the coefficient of variation (SDD/mean x 100) was 1.9% for 15 milks.

Key Words: Cheese yield

EXTENSION EDUCATION

434 Beef Infobase: a new brand of information exchange. R.M. Kattnig*[1], W.E. Kunkle[2], T. Troxel[3], and B.R. Eastwood[4], [1]*University of Arizona, Tucson,* [2]*University of Florida, Gainesville,* [3]*University of Arkansas, Fayetteville,* [4]*USDA-CSREES, Washington, DC.*

Today's beef industry is faced with the overwhelming task of searching for creditable answers to specific questions. Therefore, a joint effort between the USDA-CSREES, land grant universities, producer commodity groups and the private sector resulted in a virtual library of current, credible information (Beef Infobase). Infobase articles are categorized into general topics including animal welfare/behavior, annual research reports, beef quality assurance, breeding and genetics, business management, carcass and product, facilities and equipment, feeding and nutrition, grazing lands, forages, herd and animal health, herd management, industry facts and figures, marketing, reproduction, and waste and environmental management.

The Infobase consists of peer reviewed articles submitted through five regional editors (Northeast, Southeast, Midwest, Texas/Oklahoma and West). The management of the Infobase is the responsibility of the beef infobase committee, comprised of cooperative extension, producers and representatives of allied industries. ADDS Inc. publishes the Beef Infobase electronically in both CD and web format. ADDS Inc. is a non-profit educational corporation that facilitates cooperation between public and private sectors across various institutions and disciplines. The Beef Infobase has three directors on the board of ADDS Inc.

Keyword search tools are utilized to quickly locate articles. By using the Folio commands, articles can reviewed by searching key words, or the table of contents can be searched for specific articles. Each article lists the title, author and publication origin. Over 1500 articles (from 35 states) from extension publications, university research reports, and industry experts are represented in the info base.

The process of updating, collecting user feedback, and annual product review is the responsibility of the Beef Infobase Committee members. The goal is to keep this product on the leading edge of useful technology. The Infobase is available by purchasing a CD or by subscribing to a web site (www.adds.org). Access to credible information in an easily searchable and retrievable format is an essential tool to provide situation specific answers for today's beef industry. The Beef Infobase can fulfill that need.

Key Words: beef, database, beef production

435 Dairy InfoBase: promoting cooperation, division of responsibilites and national leadership in support of dairy education. B.R. Eastwood*[1], M.F. Hutjens[2], M.B. Opperman[3], J.M. Mattison[3], and M.J. Joyce[4], [1]*USDA-CSREES,* [2]*University of Illinois, Urbana,* [3]*ADDS Center,* [4]*Wisconsin Milk Marketing Board.*

The dairy infobase is an electronic resource for information, educational programming and support for decision making by dairy producers and the agri-support industry. It is available on CD and the web as a product of the ADDS (Agricultural Databases for Decision Support) program.

The national project which developed the dairy infobase is organized by twenty one subject matter domains. Domain leaders were selected from among individuals recommended by university administrators and dairy project leaders. Domain leaders work with individuals who were recommended for their expertise. Each member of a domain group is considered an editor/developer of the infobase.

The charge to each domain group is to develop a strong and useful section for the infobase. This is done by reviewing the material from the previous iteration of the product, selecting those items to be included in the new version, and recommending additional new materials to incorporate into that domain. The expected result is a section that incorporates a reviewed and selected set of the most useful material to support informed decision making related to that area of the dairy operation.

Domains addressed in the infobase include agricultural safety and health; animal care and behavior; animal health and biosecurity; buildings and facilities; business management; calves and heifers; culling; dry cows and maternity; expansion; feeding and nutrition; forages; genetic improvement; grazing; HAACP and pre-harvest food safety; human resources management; information systems, records and tests; manure, odor, waste management and the environment; marketing and policy; milking management; reproduction; and small-scale and sustainability issues.

The domains facilitate division of responsibilities for developing and updating each section of the infobase. Domain leaders become de facto national leaders for their area of expertise, providing leadership for their domain group in carrying out the development of each section of the infobase product.

Key Words: Extension, InfoBase, Database

436 Combining television and the internet for beef producer education. G. E. Selk*, S. L. Grussing, L. G. Burditt, and R. K. McClendon, *Oklahoma Cooperative Extension Service, Stillwater.*

Combining television and the internet can effectively deliver management information to cow calf producers. Oklahoma Department of Agriculture statistics indicate that over 60,000 Oklahoma beef operations have beef cows. Extension beef specialists have a challenge bringing educational material to that number of producers. Two forms of media that have the potential to reach many rural homes are television and the internet. Oklahoma State University extension animal scientists and agriculture communications faculty combine television and the internet in a novel approach to information transfer to a large number of cow calf producers. The Cow-calf Corner is a two to four minute weekly presentation of a research-based management tip on the daily television show SUNUP. Because SUNUP is broadcast on the Oklahoma Education Television Authority network, the Cow-calf Corner has a statewide audience. Producers often request more detailed information than what could be delivered in the short time on television. Therefore a Cow-calf Corner website was developed to allow producers access to more in-depth information on each topic. This allows producers that desire more in-depth information or those unable to watch the televised presentation to retrieve the information at a more convenient time. Nielsen ratings have estimated that SUNUP has a daily audience of approximately 100000 viewers in the metropolitan areas of Oklahoma. A recent survey of rural residents of Oklahoma indicate that 45 percent of rural residents watch SUNUP occasionally and 33 percent watch the show on a regular basis. The Cow-calf Corner website has a mean of over 1600 user sessions per month. Combining the two forms of media reaches a large cow calf producer audience.

Key Words: beef, television, internet

437 Decision Model to Aid in the Retain/Replace decision for Open Breeding Stock for Beef Cattle Producers. K. H. Burdine*[1], G. Ibendahl[1], J. Anderson[1], J. T. Johns[1], and L. H. Anderson[1], [1]*University of Kentucky, Lexington.*

Cow-Calf operators face the replace/retain decision for open breeding stock on a yearly basis. Historically, recommendations have consistently favored replacment of open animals. In many situations, this recommendation may be incorrect. Often, cows which are to be culled are entering their most productive years. Replacing them with young females that require additional management inputs may not be profitable. The objective herein was to create a spreadsheet-based model to assist beef producers in evaluating the profitability of retain/replace decisions. Our model prompts the user to input age of the open cow, expected annual cost of retaining a cow in inventory, market value of the open cow, cost of a bred replacement heifer, the required rate of return, typical weaning weight of calves, a salvage value for the cow at the end of her productive life, and expected productive life of a brood cow. The spreadsheet uses these data to derive the net present value of both the open cow if retained and the potential replacement heifer. We have attempted to eliminate time bias by conducting a series of net present value calculations for ten subsequent replacements. After ten subsequent replacements, the value of additional replacements is near zero due to discounting. The action (retain/replace) that yields the greater net present value becomes the recommended action for the producer. The influence of the cow cycle is reflected through the market value of the open cow, salvage value of females, and the cost of replacement hiefers. This model will allow farmers and extension personel to more accurately evaluate the decision to replace open females.

Key Words: Management Decisions, Beef Cattle, Culling

438 Development and implementation of an interactive, hands-on summer day camp for urban youth. T. Radintz*[1], A. DiCostanzo[1], J. Reed-Boniface[1], T. Ames[1], and F.A. Ponce de Leon[1], [1]*University of Minnesota, St. Paul.*

A day camp (University of Minnesota's Farm In The City Day Camp) was established in 1999 to complement consumer education efforts by agriculture commodities. Under the theme "Every Day is an Ag Day for Everyone", representatives from commodity organizations, the Minnesota Department of Agriculture, and the Colleges of Agriculture Food and Environmental Sciences (COAFES) and Veterinary Medicine developed a 5-day summer camp for children ages five through 11. The anticipated outcomes were: 1) to enhance the perception of animal agriculture as an important contributor to basic societal needs, and 2) to increase interest in agriculture careers. The resulting curriculum led children through an introductory day (Monday), career and activities exploration days (Tuesday and Wednesday), a farm visit day (Thursday), and a food processing and community fair day (Friday). Student-educators, COAFES majors, led children (6 students to 1 educator) through daily activities. The focus activity was feeding and caring for suckling dairy calves (a calf was assigned to one or two children), a pen of weaned pigs, and a pen of weaned lambs twice daily. This activity was established to emphasize the responsibility and discipline that farmers have when owning livestock. During the activities exploration day, children were led through a veterinarian visit, a tour of the veterinary hospital, a prairie preservation plot, a cattle pasture, and a series of activities that introduced the concept of comparative nutrition in humans and animals. During the farm visit day, children were challenged to utilize their newly gained knowledge. Activities planned during the community fair involved a sponsored picnic that permitted interaction between producers and families of the children. Summary evaluations from parents of the 191 children that participated reflected an overwhelmingly positive response to this camp. Their responses indicated that children learned positive aspects of animal agriculture while having fun in a safe and interactive environment.

Key Words: Agriculture, Education, Youth

439 Evaluating the impact of management intensive grazing schools in central Missouri. M.A. Stewart* and J.K. Rogers, *University Outreach and Extension, University of Missouri, Columbia.*

Management Intensive Grazing (MIG) offers forage, animal and natural resource benefits that make it attractive to producers. While research at the University of Missouri's Forage Systems Research Center (FSRC) documented many of these benefits for Missouri producers and literature on the subject was widely available, MIG was not being widely adopted. In 1989, a curriculum was developed for grazing schools (GS) to be held at FSRC to present MIG components and principles to producers in a classroom and field demonstration setting. In 1994, the curriculum was adapted for out state regional grazing schools (RGS) to be conducted by regional extension faculty and Natural Resources Conservation Service staff. A program evaluation on the impact of both the SWGS and RGS was conducted in the fall of 1999. The purpose was to evaluate the impact that these schools had on the adoption of MIG by livestock producers attending these schools. A survey instrument was mailed to 450 Central Missouri participants of these schools. A return rate of 31 adopted some type of managed grazing system. Of those who had not adopted a managed grazing system, time, money and lack of sufficient water supplies were given as the major obstacles to adoption. Ninety percent of respondents indicated that their level of understanding MIG was such that they could implement a system, explain it to a friend or "write a book on it". When information about respondents goals was tabulated: 74% of the respondents included natural resource goals and 77% included agricultural profitability or value added goals; 79% were at least beginning to meet their natural resource goals while 60% were at least beginning to meet their economic goals. When asked to rate the overall usefulness of the topics and materials covered in the grazing school, 93% responded good to excellent. Based on producer responses, both the RGS and SWGS have had a positive impact on the adoption, understanding and implementation of MIG.

Key Words: Management Intensive Grazing, Grazing Schools, Forages

440 The Missouri Premier Beef Marketing Program: an integrated education approach to enhance economic and production efficiency for cow-calf producers. R. L. Larson*, K. C. Olson, and V. L. Pierce, *University of Missouri, Columbia.*

The Missouri cow-calf industry represents 2.15 million beef cows making Missouri the second largest producer of feeder cattle in the United States. Most (70%) of these feeder cattle are produced on small farms (i.e., less than 100 beef cows) which represent the vast majority of cow-calf producers in Missouri (93.5%). Consumers are demanding a more consistent and higher quality beef product. Creating a system that maintains the identity of a beef animal from birth to slaughter while allowing information feedback to the genetic decision-maker is paramount

to delivering a product of higher and more consistent quality. There has been growth in value-added, identity-preserved businesses in the beef industry which facilitate marketing systems of this type. Unfortunately, small and medium sized beef farms have difficulty in attracting buyers from these alternative marketing systems when only small numbers of animals can be offered for sale at a given time. The purpose of the Premier Beef Marketing Program is to help small and medium sized beef farms learn how to participate in these identity-preserved ventures which provide a high-quality beef product to consumers. The participating producers develop production and marketing criteria that all members can first agree upon and then implement. These criteria include similar genetics, health, and husbandry practices, both prior to weaning and during a short commingled feeding/stocker period following weaning. Producers learn how to interact as a group to explore alternative marketing opportunities and negotiate prices. By capturing growth and carcass information through negotiated agreements, producers learn how to interpret feedlot gain and efficiency data as well as carcass yield, yield grade, and quality grade and explore the potential impact of making changes in their operation on future profits. To date, four groups have formed and sold 1,154 yearling calves in 1999-2000.

Key Words: marketing, cooperative, information feedback

441 Dairy employer experiences with Hispanic workers in New York State. T.R. Maloney*, *Cornell University, Ithaca, NY.*

In recent years there has been an increasing number of Hispanic workers employed on New York dairy farms. In 1999 survey interviews were conducted with 20 New York dairy farm managers who employ Hispanic workers. The purpose of the survey was to benchmark current employment practices on New York dairy farms where Hispanic workers are employed. The survey questionnaire examined a variety of employment related issues including language differences, recruiting patterns, wages, transportation, housing and cultural issues. The dairy employers interviewed have been very resourceful in recruiting and managing Hispanic workers. Despite linguistic and cultural differences employers found positive ways to manage Hispanic employees. While most working relationships with Hispanic employees have been positive, several challenges exist. Solving the language problem is the greatest initial challenge, since few Hispanic workers speak English. In addition, managers must understand cultural differences to avoid misunderstandings and interpersonal problems. Employers reported other challenges including illegal immigration, community relations and employee turnover.
Based on this survey, dairy farm employers who successfully manage Hispanic employees possess the following characteristics: 1)They work aggressively to overcome the language barrier. 2)They make considerable effort to learn about the culture of their employees. 3)They develop a business culture that accepts and appreciates the differences that individual employees bring to the workplace. 4)They establish employment policies and carefully communicate them to all employees. 5)They make every effort to hire Hispanic employees who have legally entered the United States. 6)They acknowledge their employees strong family ties and desire to return home for extended periods of time.7)They help create and support social and recreational activities that will create a quality of life outside the job. 8)They help employees become oriented to the community.

Key Words: Hispanic worker, human resource management, multicultural workforce

442 HACCP at the Dairy Farm. J.K. Reneau*[1] and W.E. Coleman[2], [1]*University of Minnesota, St. Paul,* [2]*Dairy Consultant, Fargo, ND.*

Eleven Minnesota dairy farms were enrolled in a descriptive survey January 1998. The purpose of the project was to: explore the practical application of HACCP plans on dairy farms; determine what may be the critical control points; and determine what samples and at what frequency samples should be collected. The farms ranged in size from 40-1200 milking cows. Minnesota State Department of Agriculture field staff inspected the dairies each month for 1 year. All official inspection reports, SCC, and bacteria reports were compiled. Milk plant component testing (SCC, % BF, % solids, % lactose) done for each bulk tank pick-up was collected. On 3 of these farms this data was electronically transferred via electronic bulletin board at the milk-testing lab to process control charting software at the farm. This information feedback to the farm manager was used to maintain or improve milk quality. Monthly visits were made to all project dairies by project researchers to collect BT milk samples, individual cow milk samples for all clinical cases, and bedding samples. Monthly bulk tank milk samples were cultured for the presence of human food-borne pathogens (Salmonella, Listeria) and bovine mastitis pathogens. Bedding samples were also cultured for the presence of mastitis pathogens. Over one million bulk tank temperatures were recorded at 5-minute intervals and stored in data loggers for the 1-year duration of the project. While analysis is not yet complete, preliminary analysis shows that: bulk tank cooling and wash temperatures are critical control points; daily use of bulk tank SCC data in process control charts is an effective aid in motivating dairy personnel to maintain or improve the process of producing quality milk; Listeria was not isolated from any of these dairy's monthly bulk tank samples; 3 Salmonella isolates were found from the monthly bulk tank milk of 2 of the project dairies; and bedding cultures were useful for decisions on bedding frequency. Bulk tank cooling temperature, bulk tank wash temperature, bulk tank SCC, bulk tank bacteria counts, and bedding bacteria counts appear to be important outcome indicators of the management practices governing quality milk production.

Key Words: HACCP, Critical Control Points, Management Practices

443 Differences between dairy nutritionists and veterinarians and the effect on educational strategies. G.R. Oetzel*, *University of Wisconsin, Madison.*

Veterinarians and nutritionists are increasingly working together and assuming overlapping roles in servicing dairy clients. Correspondingly, educational programs are being targeted at both nutrition and veterinary audiences. An understanding of the educational and operational differences between these two groups of dairy professionals may improve the effectiveness of educational programs designed for both groups. Veterinarians work primarily with the outliers in the herd management system - individual animals with health problems. Nutritionists are more attuned to central tendencies of herd performance. Veterinarians are trained to always make at least a tentative diagnosis and initiate treatment, even when the diagnostic data are incomplete or obscure. Nutritionists tend to be less likely to make diagnostic decisions in response to unclear problems in herd performance. Veterinarians are generally trained to find a single cause of an animal's health problems and may be uncomfortable with multi-factorial causes of herd-based problems. Nutritionists are typically more comfortable integrating multiple causes of herd problems. Veterinarians often deal in realms of high mystique (e.g., pregnancy diagnosis or life-and-death clinical decisions) and thus are afforded disproportionately high standing with dairy producers. Nutritionists generally have a less secure position with their clients and may be more cautious for fear of making a mistake. Veterinarians are more likely to be given the benefit of the doubt by producers and may be bolder to implement herd changes. Nutritionists often focus on shorter-term production goals in a herd, while veterinarians are more likely to be concerned with longer-term issues of cow health, longevity, and culling. The differences between nutritionists and veterinarians are complementary. Dairy herd profitability and educational programs are most successful when veterinarians and nutritionists understand each others' situations and work cooperatively.

Key Words: Nutritionists, Veterinarians, Educational strategies

444 California dairy quality assurance program environmental stewardship certification process. D. Meyer*[1], D. Wilson[2], S. McGinnis[2], M. Payne[1], and G. Veserat[1], [1]*University of California, Davis,* [2]*California Department of Food and Agriculture.*

Three requirements must be completed for environmental stewardship certification: completion of a six hr short course on environmental stewardship, development and implementation of an environmental stewardship farm plan, and successful completion of a non-regulatory, third party evaluation. Participation in the certification process is voluntary. The three classes of the short course are offered in the fall and spring. Classes need not be taken in sequence. The course addresses the top 20 problems regulatory agencies staffs have with dairy operations. The environmental stewardship farm plan consists of: estimation of winter liquid storage requirements including runoff and existing storage capacity, completion of risk assessment documents and creation of an action plan associated with high risk categories, a storm water pollution prevention plan, an mergency manure management plan and required documents

for local, regional and state permits. Producers request the third party evaluator. This individual reviews farm documents and walks through the facility to determine if the management and the facility are capable of being in compliance with regulations. A grant from U.S. EPA is covering the cost of the first 950 dairies that request the third party evaluation.

Key Words: Dairy, Manure, Management

445 A study on the demography of milkers in Pennsylvania and their influence on milk quality.. C. Burns*, D. Wolfgang, and B. Jayarao, *Pennsylvania State University, University Park*.

Changing trends in the production of food and fiber is causing major concern with ag-industries. A questionnaire was administered by PA DHIA personnel to determine current demographics for milkers in Pennsylvania, their education levels, and standard milking practices on the farm. A total of 115 farms representing 319 milkers participated in the survey. Most dairies surveyed have less than 100 cows (mean; 71 cows/herd), About 5% of farms had written protocols for milking. There was no evidence of common milking techniques among the farms surveyed, except for the use of paper towels for wiping and drying teats. The average milker was more than 35 years old with a highschool education and little off-farm training on proper milking technique. Many milkers (31%) were asked to make suggestions for improving farm's milk quality. The majority were asked to report health problems with herd cattle, and had access to the PA DHIA records (64%), but few received any financial rewards toward their efforts (12%). The findings of the study indicated a need to improve existing, and develop new training programs focused on issues related to milking management practices, milk hygiene, and labor relations.

Key Words: Demographics, milkers, milk quality

446 DairyNew: An Internet-based electronic mail distribution system for dairy production related newsletters. M.A. Varner*[1], S.W. Fultz[1], and K.E. Olson[2], [1]*University of Maryland, College Park,* [2]*American Farm Bureau Federation*.

An automated electronic mail (e-mail) distribution system was devised for dairy production newsletters. L-Soft Listserv^{TM} e-mail software (Ver. 1.8c) running on an IBM mainframe computer was used to establish a centralized distribution address in 1995 for distribution of newsletters in electronic format. Individual articles of national/international interest from 27 public-sector and two private- sector newsletters listed in the World Wide Web Virtual Library for Dairy Production (www.ansi.okstate.edu/library/dairy/pub-coll.htm) were selected and classified according to content (veterinary medicine; reproductive management; nutrition and feeding; mastitis and milking management; economics and dairy farm finances; facilities and engineering; replacements and calves, genetics; and grazing and pastures). Subscribers received messages from as many, or as few, of the content classifications as they wish. Newsletter editors were contacted, and all agreed in advance to allow others to redistribute the articles as long as the original source and author for the article was cited. Each subscriber must agree to adhere to this policy before they receive DairyNew messages. The source and author citation information is distributed with each article. All messages are archived, and the Listserv software allows subscribers to search for articles on specific topics, by individual authors or newsletters or within certain time frames. One hundred ninety nine newsletter articles were distributed as e-mail messages in 1999 to over 400 subscribers from over 20 countries. Subscriptions are automated, and information on the various features can be found at the DairyNew homepage (www.wam.umd.edu/ markv/DairyNew.html). Use of material from additional newsletters and more subscribers are solicited.

Key Words: Dairy production, Internet, Extension newsletter

447 Silage-L: Electronically connecting the silage industry. T.E. Schmidt*, K.K. Bolsen, M.K. Siefers, and M.E. Uriarte, *Kansas State University, Manhattan*.

Agriculture relies on the experience of yesterday, the technology of today, and the speed of tomorrow. New developments in the industry stem from university research and branch out to commercial businesses, which in turn respond to producer's needs. The speed and timeliness of delivering information is critical, especially when livelihoods depend on it. In the silage industry, there is a link between producer, researcher, and silage contractor. It is referred to as the "Silage Triangle." Kansas State University has developed a way to further, and faster, connect the Silage Triangle by creating the e-mail listserv Silage-L. Its purpose is to provide an information and technology link between university or commercial researchers, extension agents, technical advisors, consultants, silage contractors, crop growers, and dairies and feedlots. Questions, research news and ideas, job opportunities, and other information dealing with silage are submitted to the list for discussion. Discussions on production, management, utilization, microbiology, silos, evaluation, crop agronomics, economics, "band-aid" solutions, sanitation, and the environment are encouraged. Announcements of conferences, educational events and aids, and government regulations and policies are also acceptable topics of discussion. The listserv spans nationally and internationally. Members to the list receive e-mails from the list, can send their own question to the list, and can access past discussions via the archives. By providing this service to the silage industry worldwide, information transfer can go where and when it's needed.

Key Words: Silage-L, Information transfer, E-mail listserv

448 An interactive web site to help producers select the most economically desirable Holstein sire portfolio. P. R. Tozer*, G. W. Rogers, J. B. Cooper, and H. J. Oberholtzer, *Pennsylvania State University, University Park*.

An interactive website (www.das.psu.edu/grogers/sireportfolio) was developed to assist medium and large dairy producers select a portfolio of sires that would suit their economic and genetic goals. Dairy producers can compare the investment value of different portfolios of sires from various breeding companies based on the expected net revenue (ENR$) of each bull within the respective portfolios and the risk preferences of the dairy producer. The interactive website is user initiated and requires limited information from the producer. Producers enter appropriate information on the milk market and select values for indicators of basic herd management data, such as reproductive efficiency and replacement management. Producers answer a series of questions that allows for the quantification of their view of risk in sire selection. Risk preferences determine the relative importance of the ENR$ and the variability in ENR$ and are critical for making the optimum choice among portfolios. Sire data are accessed directly from databases containing information on PTAs and reliabilities from the most recent sire summary. A summary page details the entire portfolio and the contribution each bull makes to the portfolio. Results are presented with and without adjustments based for risk on the preferences of the dairy producer. The website has been reviewed for ease of use and technical aspects by individual producers and industry experts. Keywords: Sire selection, investment portfolio.

Key Words: sire selection, investment portfolio

449 Field implementation of nutrition and herd management practices to reduce nutrient losses from Shenandoah Valley dairy farms. F. P. Wydner, III*[1], G. M. Jones[1], and K. F. Knowlton[1], [1]*Virginia Polytechnic Institute and State University, Blacksburg*.

A two-year field study was implemented to reduce nutrient losses from dairy farms through nutritional and herd management practices. Farm advisory teams were established, and nutrient intake and excretion, whole farm nutrient balance, herd milk yield and reproductive efficiency were monitored throughout the study. Ten collaborator herds were identified, all at state DHIA average or better for milk yield and days open. Baseline feed samples and ration information were collected for two months and analyzed for phosphorus (P) and nitrogen (N) content. Feeds were analyzed monthly, and monthly DHIA milk yield, milk composition, milk urea N (MUN), and reproductive data were obtained. Blood and fecal samples were collected from 25 cows per herd every three months to monitor P excretion and blood urea N. Individual farm advisory teams were formed to provide targeted advice, and were comprised of the owner, nutritionist, veterinarian, extension agent and other key individuals. Each farm advisory team met monthly and reviewed milk yield, milk composition, MUN content, and results of feed analyses to determine if changes were needed to reduce excess excretion of N and P. Advisory teams were used to improve communication, owner education, and implementation of needed changes, but the owner made all final

decisions. Nutrient budgets were developed for each farm for N and P at the start of the study and following ration and management changes. Ten control herds similar to collaborator herds were identified and monitored. Feed samples and intake data were collected and analyzed every three months in control herds, and milk yield, milk composition, MUN, and reproductive data recorded once per year. Control herds received this data, but no additional intervention occurred and no advisory teams were established. The goal of this project was to demonstrate the use of nutritional and management practices to reduce nutrient losses from Virginia dairy farms.

Key Words: Farm Advisory Teams, Dairy, Nutrient Losses

450 Nitrogen cycling on pasture based dairies. T.W. Downing*, *Oregon State University, Corvallis*.

Most animal waste management plans (AWMP) written for pastured based dairies use estimates for manure produced and yields removed to design the waste plan. Landowners theoretically have been required to apply nitrogen (N) in quantities equal to what they remove annually in a crop. As concerns for water quality have increased, so has the need to demonstrate that the nutrients applied are equal to what is removed. Over the past year, a trail was conducted on three farms to develop a realistic plan for dairymen to document nutrient application and removal on pasture based dairies. This challenge was fairly complex, because grazing animals are constantly harvesting forage and depositing manure. You also have continuous grass growth as a factor. Participates received a customized AWMP, calibration of manure handling equipment, and a detailed farm map. They also decided how they were going to measure standing forage daily and record their data. Soils samples were taken before and at the conclusion of the project to help verify and confirm the results. Farm A did not complete the yearly forage measurements. Farm B had grass yields ranging from 8743 to 20177 kg/ha with an average of 16926±1959kg. Farm C had yearly yield totals ranging from 4214 to 16254 kg/ha with an average of 8967±3138kg. Pasture protein levels varied some throughout the season, but were averaged to determine the approximate level on nitrogen removed. Total nitrogen removed per hectare by grazing ranged from 225 up to 589kg of N/ha removed. Net nutrient balance for nitrogen was negative for thirty-one of thirty-two fields studied. Farm A continues to record manure applications by field, focusing efforts on even manure distribution. Farm B and C found this increased level of management rewarding and profitable. They also used this data to give them confidence to add commercial fertilizer. Both these farms believe this approach has made them more profitable in addition to being able to truly document agronomic applications.

Key Words: Waste manangement, Nutrient balance, Animal Waste Management Plan

FOOD SAFETY

451 A comparison of antibiotic resistance patterns from swine farms using or excluding antibiotics. M. Beckmann*, F. R. Jackson, and A. G. Mathew, *The University of Tennessee, Knoxville, TN*.

The effects of farm use or exclusion of antibiotics on antibiotic resistance patterns of bacteria were compared using fecal samples from live swine. Four farms that used antibiotics and three farms that excluded antibiotics from production were selected and from each farm, 6 pigs from each of 4 weight groups (4.5, 23, 45, and 109 kg) and 5 sows were randomly selected for collection of fecal samples. Non-pathogenic *E. coli*, O157:H7 *E. coli*, and *Salmonella spp.* were isolated from fecal samples and tested for sensitivity to gentamicin, sulfamethazine, oxytetracycline, ceftiofur sodium, and ampicillin using a standardized minimum inhibitory concentration (MIC) analysis. Sensitivity patterns were markedly different between farm types in non-pathogenic *E. coli*, and moderately so in salmonella. In both cases, isolates from farms that excluded antibiotics had lower ($P < .05$) MICs. The number of resistant isolates and those that demonstrated multiple resistance patterns was greater ($P < .05$) on farms that used antibiotics. Nonpathogenic *E. coli* from farms that excluded antibiotics had significantly lower ($P < .001$) MICs for gentamicin, sulfamethazine, oxytetracycline, and ampicillin and lower ($P < .10$) MICs for ceftiofur. Farm type differences were most evident for isolates from younger pigs for gentamicin, ceftiofur, and ampicillin, but were also noted among all pig groups for sulfamethazine and oxytetracycline. In salmonella, the MICs were higher from farms that used antibiotics, particularly for oxytetracycline and ceftiofur ($P < .001$). O157:H7 *E. coli* were isolated from 2 farms, both of which used antibiotics in production, thus a relevant analysis on that bacterium was not possible. In total, these data indicate that exclusion of antibiotics in swine production decreases antibiotic resistance in non-pathogenic *E. coli*, and to a lesser extent resistance in salmonellae.

Key Words: Antibiotic resistance, *E. coli*, Swine

452 Effect of drug combinations and regimens on antibiotic resistance in bacteria from swine. F. R. Jackson*, M. Beckmann, and A. G. Mathew, *The University of Tennessee, Knoxville*.

In 2 replicate trails, 144 weaned pigs were used to test the effects of antibiotic dosing schemes on resistance in bacteria. Pigs were inoculated with the foodborne pathogen *Salmonella typhimurium* prior to being treated with feed- and water-based antibiotics. Treatments included maximum label use, rotation of similar and non-similar antibiotics, increasing gradient doses, and pulse dosing of antibiotics for a period of 2 weeks following pathogen challenge. Fecal samples were obtained prior to initiation of treatments, on various days during treatment, and throughout the grow-finish phase. The challenge organism and non-pathogenic *E. coli* were recovered from fecal samples and tested against all antibiotics used in the study to determine effects on resistance patterns. Antibiotic resistance was affected to a greater extent in non-pathogenic *E. coli* compared to *Salmonella typhimurium*. Greater resistance ($P < .0001$) occurred when similar antibiotics (apramycin, gentamicin, neomycin) were used in rotation compared to the other treatments. Significant ($P < .05$) time by treatment interactions also occurred during or just following rotational treatment with similar antibiotics compared to samples collected later and from other treatment groups. Pigs on the control and pulse dose treatments produced bacteria with lower resistance compared to other groups. These data indicate that dosing regimens affect antibiotic resistance patterns in bacteria associated with swine.

Key Words: Swine, Salmonella, Antibiotic Resistance

453 Prevalance of verotoxin-producing *Escherichia coli* in sheep grazing Great Basin irrigated pastures. S. L. Lake*, B. H. Thran, H. S. Hussein, S. F. Khaiboullina, M. R. Hall, and H. A. Glimp, *University of Nevada, Reno*.

Although sheep have never been implicated in an *Escherichia coli* associated foodborne illness, the limited research published in recent years have shown that sheep harbor verotoxin- producing *E. coli* (VTEC), including O157:H7 at high rates. This suggests that mutton, lamb, or their products share a food safety risk similar to that of beef. In most cases research has focused on characteristics (i.e. sorbitol negative and 4-methylumbelliferyl-β-D-glucuronide [MUG] negative) usually associated with *E. coli* O157:H7. However, VTEC encompass numerous serotypes of *E. coli* and are not limited to sorbitol negative; MUG negative isolates. The objective of this study was to assess the VTEC prevalence in sheep grazing an irrigated pasture over 6 months (summer and fall, 1999). Twenty yearling (15-mo old) ewes (7/8 Merino; 1/8 Rambouillet) were selected at random from a large flock (>1,000 ewes) at Rafter 7 Ranch. The ewes grazed fescue (*Festula arundinacea*) and white clover (*Trifolium repens*) pasture during the summer and were supplemented with alfalfa (*Medicago sativa*) hay during winter. Thirty-nine fecal samples were rectally collected in August and November. One ewe was lost to predation after the first collection. Initial *E. coli* isolates were selected using microbiological methods utilizing the lack of sorbitol fermentation properties of *E. coli* in conjunction with MUG. Verocytotoxicity tests were performed to determine the toxicity status of the isolates. Eleven isolates from five ewes (one from the summer and four from the fall collections) were cytotoxic. None of the isolates matched the classical identification of O157:H7 (sorbitol negative; MUG