be able to: 1) install the ADDS National Dairy InfoBase (NDIB, Ver. 4) from the CD to the hard disk of their computer; 2) start the NDIB on their computer; navigate the various windows within Folio Views; 3) browse through publications in the various subjects; 4) Search the NDIB with single word, multiple word and phrase searches; 5) print various amounts of a publication and 6) use the NDIB over the Internet. The workshop was held in a two hour time period. Introductory remarks were made before each of the six sections and then individuals were encouraged to complete the step-by-step tutorials that would allow them to accomplish the desired tasks when returning home with their CD-ROM disk. After approximately 15 minutes, a short summary was presented and an introduction was made for the next topic. The workshop was presented by one instructor and the time between presentations was spent answering individual questions. All participants were able to complete the workshop in the two hour time frame. Conducting the hands-on workshop for the NDIB as a pre-conference program was desirable as participants could maximize their educational efforts on that day. A copy of the training materials used in the workshop are available at http://www.wam.umd.edu/ markv/NDIB.pdf.

Key Words: Dairy, Computer, Training

1307 Teaching pork producers breeding and gestation herd management skills via the Internet. M.T. See* and B.A. Belstra, *North Carolina State University, Raleigh NC.*

To enable distance education for pork producers and their employees a nationally developed curriculum was transformed into an Internet course comprised of interactive HTML lessons, images, and self-grading quizzes. The Breeding and Gestation Herd Management Curriculum is divided into six sections. These sections are not separated to be equal in length but rather to break at distinct phases of breeding and gestation management. The Internet course was pilot tested in cooperation with the National Pork Producers Council during the spring of 2000. In the pilot class 39 participants enrolled and 26 completed the course. Participants were from 17 states (AK, AR, CA, FL, GA, IA, ID, IN, IL, MI, MN, MO, NC, NE, NH, OH, OK), Ecuador, Colombia and the Philippines. Of the 26 participants completing the course 14 were owner/operators, 6 were farm managers, 2 were breeding and gestation managers, 3 were employees and 1 was an educator. Of the 26 completing the course 20 were male and 6 were female. After completion of the six lessons and quizzes students were asked to complete a survey response. Average time spent on this course was 12 hours per student and most students worked on the material in the evenings. The completion of the pilot Internet course resulted in an average quiz score of 88.2%. Ninety-six percent of the participants completing the course agreed that Breeding and Gestation Herd Management provided him or her with an opportunity to improve their job skills. When asked about their improvement of knowledge on 14 key concepts the average responses ranged from 2.0 to 2.5 for every concept where 1 is Strongly Agree and 5 is Strongly Disagree. Furthermore 46% of the completing students indicated that they planned to make changes in their breeding and gestation barn practices based on information they learned in Breeding and Gestation Herd Management. Ninety-six percent of respondents also indicated that they would be interested in taking additional courses over the Internet. These results demonstrate that distance education programs not only makes information readily available at a time convenient to the clientele but that it is also effective in delivery and can result in improved knowledge and job skills.

Key Words: Pigs, Internet, Breeding

1308 Undergraduate education: exposing first- and second-year students to laboratory research. G. F. Erf*, W. G. Bottje, H. D. Chapman, M. Iqbal, R. Okimoto, and M. S. Parcells, *University of Arkansas, Fayetteville, AR, USA.*

In agricultural colleges with a strong research base, there are many research opportunities for undergraduate students in formal and informal settings (e.g., special problems courses, internships, work study and honors programs, etc.). However, entry-level undergraduate students interested in research opportunities may not pursue these interests due, in part, to limited exposure to the research environment, a lack of confidence, and difficulties in identifying a research mentor. The laboratory course entitled Rotations in Agricultural Laboratory Research described below was developed to provide first- and second-year undergraduates interested in science-based agricultural programs with the opportunity to conduct hands-on, interdisciplinary, team-based research. During the first 8 wk, students were taught research techniques and approaches during a 4-h structured laboratory and a 1-h discussion-session per wk. The teachers involved were researchers from three disciplines. For example, during Year 1, nine students conducted laboratory exercises in parasitology, immunology, and molecular virology. During wk 9, the students split into two groups and, with the aid of their teachers, each group developed a 4-wk research project integrating techniques used from at least two of the three disciplines. The teachers served as mentors for projects involving their discipline throughout the project period. The students reported their project and final results in an oral presentation and a written abstract. Students were evaluated based on the quality of their laboratory notebook, weekly quizzes on concepts learned in the laboratory, and their final abstract and presentation. Although still at the experimental stage, this course was very successful in providing students with confidence, enthusiasm, and the contacts to successfully pursue laboratory research opportunities. Currently (Year 2), disciplines taught are cellular physiology, immunology, and molecular genetics.

Key Words: Education, Laboratory course, Experiential learning

ASAS/ADSA International Animal Agriculture

1309 Interaction between chopping length of corn silage and long hay on chewing activity of dry cows. Paolo Berzaghi*[1,2], Giulio Cozzi[1], Flaviana Gottardo[1], and Igino Andrighetto[1], [1]*University of Padova, Italy,* [2]*US Dairy Forage Research Center, Madison, WI.*

Five Holstein dry cows were used in a 5 x 5 Latin square design with periods of 14d. Diets consisted of corn silage chopped at 6.7mm (S) and 14mm (L), long grass hay (H), and a combination of hay (20 %DM of the forages) with the short (SH) and the long (LH) corn silage. In all of the diets, soybean meal and a mineral premix were mixed to the forages to obtain a TMR with a CP concentration of 10 % DM. Diets were fed ad libitum (10% refusals) once a day. Chewing activity was monitored during the last 5d of each period using a portable APEC device (INRA, Clermont Ferrand, France) connected to a foam filled balloon placed under the lower jaw of the cows. The greater NDF content of grass hay (71.1 %DM) than the corn silages (44.6 %DM) reduced ($P < .01$) DM intake of H diet, but it maximized its NDF intake (7.0 *vs.* 5.6 kg; $P < .001$) in comparison to the four corn silage based diets. In diet S 2.6 % of the particles were retained by a 19mm screen. The coarser chopping of L diet increased this value up to 7.2 %. The different particles size did not affect DM intake and eating time, but it resulted in longer rumination time (491 vs. 389 min/d; $P < .02$) for L compared to S diet. The addition of hay to the corn silage diets resulted in a higher content (+3.7 %DM) and intake of dietary NDF (5.9 *vs.* 5.3 kg/d; $P < .02$). However, the rumination time of SH and LH diets was similar, leading to a significant ($P < .03$) hay addition x silage chopping length interaction. The same interaction tended to be significant ($P < .06$) for effective NDF, measured as time spent chewing per kg of NDF intake. The results indicate that chewing activity is affected by the particle size of the forage and by associative effects among forages with different composition and particle size. These results would also support the suggestion that in dry cows normal chewing activity is maintained by providing diets with 10-15 % of forage particles retained by a 19mm screen.

Key Words: corn silage, chopping length, chewing activity

1310 The peruvian dairy sector: farmers' perpectives, development strategies and policy options. Thomas Bernet[1] and Carlos Gomez*[2], [1]*International Potato Center,Lima/Swiss Agency for Development and Cooperation,* [2]*Universidad Nacional Agraria La Molina,Lima.*

This work assesses how expected market changes, farm strategies, and policy interventions might affect typical milk producers within the main Peruvian milksheds: Arequipa (coast), Lima (coast) and Cajamarca

(highlands). The analysis is based primarily on the application of a flexible farm-household optimization model able to project farmer behavior in different farming systems under varied production conditions.Cross-regional analysis shows a certain distortion in the current market situation, driven by varying degree of competition among the main milksheds for regionally produced milk. In Lima, the elevated number of regional milk buyers, many with under-used processing capacities, have caused strong competition on the demand side, provoking high milk prices. In Arequipa and Cajamarca, prices are much lower, since there are fewer wholesale milk buyers and thus less competition for farmers milk supply.Because condensed products for the Lima market (evaporated milk and cheese) are produced most cheaply in Arequipa and Cajamarca with local milk supply, corresponding growth in milk demand is likely to increase milk prices in those milksheds.The effect is enhanced by the fact that imported milk powder is more expensive than regionally collected milk, thanks to Peru current import taxation scheme.In Lima, a drop in milk price will consolidate the prevalence of better managed, more efficient larger dairy farms, because small and medium farms lack economies of size and tend to become unprofitable. In Arequipa, despite the expected increase in milk prices, dairy production is expected to decline, as farmers will tend to shift stronger towards agricultural crops when the price risk decreases in crop production. In contrast, in Cajamarca, the expected increase in milk prices will provide an important incentive for farmers to identify dairy production with improved feed and herd management.Potential government interventions could also reinforce and accelerate the expected upturn of dairy production in highland areas.

Key Words: Milk Production, Peru, Dairy Development

1311 Macedonian Dairy Industry situation and outlook. Alexsandra Depinovska*[1] and Mingruo Guo[2], [1]*Land O'Lakes-Macedonia, Kej 13 Noemvri bb,1000 Skopje, Macedonia,* [2]*University of Vermont, Burlington VT 05405.*

Macedonia is a small country situated in the heart of the Balkan Peninsula, approximately the same size as Vermont. The dairy industry of Macedonia has undergone a difficult process of transition since 1991. Dairy herds in Macedonia consist mainly of cows and sheep. The dairy cow population increased from 90,000 in 1991 to a peak of 93,000 in 1996 and decreased back to about 90,000 in 2000. The raw milk supply is primarily collected from thousands small farms with an average of 5-10 cows each. The average milk production per cow is still very low compared with the US standard. However, milk productivity has been improved through genetic breeding since 1991. The average annual yield was increased from 1,357 liters per cow in 1991 to 1,700 liters in 2000. Total cow's milk production was increased from 119,194 tons in 1991 to 148,445 tons in 2000. Sheep milk is the second important source of dairy production for the country. The share of sheep milk was about 25% of the total milk production in 2000. In contrast, the population of sheep has been decreasing since 1991 from nearly 1.5 million to about 1 million in 2000 due to the embargo on the export of Macedonian lamb imposed by the EU. Presently there are 49 registered dairy processing plants in Macedonia. The majority of them are small operations ranging from 5 to 10 tons of processing capacity, with except of the Bitola Dairy Plant which can process up to 200 tons of milk per day. Per capita milk consumption is more than 120 kg per year. The major domestic dairy products in Macedonia are cheese and fluid milk products including yogurt. Domestic products are only enough for 75% of the Macedonian market needs and the rest are imported from Europe, especially dry milks, butter, and nearly all the functional additives, including stabilizers, flavoring agents, starter cultures, and other nutritional additives.The dairy industry has a potential to grow. Challenges faced by Macedonian dairy industry include procuring high quality of raw milk from the small family farms, developing new and high quality dairy products, improving production efficiency, and developing a well-trained work force.

Key Words: Macedonia, Dairy Industry, Milk Products

1312 The suitability of the Beefmaster as a dam breed in hot and arid regions of Israel. J.E. Huston[1], Z. Holzer[2], P.V. Thompson*[1], Y. Aharoni[2], and B.S. Engdahl[1], [1]*Texas A&M University System, San Angelo, TX,* [2]*Israeli Ministry of Agriculture, Haifa, Israel.*

A study supported jointly by the Texas Department of Agriculture and the Israeli Ministry of Agriculture was conducted to evaluate the adaptability of Texas Beefmaster cows to the environmental conditions of southern Israel. Beefmaster embryos were transferred from Texas donor cows into Israeli recipients, and the resulting offspring were raised under local conditions to 2 and 3 yr of age. These cows were compared to similar aged Simford cows (products of crossing European breeds, Simmental and Hereford) on a cooperating site in southern Israel over a 3-wk period during August 2000. Each animal was monitored for time spent lying, standing, walking and grazing over 24-h periods. Heart rates and body temperatures were monitored for 24-h cycles using data loggers, and energy expenditures were estimated by measuring oxygen consumption. Voluntary intake of forage was calculated for each cow from fecal output estimated using intraruminal chromic oxide boluses. Behavioral activities showed greater similarities than differences. Each group was active during the early morning hours, rested during the afternoon, and then resumed grazing during the early evening. Heart rates and skin temperatures for the Beefmaster cows were lower during the early morning hours, indicating a greater capacity to dissipate body heat during nighttime hours. The energy expenditure (kilo joules /($W^{0.75}$*d)) varied greatly among individual cows. Fecal output and forage intake did not differ between breed groups. The Beefmaster cows produced from embryos transferred from Texas cattle appeared at least equally well adapted to Israeli conditions as cattle currently produced in the area. Subsequent studies measuring productivity (reproductive rate, growth rate and efficiency, and carcass value) are needed to determine whether the Beefmaster breed can improve productive and economic efficiencies of cattle herds in this region.

Key Words: Beef cattle, Adaptability, Israel

1313 Effect of seasons on milk production and calving pattern in nili ravi buffaloes . Syed Hassa Raza*[1], Arshad Iqbal[1], M.S. Khan[1], Shahid Mahboob[2], and M. Abdullah[1], [1]*FAculty of Aniaml Husbandry, University of Agriculture, Faisalabad, Pakistan,* [2]*Dept.Zoology, Govt. Colleage, Faisalabad, Pakistan.*

Although buffaloes are not seasonal breeder but they do show seasonality in breeding and calving which ultimately results in shortage of milk in summer, when its demand is at peak. To investigate the effect of different seasons on traits of economic importance in dairy buffaloes, this study is conducted. The data on five years (1983-1987) regarding calving, milk production and breeding in Nili Ravi buffaloes, maintained at the Livestock Experiment Station, University of Agriculture, Faisalabad were collected and statistically analyzed. It was inferred that seasons have significant ($P<0.01$) effect on calving pattern, milk production and occurrence of heat in dairy buffaloes. Maximum calving took place in autumn (45.29 %) and minimum in winter and spring (5.66 %) in each case. The highest values for milk production were observed in autumn (25,528 lit.) and lowest in summer (14,507 lit.). Out of the total, about 48% buffaloes exhibited heat in winter and only 2.39% in summer. These revealed that severe summer season adversely impair the reproductive efficiency of the lactating females. Through adoption of certain managemental practices, this effect of heat stress can be minimized to alleviate the situation for the improvement in milk supply.

Key Words: Buffalo, Milk, Environment

1314 Effect of high-levels of brewery supplementation on blood metabolites of Holstein cows from a semi-intensive dairy in north-central Mexico. E Guzman, RM Rincon, DF Cortes, R Bauelos-Valenzuela*, and CF Arechiga, [1]*Universidad Autonoma de Zacatecas. Zacatecas, Mexico..*

The purpose of this study was to determine blood- metabolite differences in response to a high-level of brewery supplementation, which has become a routine practice in typical semi-intensive dairies from north-central Mexico (Fresnillo, Zacatecas) with low level of technology and grain scarcity. Twenty-one lactating dairy cows were exposed to 3 different levels of brewery supplementation: 25, 50 and 75% of the

diet. Besides brewery, cows received corn silage, concentrate, and accesss to a rye-grass pasture during 4 h/d. Brewery supplementation at the 75% level increased blood pH (P<0.01), reduced glucose (P<0.001), and tended to increase protein (P=0.10). Besides, there was a general correlation within glucose and protein, glucose and glutamic-oxaloacetic transaminase (GOT), pH and GOT, protein and GOT. In conclusion, high levels of brewery supplementation increase blood pH, tended to increase protein and reduce glucose in dairy cows.

Key Words: Dairy Cow, Blood Metabolites, Mexico

1315 Timed-embryo transfer (Gyr/Holstein) in recipient cows exposed to a synchronized ovulation. BA Barrios, LA Guillen, JC Acua, and CF Arechiga*, [1]*Universidad Autonoma de Zacatecas. Zacatecas, Mexico.*

The purpose of the present work was to evaluate heat induction and pregnancy rates in response to a frozen/thaw embryo transfer (Gyr/Holstein embryos) in the uterine horn ipsilateral to the corpus luteum of recipient cows exposed to a synchronized ovulation. Experiment was done from April to August. Twenty-six cows from different locations and genetic background were exposed to a synchronized -ovulation protocol (d 0, GnRH; d 7, PGF2a; d 9, GnRH; d 10, checking estrus instead of timed AI; d 17, embryo thawing and deposition). Cows were rectally palpated at each farm on d 10 of treatment and signs of estrus were observed. However, cows were not inseminated but rather and embryo was deposited in the uterine horn ipsilateral to the corpus luteum palpated at d 17. During embryo transfer cows were rectally examined, feces were removed, and perianal region was washed. Then the embryo was deposited using a Cassou AI gun passing through the cervix of the uterus and leading it into the uterine horn ipsilateral to the ovary that contains a corpus luteum. Sixty days after embryo transfer, cows were diagnosed for pregnancy and 19.2% of the recipient cows were pregnant (i.e., 5/26). One of the cows received two embryos and the cow delivered both calves alive. In conclusion, the synchronized-ovulation protocol could be utilized for synchronization of cows included in embryo transfer programs. However, in this preliminary study, pregnancy rates were low probably due to the heterogeneity of the cows included in the trial.

Key Words: Synchronized Ovulation, Embryo Transfer, Mexico

1316 Meat quality characteristics of loin eye and tenderloin muscles of native Korean (Hanwoo) steers. Y.K. Lee[1], K.H. Kim*[1], Y.S. Kim[2], S.S. Sun[1], and M.G. Baik[1], [1]*Chonnam National University, Kwangju, Korea,* [2]*University of Hawaii at Manoa, Honolulu.*

The objective of this study was to investigate postmortem glycolysis, histochemical, and meat quality characteristics of longissimus dorsi (LD) and psoas major (PM) muscles of Hanwoo (native Korean) steers. Four steers weighing about 550 kg were slaughtered, then 20 g of LD at the 13th rib and PM at the 4th lumbar vertebra were collected at 1, 2, 6, 12, and 24 hr postmortem to measure changes in metabolite concentrations and pH. At 24 hr later, 1 cm^3 of LD and PM samples were cut for histochemical analysis. At 1, 3, 7, 14, and 21 day postmortem, LD samples between 6th and 12th rib and PM were collected for TBA value and shear force measurements. Three 1.8 cm diameter cores were prepared for shear force measurement from 2.54 cm thick steaks that were vacuum packaged and cooked in a water bath at 70°C. ATP and pH in PM declined faster (p<0.05) than those in LD during the 24 hr postmortem period, and remained lower at 24 hr after slaughter (0.47 vs 0.62 μmoles/g muscle, 5.92 vs 5.64). Glucose-6 phosphate in PM increased faster (p<0.05) than in LD muscles, and remained higher (11.5 vs 5.5 μmoles/g muscle). LD had a lower (p<0.05) proportion of type I fiber than PM (51.1% vs 58.3), but higher (p<0.05) proportion of type IIb fiber than PM (18.9% vs 9.0%). The shear force to cut cooked PM was lower than that for LD in 1 and 7 day aged samples, but no difference was observed between the two muscles in 21 day aged samples. The TBA value increased gradually during the 21 day aging period in both muscles. The increase in TBA value was similar in both muscles up to 14 days, but at 21 day the TBA value of PM was significantly higher than that of LD. In summary, this study demonstrated that the rate of postmortem glycolysis is faster in the PM than in the LD. The study also indicated that PM muscle needs less aging time than LD muscle for optimum meat quality.

Key Words: Native Korean steer, Meat Quality, Postmortem metabolism

1317 Characterization of forage trees as strategic feed sources for goats under semiarid rangeland conditions of Tamaulipas, Mexico. R. Hernandez[1], A. Tewolde[1], S. S. Gonzalez*[2], E. Gutierrez[3], H. Diaz[4], and F. Briones[1], [1]*U. Autonoma de Tamaulipas,* [2]*Colegio de Posgraduados,* [3]*U. Autonoma de Nuevo Leon,* [4]*U. Autonoma Agraria Anotonio Narro.*

Ten locally available forage trees under semiarid rangeland in the State of Tamaulipas were identified and characterized as main feed sources for goat based production systems that predominate in the area (22 C average temperatures; 500 mm average rainfall in August- December). The forage trees included Guajillo (Acacia berlandieri), Gabia (A. rigidula), Huizache (A. romeriana), Granjeno (Celtis spinosa), Pata de gallo (Chloris virgata), Cruceto (Condalia lycioides), Nacahua (Cordia boissieri), Vara dulce (Eysenhardtia polystachya), Escoba (Fraxinus greggii), and Charrasquillo (Pithecellobium elastichophyllum). Density was estimated by the Point Quarter Center method (Bruce, 1986) using the formula of Arvanitis and Portier (1997): $D = 1/x^2$, where D is plant density by m^2, and x is the average distance between each sampling. Results showed densities (%) of: A. berlandieri 29.99, C. virgata 29.91, C. boissieri 13.29, A. romeriana 7.47, A. rigidula 5.48, C. spinosa 4.06, F. greggii 3.32, E. polystachya 2.65, C. lycioides 2.25, P. elastichophyllum 1.53. Production (kg/ha) of biomass, wood and forage was higher for A. berlandieri (3871, 2879, 993, respectively) and lower for P. elastichophyllum (44, 39, 5, respectively). Proximal analysis and in vitro DM digestibility (IVDMD) values (%) ranged from 82 to 94, 11 to 21, 26 to 58, 16 to 38, 5 to 17, 11 to 46 for DM, CP, NDF, ADF, ashes and IVDMD, respectively. The CP (21%) and IVDMD (46%) values were higher for C. spinosa. Intake of plant parts by goats, measured by direct field observation showed: foliage in A. romeriana, C. virgata, A. berlandieri, A. rigidula, C. lycioides, E. polystachya, P. elastichophyllum; leaves in C. spinosa, F. greggii; fruits in C. boissieri, C. virgata; pods in A. berlandieri; stems in F. greggii. Six of the forage trees (A. romeriana, C. boissieri, C. spinosa, A. rigidula, A. berlandieri, C. lycioides) are used as fuel wood by local farmers.

Key Words: Forage Trees, Goats, Semiarid Rangelands

ASAS Nonruminant Nutrition: Specialty Grains and Amino Acids

1318 Soybean meal from Roundup Ready® or conventional soybeans in diets for growing-finishing pigs. G. L. Cromwell*[1], M. D. Lindemann[1], J. H. Randolph[1], E. P. Stanisiewski[2], and G. F. Hartnell[2], [1]*University of Kentucky, Lexington,* [2]*Monsanto Co., St. Louis, MO.*

Dehulled soybean meal (SBM) prepared from genetically-modified, herbicide-tolerant soybeans containing the CP4 EPSPS protein (Roundup Ready® [RR]) and near-isogenic conventional (C) soybeans were assessed in an experiment with growing-finishing pigs. The soybeans were grown in yr 2000 under similar agronomic conditions, the RR soybeans were sprayed with Roundup®, and both were processed at the same plant. The C-SBM and RR-SBM were indistinguishable in composition (DM: 90.3, 91.0%; CP: 51.5, 51.2%; NDF: 4.95, 4.85%; ADF: 3.50, 3.94%; lysine: 3.16, 3.09%; meth+cys: 1.47, 1.51%). Crossbred pigs (n=100) were fed fortified corn-soy diets containing C- or RR-SBM from 24 to 111 kg BW. Diets contained 0.95% lysine initially, then lysine was reduced to 0.80 and 0.65% when pigs reached 54 and 87 kg BW. There were 10 pens (5 pens each of barrows and gilts)/treatment with 5 pigs/pen. All pigs were scanned at 104 kg mean BW, and all barrows were killed at the end of the test for carcass measurements and tissue collection. ADG (833 vs 854 g), ADFI (2.53 vs 2.64 kg), feed:gain (3.04 vs 3.09), scanned backfat (BF, 18.8 vs 19.1 mm) and longissimus area (LEA, 34.9 vs 33.8 cm^2), and calculated carcass lean (52.9 vs 52.5%) were not different (P>0.05) for pigs fed C- and RR-SBM. Gilts gained slower, but they were more efficient and leaner (P<0.05) than barrows. Responses to type of SBM were similar for the two genders. Carcasses