contained 0, 100, 200 and 300g maize cobs/kg. There was a negative correlation (P<0.001) between the digestibility of the nutrients and the level of NDF in the diet. There was a linear decrease (P<0.05)in the digestibility of OM, ADF and hemicellulose with increase in the level of fibre among all the breeds. The OM, ADF and hemicellulose digestibilities, however, decreased faster (P<0.05)in the LW than in the Mukota and F1 crosses as the level of maize cobs increased. Both breed and level of maize cobs had no effect on N digestibility, N retained per metabolic body weight and N retained per nitrogen intake (P>0.05). The findings showed that the Mukota and the F1 crosses were better able to digest the fibrous components than the LW. In addition, the Mukota and F1 crosses displayed an ability to retain protein to the same extent as the LW.

Key Words: Zimbabwean Mukota, Nitrogen balance, Digestibility

943 Present Status of the Heifer Project International-Cameroon Rabbit Program. S. D. Lukefahr*[1], H. I. Nkwocha[2], H. Njakoi[2], E. Tawah[2], J. M. Akob[2], F. A. Kongyu[2], and D. Gudahl[3], [1]*Texas A&M Univ.-Kingsville,* [2]*Heifer Project International, Bamenda, Cameroon,* [3]*Heifer Project International, Little Rock, AR.*

In the past five years, Heifer Project International (HPI) has distributed a minimum of 2,119 rabbits to 1,410 limited-resource families in 66 villages primarily located in the northwest province of Cameroon. However, these figures exclude thousands of additional farmers who received either direct or indirect assistance by HPI since project inception in 1982. HPI's approach towards poverty alleviation is to financially support a new rabbit project for farm families in a selected village for a period of three years. Technical follow-up support is then extended for an additional two years, after which time the anticipated self-sufficient project is formally phased-out. In 1999, accompanied by HPI field staff, the consultant (the first author of this abstract) visited a total of 48 farmers from 9 villages in the northwest province. On each farm, notes were taken which identified poor to good management-level practices, housing and feeding systems, as well as socio-economic aspects of the project. HPI progress reports and case studies conducted by student interns from University of Dschang were made available to supplement the consultant's notes in developing an evaluation report. Overall, production level of rabbit fryers presently appears to be low on farms (approximately 2.45 fryers are consumed and 2.61 fryers are sold per month). Further, income generation is a critical determinant of whether rabbits will continue to be regarded by farmers as a backyard livestock species for domestic use or as a commodity species for supplemental income. HPI could play a pivotal role in developing either local or formal market outlets for their surplus fryers. To date, the HPI-CAM rabbit program has improved family nutrition, enhanced community development and gender status in villages.

Key Words: Rabbits, International Programs, Development

944 Effects of World Bank prescribed economic structural adjustment on poultry production in Nigeria and policy suggestions for the improvement of the sector. A. A. Onifade*[1], F. A. Nasiru[2], O.T.F. Abanikannda[1], and F. Kudayah[2], [1]*Department of Animal Science, University of Ibadan,* [2]*Michael Stevens & Associates, 1 Tokan Street, Western Avenue, Surulere, P. O. Box 528, Apapa, Lagos.*

The World Bank advised the Nigerian Government to undertake structural adjustment (SAP) of the economy, and this was commenced in June 1986 and remained until early 1990. The economic reforms involved policy reforms such as exchange rate deregulation, trade reforms, tariffs restructuring, all of which affected the macroeconomic variables such as inflation, interest rate, employment. A nationwide study was carried out to obtain primary data using stratified random questionnaire administration and structured interviews of small-scale and organized poultry farmers, and officials of Government livestock Departments. Additional data were sourced from secondary sources. The depreciation of the Nigerian currency caused spiraling inflation and volatile interest rates, which made cost of livestock inputs especially the imported components such as feed ingredients and medicaments to soar, access to credits became difficult, producer prices rose significantly, capacity utilization and demand for animal products fell drastically, and a general decline in poultry production was noticed from 1986. The ban on importation of corn and barley caused distortion in animal feed production and led to widespread closures of poultry production facilities. There was intra-sectoral shift with more farmers moved into egg production and meat-type poultry production was targeted at festivals. There was increased utilization of alternative feedstuffs especially by-products of oil mills and tuber processing. The establishment of private veterinary services increased, but farmers complained of low-quality services and products. Quality of feedstuffs and finished feeds in the market decreased forcing most medium producers to integrate feedmilling into their production. In conclusion, the economic adjustment in the main negatively impacts on poultry production, there was policy misjudgment in banning of corn, but increased utilization of alternative feedstuffs; increased custom feedmilling, vertical integration and intra-sectoral shifts and increased accessibility to veterinary services were recorded. Policy suggestions favored concretization of national policies on poultry production, nutrition, health, research and extension.

Key Words: Economic Adjustment Program, Poultry Production, Policy Suggestions

945 Comparing the economic power of the populations of European Community (EC) and North American Treaty Countries (NAT)-1999-2010, using per adult human unit (PAHU) versus per capita (PC). S. Hasimoglu*[1], [1]*Continental Analytical Services Inc., Salina, KS.*

At the beginning of the new millenium EC and NAT countries became strong economic competitors. As the 15-nation EC expands during the next 10 years, competition will continue to increase. The data gathered to evaluate food production and consumption has traditionally been presented on PC basis. The use of "per capita" rarely has been challenged. Presentation of the alternative PAHU system will, however, show "per capita" as inherently erroneous. The PAHU calculation method and obtained conversion factors for the age groups showed a 21.76 percentage units (PU)difference from PC calculations in the under 20-year-old age group in equally populated developed and developing countries. PC evaluation disregards not only the younger, but also the older portions of populations. The calculated, unintended, fault level is not less than 15.86 PU when compared to PAHU. In 1999, three NAT countries had 405 million PC population, calculated as 329 million PAHU. These three countries will reach 451 million PC,or 374 million PAHU in the year 2010. In 1999 NAT had 31 and 12 million higher PC and PAHU than EC countries respectively. EC (15-nation) during same time of period will have 374 million PC, or 317 million PAHU. Since EC going to expand in the next ten years to include 11 new applicant countries (an addition of 159 million PC, or 134 million PAHU), it will reach 533 million PC, or 445 million PAHU inhabitants. Planned as an integrated economic area with a single currency, it will be the largest organized agricultural trading, production and consumption power in the world. Since PAHU replaces the word "predict" with "measure", it will not only help better redesign economic relationships throughout the world, it will influence national and international direction of obtaining precise food consumption/production measurements aimed to create a nutrition monitoring system that will standardize all nutrition intake reporting done by various agencies of both developed and developing countries.

ASAS/ADSA Physiology: Male Physiology/Conceptus Development and Survival

946 The History of Artificial Insemination: Founders and Facts. R.H. Foote*, *Cornell University.*

This overview will cover briefly the relevant knowledge existing when intensive studies on artificial insemination (AI) began, the problems faced, and how these were overcome. Also, some of the people who made it happen will be identified. Emphasis will be on dairy cattle, but also beef cattle, swine, horses, sheep, goats, poultry, laboratory animals, and endangered species will be included. There are many steps that are important in AI so that maximal fertility will result when sperm are transferred from the male at one time and place to a female in estrus elsewhere. These steps include: 1) understanding and exploiting each bull's sexual behavior; 2) providing an optimal schedule and place

for semen collection; 3) using the most reliable equipment for collecting and processing semen; 4) using objective methods for evaluating semen; 5) providing optimal semen extenders and procedures for sperm preservation; 6) adopting procedures to insure protected distribution and storage of semen in the field; 7) and skillful insemination of cows properly selected for the right time to inseminate. With modification of these procedures the principles apply to all species. New methods for accurate evaluation of the genetic worth of the males selected for use in AI were needed and developed. Resistance by elements of the public to "meddling with nature", and by cattle breeders in competition for the sale of bulls, had to be overcome. But eventually AI was accepted as the greatest biotechnology ever developed and applied for the control of venereal diseases and the genetic improvement of dairy cattle. The acceptance of AI laid the foundation and opened opportunities for subsequent development of synchronized estrus, embryo transfer, sexed semen, and even cloning. Conventional AI will continue to benefit animal agriculture and human welfare as it moves into the 21st century of genomics, with marker assisted selection and genetic engineering.

Key Words: Artificial Insemination, Domestic Animals, Biotechnology

947 Effect of capacitation environment of spermatozoa on fertilization of porcine oocytes in vitro. J.M. Popwell[1] and W.L. Flowers*[1], [1]*North Carolina State University.*

The objective of this study was to examine the effect of the capacitation environment of porcine spermatozoa on their ability to fertilize oocytes in vitro. Semen was collected from 4 boars and processed for either in vivo or in vitro capacitation. For in vivo capacitation, 50 mL of neat semen containing 20 billion spermatozoa was used for insemination (n=18 gilts/boar). Between 6 and 16 h after insemination, uterine horns and oviducts were flushed and spermatozoa recovered from each location were classified as being exposed to a unique capacitation environment. For in vitro capacitation, the remainder of each ejaculate was washed and incubated in media for an equivalent length of time. Spermatozoa (200/oocyte) from each environment (oviduct, uterus, and in vitro) were used to fertilize oocytes (n=200/environment) in vitro. Chlortetracycline staining also was used to assess the capacitation status of spermatozoa at the time of fertilization. Boar A (15.3+/-4.7%) had fewer (P<.05) capacitated spermatozoa than boars C (32.7+/-6.7%) and D (42.1+/-6.8%). The capacitation status of sperm cells from boar B (28.1+/-9.2%) was similar (P>.15) to that observed for the other boars. In contrast, boar B (14.7+/-1.4%) produced higher (P<.05) monospermic fertilization rates in vitro than boars A (10.0+/-1.5%) and C (6.2+/-2.1%). Sperm cells from boar D (12.3+/-1.7%) fertilized more (P<.05) oocytes than those from boar C. A greater proportion (P<.05) of capacitated spermatozoa were present in vitro (40.7+/-7.1%) and in the oviducts (52.2+/-7.1%) than in the uterus (18.3+/-6.2%). However, there was no difference (P=.27) in the ability of spermatozoa from the oviductal (12.3+/-2.0%), uterine (8.7+/-2.1%), or in vitro (9.8+/-1.8%) environments to fertilize oocytes. In summary, capacitation environments of spermatozoa did not influence monospermic fertilization in vitro even though significant differences were present for the porportion of capacitated sperm cells in each environment.

Key Words: Spermatozoa, Fertilization, Swine

948 Apoptosis as a Mechanism of Germ Cell Loss in Yearling Stallions. N.L. Heninger*[1], C.L. Donnelly[1], C. Staub[3], T.L. Blanchard[2], D.D. Varner[2], D.W. Forrest[1], and L. Johnson[3], [1]*Texas A&M Dept. of Animal Science,* [2]*Texas A&M Dept of Veterinary Large Animal Medicine and Surgery,* [3]*Texas A&M Dept of Veterinary Anatomy and Public Health.*

In an effort to determine whether germ cell loss occurs via apoptotic mechanisms during the development of spermatogenesis, 22 testicles from 17 yearling stallions with normally developing testes (ages 11-15 mo) were weighed, cross-sectioned, fixed in 4 % paraformaldehyde, and set in paraffin. Immunohistochemical apoptotic detection was performed on 5mm sections mounted on glass slides using Apoptag peroxidase detection kit S7100 (Intergenco, Purchase, NY). Tissue sections were deparaffinized and free 3-OH ends labeled (TUNEL) in situ by direct immunoperoxidase detection of digoxigenin labeled DNA. Sections were counterstained with methyl green. Two evaluators counted the total number of apoptotic cells in 50 round seminiferous tubules from both light and dark parenchyma within a single section. The frequency of tubules containing at least one apoptotic cell, as well as tubule diameter were also recorded. Light and dark tissue was classified according to lumen score (1-5) as described in previous research. Lumen scores of 1-2 were obtained for dark parenchyma, and 3-4 for light parenchyma. No stage 5 tubules (the most mature) were seen for these young animals. More apoptotic cells per tubule were detected ($P < 0.001$) in light tissue (0.5 ± 0.01) when compared to dark tissue (0.06 ± 0.01). As tubule diameter increased, total number of apoptotic cells increased ($r^2 = 0.70$, $P < 0.001$). Light parenchyma contained a greater ($P < 0.001$) proportion of tubules with at least 1 apoptotic cell ($23\% \pm 3\%$) when compared to dark parenchyma ($5\% \pm 1\%$). It is clear that apoptosis is involved in normal progression of spermatogenesis as a means of removing germ cells from the seminiferous epithelium in pubertal stallions. Further research is needed to determine cell types typically undergoing apoptosis, as well as topographical trends in development of apoptosis during initiation of spermatogenesis.

Key Words: Apoptosis, Spermatogenesis, Stallion

949 Comparison of traits at sexual maturity of recently introduced breeds to Angus and Brahman bulls. S.R, Tatman*[1], C.C. Chase[2], D.A. Neuendorff[1], A.W. Lewis[1], T.W. Wilson[1], C.G. Brown[1], and R.D. Randel[1], [1]*Texas Agricultural Research and Extension Center, Overton, TX 75684-0290,* [2]*Subtropical Research Station, ARS, USDA, Brooksville, FL 34601-4672.*

Reproductive development of Angus (A; n=7), Brahman (BR; n=10), Bonsmara (BO; n=8), Romosinuano (R; n=10), Tuli (T; n=14), and Wagyu (W; n=10) bulls was studied. All bulls were maintained together and fed a 3:1 (corn: soybean meal) supplement containing lasalocid. The supplement was fed at 1.5% BW with with free access to coastal bermuda grass hay, water, and a salt/mineral mix. Measurements of reproductive development were taken at 14-d intervals until each bull reached sexual maturity (SM; ejaculate with at least 500 million sperm with at least 50% motility). Measurements included BW, body condition score (BCS), scrotal circumference (SC), and individual testis length. After reaching 21 cm SC, ejaculates were collected at 14-d intervals through SM via electroejaculation. Age at SM differed among breeds ($P < 0.05$) with BR the oldest (453±11 d), followed by A (417±13 d) and R (414±11 d) which did not differ ($P > 0.10$), and T (377±9 d), W (359±11 d), and BO (335±12 d). Age at SM in W and BO bulls did not differ ($P > 0.10$). BW at SM was greatest for BR (418±14 kg) and differed ($P < 0.01$) followed by A (350±16 kg), BO (336±15 kg), and R (330±13 kg). A vs T (308±11 kg) BW at SM was similar ($P > 0.10$) while W bulls were lightest (281±13 kg), yet similar ($P > 0.10$) to T. SC at SM was similar for ($P > 0.10$) BR (30.2±.9 cm), BO (30± .9cm), A (29.9±1 cm), R (28.5±.8 cm), and T (28.4± .7cm) while W bulls had the smallest ($P < 0.05$) SC at 25.9± .8 cm. A, BO and BR bulls had the greatest PTV at SM (448±36 cc, 426±33 cc, and 405±31 cc) and were similar ($P > 0.10$), followed by T (370±25 cc), R (351±30 cc), and W (286±30 cc). BR bulls were oldest and heaviest at SM followed by A in both categories. W bulls had the least BW, SC, and PTV at SM. Newly introduced breeds in this study performed competitively with A bulls in a subtropical environment and may play an important role in crossbreeding.

Key Words: Beef Breeds, bulls, sexual maturity

950 Comparison of adrenal and testis content of the steroidogenic acute regulatory (StAR) and P450 side-chain cleavage enzyme proteins in Angus, Brahman and Romosinuano bulls. J.W. Koch*[1,2], K.N. Livingston[1], S.R. Tatman[2], D. Alberts[3], D.M. Stocco[3], C.C. Chase, Jr.[4], R.D. Randel[2], and T.H. Welsh, Jr.[1], [1]*Texas Agricultural Experiment Station, College Station, TX,* [2]*Overton, TX,* [3]*Texas Tech University Health Sciences Center, Lubbock, TX,* [4]*ARS, USDA, Brookesville, FL.*

Whether breed influences adrenal and testis content of StAR and P450 proteins was studied by use of Angus (n=7; A), Brahman (n=8; B) and Romosinuano (n=10; R) bulls. Bulls were slaughtered 69-111 d after reaching sexual maturity. Adrenals and testes were collected at slaughter, trimmed and weighed. Western blot analyses were performed to compare StAR and P450 content based on integrated optical density units (IOD). B and R had similar adrenal gland weights (14.8±0.8; 14.9±0.7 g, respectively) which were less (P<.02) than A adrenal weight (17.7±0.7). Plasma cortisol was similar among breeds at slaughter (A, 11.9±2.9; B, 16.5±2.7; R, 18.3±2.6 ng/ml). Adrenal StAR protein was similar in A and R (.209±.010; .199±.008, respectively). B adrenal StAR (.0177±.009) was lower than A but not R adrenal StAR. Adrenal P450 did not differ among breeds. Adrenal StAR and P450 proteins

were not significantly correlated. Testis weight was greater (P<.02) in B (642.7±32.6 g) than A (417.7±34.8 g) and R (379.1±29.2 g). Plasma testosterone at slaughter was similar among breeds (A, 3.0±2.2; B, 2.5±2.1; R, 6.7±1.9 ng/ml). Testis StAR was lower (P<.006) in B (.079±.016) than A (.154±.017) and R (.155±.014) bulls which did not differ from each other. Testis P450 was lower (P<.02) in B (.012±.006) versus A (.036±.006) bulls. Testis P450 in R (.028±.005) did not differ from A or B bulls. Testis StAR was positively correlated with testis P450 (r=.6, P<.003) and testosterone at slaughter (r=.4, P<.03) but negatively correlated with testis weight (r=-.6, P<.005). Breedtype appeared to influence expression of proteins involved in adrenal and testicular steroidogenesis.

Key Words: Adrenal, Testis, StAR

951 Effects of castration on patterns of LH and testosterone and reproductive behavior in bulls. D.B. Imwalle and K.K. Schillo*, *University of Kentucky, Lexington KY.*

We tested the hypothesis that testosterone is required for maintaining reproductive behavior in sexually experienced bulls. Eighteen yearling bulls were divided randomly into three treatment groups: intact (I); castrated (C); castrated + testosterone (T). All bulls were subjected to libido tests one week before and weekly for four weeks after castration to quantify mounting activity and flehmen responses. Patterns of LH and testosterone were also assessed at these times. One week before castration, concentrations of testosterone, concentrations of LH and frequencies of LH pulses were not different among treatment groups. In the C group, concentrations of testosterone decreased (P=.01) to nondetectable levels by one week following castration. During this time, concentrations of testosterone did not change in the I group and increased (P=.003) in the T group. Throughout the post-castration period, concentrations of testosterone were higher (P=.001) in T bulls than in I or C bulls, and concentrations of testosterone in I bulls were higher (P=.02) than in C bulls. Mean concentrations of LH and LH pulse frequencies increased (P<.001) between one week before and one week after castration in C animals, but did not change in I or T animals during this time. During the post-castration period, LH concentrations and LH pulse frequencies were higher (P<.001) in C bulls than in the I and T bulls, but neither of these variables differed between the I and T groups. Mounting activity decreased (P=.05) in all groups between one week before and one week after castration. Thereafter, mounting activity increased (P=.001) in each group and reached pre-castration levels by the end of the experiment. At no time during the post-castration period did mounting activity differ among treatment groups. Number of flehmen responses did not differ among groups before castration. However, after castration, C bulls consistently showed fewer (P=.04) flehmen responses than I and T bulls. In conclusion, testosterone does not appear to be required to maintain mounting activity in adult bulls. However, testosterone may be important in regulating flehmen responses.

Key Words: LH, Testosterone, Masculine behavior

952 Evaluation of somatotrophic axis gene expression and function in Angus, Romosinuano, and Brahman bulls. T. A. Strauch*[1,2], J. W. Koch[1,2], S. R. Tatman[1,2], C. C. Chase, Jr.[3], C. A. Abbey[1], T. M. Bryan[1], R. D. Randel[2], and T. H. Welsh, Jr.[1], [1]*Texas Agricultural Experiment Station, College Station,* [2]*and Overton, TX,* [3]*Subtropical Agricultural Research Station, ARS, USDA, Brooksville, FL.*

Whether genotype influences somatotrophic gene expression and function in temperate *Bos taurus* (Angus; A), tropically adapted *Bos taurus* (Romosinuano; R), and tropically adapted *Bos indicus* (Brahman; B) bulls was evaluated. Growth rate, anterior pituitary expression of growth hormone (GH) mRNA, liver expression of mRNA for exon 1A of the GH receptor (GH1A) and IGF-I, and plasma IGF-I concentrations in postpuberal A (n=10), R (n=10), and B (n=8) bulls were determined. Pituitary and liver tissues were collected for mRNA analysis and blood was collected for analysis of plasma IGF-I concentrations by IRMA. GH mRNA expression in the anterior pituitary gland, and GHR1A and IGF-I mRNA expression in the liver were determined via ribonuclease protection assays and quantified via integrated optical density units (IOD). There was a difference (P < .008) among breeds in ADG with A bulls having increased ADG as compared to B and R bulls (.98, .83, and .82 kg/d; A, R, and B, respectively; SE=.04). There was no difference (P=.45) in mRNA expression of GH among breeds; however, GHR1A mRNA expression did differ among bull breeds with B bulls having the lowest expression (P < .006; .0002 ± .05, .195 ± .04, and .24 ± .04 IOD; B, R, and A, respectively). B bulls had higher IGF-I mRNA expression than R or A bulls (P < .0001; 2.11 ± .22, 1.1 ± .18, and .66 ± .18, and IOD; B, R, and A, respectively). Plasma IGF-I concentrations were highest in R bulls both preslaughter (P < .001; 380.2 ± 26.3, 277.1 ± 29.9, and 212.2 ± 29.9; ng/ml; R, B, and A, respectively) and postslaughter (P < .0001; 433.6 ± 28.6, 365.8 ± 30.3, and 178.4 ± 27.1 ng/ml; R, B, and A). This suggests that breeds differ in somatotrophic gene expression and function, with tropically-adapted *Bos taurus* bulls being more similar to *Bos indicus* bulls than to temperate Bos taurus bulls.

Key Words: Somatotrophic axis, *Bos taurus*, *Bos indicus*

953 Embryonic mortality from the embryo's perspective. PJ Hansen, *University of Florida.*

For the embryo to successfully complete the preimplantation period, it must be capable of executing its developmental program within a microenvironment largely established by the mother. Mortality results either because of intrinsic defects within the embryo, an inadequate maternal environment, asynchrony between embryo and mother, or failure of the mother to repond appropriately to embryonic signals. To some extent, the embryo's fate is dictated by events before fertilization since embryos formed from incompetent oocytes have a low probability of successful development. For example, embryos have reduced developmental competence when formed from oocytes from persistent ovarian follicles or from cows in the summer in Florida. Chromosomal abnormalities, caused by incompetent oocytes or other causes, represent additional types of intrinsic errors responsible for embryonic loss. Alterations in the maternal environment can cause embryonic mortality as has been shown for heat stress, low maternal progesterone secretion, and feeding diets high in degradable protein. The preimplantation embryo is most susceptible to certain types of stresses (for example, heat shock and arsenic exposure) very early in development. At the earliest stages of development, the embryo is distinct from most cells in that its genome is largely repressed. Thus, the cellular adjustments the early embryo can make in response to perturbations in its environment are limited. Some genes related to resistance to cellular stress can become activated very early in development while other molecular responses to stress are absent. For example, heat shock can induce transcription of the heat shock protein 70 gene in the bovine embryo at the 2-cell stage even though general embryonic genome activation occurs at the late 4-cell and 8-cell stage. In contrast, the early bovine embryo cannot undergo apoptosis in response to cellular stresses that ordinarily activate this process. One possibility is that the acquisition of the capacity for apoptosis represents an important mechanism by which an embryo acquires the ability to survive cellular stress.

Key Words: Embryonic mortality, Embryo

954 The influence of uterine function on embryonic and fetal survival. J. L. Vallet*, *USDA, ARS, RLH US Meat Animal Research Center, Clay Center, NE, USA.*

The secretion rate of growth factors and the delivery rate of nutrients by the uterus affects the growth rate, development and survival of the conceptus. For most growth factors and nutrients, passage into the uterus is not simply controlled by diffusion. Many growth factors are products of uterine tissue. Transport of some nutrients is aided by specific transporter molecules on the uterine endometrial epithelial cell, while others (e.g., retinol, iron, folate) are incorporated into uterine secreted proteins (e.g., retinol binding protein, uteroferrin, folate binding protein). The rate of production of these proteins during pregnancy profoundly affects pregnancy outcome. Uterine gland knockout experiments in sheep demonstrate that pregnancy fails in the absence of uterine glands. In pigs, both global and specific effects of uterine products on aspects of conceptus development can influence litter size. The provision of growth factors and nutrients by the uterus plays a role in entraining conceptus development, so that the uterine environment and the developmental stage of the conceptus match. This uterine dependent control of conceptus development influences pregnancy success. For example, the uterus of the Meishan pig secretes less protein prior to elongation, which slows conceptus development, results in smaller placentas and smaller fetuses, and allows for greater litter size. Furthermore, in Occidental pig breeds, an earlier rise in progesterone at the beginning of pregnancy accelerates

the onset of protein secretion, increases estrogen secretion by the conceptus, increases the size of the fetus in later pregnancy, and decreases litter size. Studies of fetal erythropoiesis also indicate that specific uterine products (uteroferrin, folate binding protein) are required for this important aspect of fetal development and that greater litter size is associated with improved erythropoiesis. Thus, manipulation of uterine function can modify conceptus development and impact pregnancy success in domestic livestock.

Key Words: Pregnancy, Uterus, Conceptus

955 Role of placental function in mediating conceptus growth and survival. M. E. Wilson*, *West Virginia University*.

Conceptus mortality is a significant factor limiting reproductive efficiency of livestock. In both singlet (i.e., cattle) and litter (i.e., pigs and sheep) bearing species, investigations of conceptus mortality have traditionally focused on the period immediately preceeding and throughout the attachment phase, around the time of maternal recognition of pregnancy. Recently, data has emerged leading to the suggestion that conceptus loss later in gestation is also significant and that variation in placental size and function may play a very important part in determining whether or not a conceptus survives. In the pig, the number of conceptuses present after the initial period of loss that survive to term appears to be influenced by the total amount of placental mass present, such that litters containing individuals with relatively small placentae have a greater potential for a large litter size when compared to litters containing similar numbers of individuals with relatively large placentae. In ruminants, recent evidence supports the time of placental development and initial vascularization (between d 28 and 40) as a second period of significant loss, particularly in situations involving manipulation (ovulation synchronization for timed AI in cattle and out-of-season breeding in sheep). In the pig, not only does placental size vary, but the efficiency (as measured by the fetal wt to placental wt ratio) can vary as much as 3-fold within a litter, leading to the suggestion that selection for small very efficient placentae may provide a mechanism for increasing litter size. In ruminants, there are obvious cases where placental growth has been markedly altered (i.e., large offspring syndrome or heat stress) and a subsequent deviation from 'normal' placental efficiency occurs. Less information is available on normal variation in placental size and efficiency; however, the timing of the secondary period of loss supports a role for events during placental development and vascularization being critical to survival and potentially contributing to the observed loss.

Key Words: Conceptus survival, Placental function, Reproductive efficiency

ASAS/ADSA Production, Management, and Environment: Management and Production Practices; Beef (Cow-Calf and Feedlot) and Sheep

956 Factors affecting profitability of the cow-calf enterprise. B.H. Dunn*, R.J. Pruitt, and E.D. Hamilton, *South Dakota State University*.

The cow-calf enterprise (**CCE**) was analyzed for factors affecting profitability with production and financial data from 148 individual CCE enterprises from the states of SD, MT, NE, IA, MN, WY, ND, and KS from 1991-1999. Data were collected at the herd level according to Standardized Performance Analysis (**SPA**) guidelines. SPA financial measurements are reported on a per 100 kg weaned calf (**CALF**), per beginning year breeding female (**FEMALE**), and a per hectare used by the CCE (**HA**). Profit is defined as return on assets (**ROA**). Mean separation was used to describe the relationships between levels of profit and SPA measurements. Enterprises were divided into three profit groups based on ROA. High Profit (**HP**) is defined as those CCE with a ROA $>$ 1 SD above the mean ROA. Low Profit (**LP**) are those CCE with a ROA $<$1 SD below the mean. Medium Profit (**MP**) are CCE with ROA of -6.7 to 12.9%. Of the 23 SPA production measurements used to describe the CCE by size, reproductive performance, and the production of weaned weight, the only variable for which HP enterprises were higher ($P < 0.10$) than MP and LP enterprises was weaning percentage. The weaning percentages were 90.2, 86.6 and 83.4 for HP, MP, and LP. The same was not the case for the comparisons of SPA financial measurements. On a CALF basis, HP had fewer total dollars invested than did MP ($P < 0.05$), lower depreciation expenses ($P < 0.10$), and lower total expenditures ($P < 0.05$) than both MP and LP enterprises. By all three units of measure, HP had lower breakevens ($P < 0.05$), and higher net income and ROA ($P < 0.01$) than MP and LP. Factors affecting ROA were determined with multiple regression. A predictive equation with an R^2 of 0.813 included the independent variables net income, owners equity, pregnancy percentage, and the interaction of net income and owners equity ($P < 0.05$). These analyzes of the CCE indicate that high ROA is not a function of size, but low levels of investment, average levels of weaned weight, high reproduction, high net income, and low total expenditures.

Key Words: Cow-calf, Profit, SPA

957 Characterization of the production and financial performance of the cow-calf enterprise using Standardized Performance Analysis. B.H. Dunn*, E.D. Hamilton, and R.J. Pruitt, *South Dakota State University*.

The cow-calf enterprise (**CCE**) was described with production data from 185 individual CCEs with 148 providing financial data. Data were compiled over nine years (1991-1999) from CCEs located in the states of SD, MT, NE, IA, MN, WY, ND, and KS. Data were collected at the herd level according to the guidelines of Standardized Performance Analysis (**SPA**). The SPA financial measurements are reported on a per 100 kg weaned calf (**CALF**), per beginning year breeding female (**FEMALE**), and a per ha used by the CCE (**HA**). The average CCE consisted of 508 $\pm$ 723 beginning year breeding females and 5,067 $\pm$ 9,106 ha. Hectares per exposed female averaged 9.7 $\pm$ 4.7. The mean beginning Gregorian calving date was 59.4 $\pm$ 26.6. Reproductive performance was measured by mean pregnancy, calving, and weaning percentage which were 93.0 $\pm$ 4.6, 91.4 $\pm$ 7.3 and 86.7 $\pm$ 7.8 respectively. The percentage of calves born from d 1 - 21, 1 - 42, 1 - 63, and calves born after d 63 were 56.8 $\pm$ 5.5, 84.1 $\pm$ 11.6, 96.0 $\pm$ 4.8, 4.0 $\pm$ 4.91. The average herd replacement rate was 19.7 $\pm$ 19.4%. The calves averaged 199.0 $\pm$ 28.0 d at weaning. Mean calf weaning weight, kg of weaned calf per cow exposed, and kg of weaned calf per ha utilized by the CCE was 235.9 $\pm$ 27.3 kg, 205.0 $\pm$ 32.3, and 44.8 $\pm$ 26.7 respectively. The CCEs had an average investment of \$970.97 $\pm$ 664.91, \$2,087 $\pm$ 1473, \$473.79 $\pm$ 435.71 per CALF, FEMALE, and HA respectively. The total annual expenditure was \$189.55 $\pm$ 98.3, \$397 $\pm$ 217, \$82.03 $\pm$ 86.52 per CALF, FEMALE, and HA respectively. Total revenue was \$206.62 $\pm$ 79.60, \$430 $\pm$ 159, \$89.27 $\pm$ 71.25 per CALF, FEMALE, and HA respectively. Net income was \$17.09 $\pm$ 84.17, \$33 $\pm$ 175, and \$16.92 $\pm$ 41.49 CALF, FEMALE, and HA respectively. The mean breakeven was \$154.11 $\pm$ 97.75, 331 $\pm$ 217, and 69.21 $\pm$ 80.20 per CALF, FEMALE, and HA respectively. The mean return on assets was 3.1%. CCEs in this sample were large, productive, required a large capital investment, and had low levels of profitability.

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958 Management factors affecting selling prices of beef calves. T. R. Troxel*, M. S. Gadberry, S. Cline, J. Foley, G. Ford, D. Urell, and R. Wiedower, *University of Arkansas Cooperative Extension Service, Little Rock, AR*.

The objective of this study was to determine how management factors affected selling price of beef calves. Data were collected from January 1 to December 31, 2000 at seventeen Arkansas livestock auctions. The database consisted of 81,703 head of cattle representing 15.3% of the total calves sold. Information was collected by experienced livestock market news reporters and included body condition, time of sale, castration, horn status, fill, health, and individual or group selling. Each factor was analyzed using GLM procedures using month, weight and nearby feeder cattle future prices as covariates and least-squared means were generated. All prices are based upon dollars per 45.45 kg of live weight. Body condition affected selling price ($P < 0.0001$) with very thin, thin, average, fleshy and fat calves selling for \$85.94, \$96.03, \$93.63, \$91.76 and \$88.94, respectively. The selling price of calves sold during the second third (\$93.90) of the sale was higher ($P < 0.02$) than cattle sold during the first (\$93.64) and third third (\$93.55). Steers sold for \$4.63