ASAS-EAAP Global Issues Symposium: Contemporary and Emerging Issues and International Animal Agriculture Joint Symposium: Global Livestock Production to 2050: Challenges and Opportunities

75 Perspectives for livestock production in developing countries – changes in production systems needed to meet projected demand. R. D. Sainz*[1], G. B. Martha, Jr.[2,3], and L. G. Barioni[4], [1]*University of California*, *Davis*, [2]*Embrapa Cerrados/Embrapa Strategic Studies and Training*, *Brasília-DF, Brazil*, [3]*Fellow, National Research Council*, *Brazil*, [4]*Embrapa Agricultural Informatics*, *Campinas-SP, Brazil*.

According to the medium growth projections of the United Nations, the human population should reach 9.15 billion by 2050, an increase of 33% over the 6.91 billion today. This increase will take place largely in developing countries. Additionally, developing countries are projected to experience a steady increase in per capita income, so that demand for food should increase by close to 70%, and for animal products by perhaps 100%. This scenario raises concerns about use of scarce resources, mainly land and water, as well as other environmental, social and economic impacts. Moreover, these changes will be concentrated in developing regions, and the technological advances in tropical agriculture required to achieve a sustainable path toward food security over the next decades must take all of these factors into account. In particular, opportunities for expanding agricultural frontiers are limited. Clearly, a 100% increase in meat and milk production on the same or only slightly greater crop and pasture land areas will require substantial improvements in productivity. This paper qualitatively and quantitatively describes several technologies and production systems that show promise toward meeting the expected demand. These include genetically improved crops, pastures and animals, integrated crop-livestock-forestry systems, increased animal feeding (particularly with crop and industrial by-products), improved pasture management, and alternative production systems (such as improved aquaculture systems). Development and implementation of these technologies and systems will require major investments by the private and public sectors. A revitalization of agricultural R&D investments to sustain productivity growth over the long run and a comprehensive program of technology transfer are needed if economic, social and environmental objectives are to be met.

76 A European perspective on the challenges for livestock farming to achieve a sustainable contribution to food security and a reduced impact on the environment. P. Herpin*[1], R. Duijghuisen[2], J. Oldham[3], P. Vriesekoop[2], and J. Williams[1], [1]*INRA*, *France*, [2]*Wageningen UR*, *the Netherlands*, [3]*Scottish Agricultural College*, *Scotland*.

World population forecasts are 9.2 billion by 2050. The daily intake of animal products will continue to rise as economies develop. Over 56% of people in the European Union live in rural areas where the livestock sector underpins community cohesion and employment. Its farm gate production value was 152 billion € in 2008, but its contribution to the European economy is greater as it supplies other sectors that generate considerable added value. Sustaining and even expanding the animal-farming sector to meet the demands for food, to reduce the rural exodus, is a priority. The European challenge is complex because we must not only increase efficiency and effectiveness to face very strong global competition but also accommodate major demands for a positive environmental impact, improved animal health and welfare and adapt to possible future changes in the Common Agricultural Policy. Climate change may also alter production capacity differentially across Europe, accelerate the emergence of new animal diseases and menace animal and human health. Both adaptation and mitigation strategies will recognize these challenges and opportunities. Past research reinforced the sector's competitiveness. But we need a 'vision for tomorrow' to face these new grand challenges that will re-design more sustainable, integrated, resource efficient and environmentally acceptable production systems. This will take new knowledge from research, with efficient innovation, implementation, and shifts in stakeholder behavior e.g., exploiting new genomic tools for novel multi-trait selection of robust and healthy animals. Renewed attention to the exploitation of feed resources, to improving reproductive efficiency, to more integrated approaches to disease control and animal welfare, and to generating animal products beneficial to human health is also needed. This research agenda needs to address local issues in a global context, embracing all disciplines and stakeholders. Research teams must question past practices, use open thinking to encompass these new dimensions, dialog with other disciplines and network in a constructive manner with society at large.

77 Sustainability of livestock production globally. H. Steinfeld*, *UN Food and Agriculture Organization*, *Rome, Italy*.

The livestock sector is contributing to the globally increasing pressure on ecosystems and natural resources: land, water and biodiversity. At the same time, the sector is increasingly facing natural resource constraints and growing competition for resources. Awareness is also increasing of the interactions between livestock and climate change, with the livestock sector both contributing to it and suffering from its impacts. Conversely, it is also being recognized that the sector can play a key role in mitigating climate change through improved technologies. Governments and institutions need to develop and enact appropriate policies that focus on and account for livestock-environment interactions. Continued growth in livestock production will otherwise exert enormous pressures on the health of ecosystem, biodiversity, land and forest resources, and water quality, and will contribute substantially to global warming. A key policy focus should be on correcting market distortions and policy failures that encourage environmental degradation, such as subsidies that directly or indirectly promote overgrazing, land degradation, deforestation, over-use of water, or greenhouse gas emissions. Market-based policies should cause producers to internalize the costs of environmental damages caused by livestock production. Environmental damage associated with open-access common-property resources can be addressed by clarifying property rights and promoting mechanisms for cooperation. The promotion of technologies that improve land and feed efficiency can mitigate the negative effects of livestock production on biodiversity, ecosystems, and global warming. Technologies that increase livestock efficiency include improved genetics, improved grazing land management, improved herd health management, and silvopastoralism. Payments for environmental services can be an effective means to promote better environmental outcomes. The livestock sector has an enormous potential to contribute to climate change mitigation. Realizing the potential will require new and extensive initiatives at national and international levels, including the promotion of research and development on new mitigation technologies; and effective and enhanced means for financing.

Extension Education 1

78 Multi-state Beef Reproduction Task Force provides science based recommendations for the application of reproductive technologies. S. K. Johnson*[1], R. N. Funston[2], J. B. Hall[3], D. J. Kesler[4], J. W. Lauderdale[5], G. C. Lamb[6], D. J. Patterson[7], G. A. Perry[8], and D. R. Strohbehn[9], [1]*Kansas State University*, [2]*University of Nebraska*, [3]*University of Idaho*, [4]*University of Illinois*, [5]*Michigan State University*, [6]*University of Florida*, [7]*University of Missouri*, [8]*South Dakota State University*, [9]*Iowa State University*.

Beef extension personnel met in 2000 to determine how best to communicate to beef producers the latest information related to reproductive technologies. Research on estrous cycle control in cattle had expanded to more precise methods that included treatment with progestins, manipulation of follicular waves, and control of the lifespan of the corpus luteum. The rapid development of new protocols to synchronize estrus and ovulation and their associated acronyms created confusion. The Beef Reproductive Task Force was formed to coordinate efforts to identify effective breeding management protocols and to provide leadership for education. Based on research data and field experience, a short list of recommend protocols for synchronization of estrus and ovulation was developed in cooperation with representatives from semen providers, veterinarians and the animal health industry. These protocols are presented uniformly in sire catalogs from all major semen providers. Protocol updates occur annually to incorporate appropriate research findings. In cooperation with the Iowa Beef Center, the Estrus Synch Planner software program now reflects the same recommendations. Since 2002 the Beef Reproduction Task Force has hosted 9 educational workshops in key cow-calf states representing 66% of US beef cows; targeted were producers, AI technicians, veterinarians, allied industry and academia. A national media sponsor has provided online coverage of the last 2 meetings. At the most recent conference, 77% of attendees indicated that information received at the conference would probably or definitely increase the profitability of their operation. When asked what changes they would make in how they applied reproductive technologies, 55% provided a response with 15% responding more use of fixed-timed AI, 13% more use of AI and/or synchronization, and 40% would change something about how they applied the technology such as specific protocols or management changes.

Key Words: estrous synchronization, fixed-timed AI, beef cattle

79 Fundamentals of beef reproduction and management: Focus on estrus synchronization. A new web-based curriculum. D. J. Patterson*[1], R. D. Geisert[1], D. C. Busch[2], N. R. Leitman[3], S. E. Poock[1], J. L. Parcell[1], and M. F. Smith[1], [1]*University of Missouri*, *Columbia,* [2]*KABA Select Sires, Inc.*, *Louisville, KY,* [3]*Boehringer Ingelheim Vetmedica Inc.*, *St. Joseph, MO*.

Reproduction is the major factor impacting profitability in a cow-calf operation. The largest cause of reproductive loss in beef herds is that cows fail to become pregnant during the breeding season. Heifers and cows fail to become pregnant because they do not show estrus or fail to conceive after showing estrus. Estrus synchronization protocols have been developed that increase the proportion of females that conceive early in the breeding season and facilitate the use of AI. Estrus synchronization and AI create the opportunity to add value to a beef cattle enterprise through use of high accuracy sires and enhanced reproductive management. A new web-based curriculum is available for beef producers, animal science instructors, veterinarians, allied industry and students entitled Fundamentals of Beef Reproduction and Management: Focus on Estrus Synchronization. The curriculum includes 3 courses with the following topics. Course 1 provides an overview of physiological principles that underlie estrus synchronization, and a review of commercially available estrus synchronization products. Course 2 reviews estrus synchronization protocols recommended for beef heifers and cows. Course 3 reviews management considerations for implementing an estrus synchronization program and a description of the impact of estrus synchronization on reproductive management. Each module includes assessment questions to evaluate the student's comprehension of the information. The focus of this Extension education program draws on the fundamental basis upon which extension and the Land Grant System were founded: The use and application of what we know to create knowledge. This curriculum will enable participants to effectively implement reproductive strategies into practice. The curriculum is available through the University of Missouri Division of Animal Sciences Web site at http://animalsciences.missouri.edu/, and the NCBA Cattle Learning Center.

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Key Words: curriculum, estrus synchronization, AI

80 Transferring reproductive technologies to the field: Fixed-time AI and high accuracy sires. D. J. Patterson*, D. A. Mallory, J. L. Parcell, S. E. Poock, and M. F. Smith, *University of Missouri*.

USDA-NRI integrated projects require a combination of research, education and extension and are expected to generate new knowledge, coincident with the application of existing knowledge. Project themes are required to be outcome oriented, stakeholder driven and problem focused. Our goal has been to foster the adoption of reproductive technologies focused on expanded use of fixed-time artificial insemination, and coincident with progress in the development of new and more effective methods to synchronize estrus and ovulation in beef cattle. Missouri's Show-Me-Select Replacement Heifer Program provides the infrastructure for effective implementation of new reproductive technologies and economic feedback regarding their use. By-products of adoption of reproductive technologies in beef cattle include enhanced genetic merit of heifers and steers, and improvements in whole herd reproductive management. Beef producers interested in implementing or expanding an AI program are encouraged to identify high accuracy sires for use in their AI programs. The Missouri Show-Me-Select Replacement Heifer Program recently created a Tier 2 classification that distinguishes heifers from high accuracy sires. Economic data collected from the program will be used to value heifers based on genetic merit, and economic indexes for heifers will be determined from steer mates based on feedlot performance and carcass merit. Organized on farm demonstrations facilitated the transfer of technology related to fixed-time AI to 73 herds in Missouri involving 7028 cows. In addition, the Division of Animal Science's Miller Internship in Reproductive Management has provided internship opportunities for 140 students that involved breeding programs in 12 states and over 175,000 cows and heifers. These efforts have lead to the successful integration of research, education and extension programming and are collectively impacting reproductive management in Missouri's beef herds.

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Key Words: technology transfer, beef, AI

81 Evaluation of attitudes, knowledge gained and anticipated behaviors of extension clientele completing food defense training conducted regionally in Missouri. R. L. Weaber*, C. L. Lorenzen, M. K. Hendrickson, A. D. Clarke, M. C. Shannon, R. M. Torres, and K. L. Savage-Clarke, *University of Missouri*, *Columbia*.

Food defense is the prevention of intentional contamination at any point during the food production/processing chain. To increase awareness of food defense government directives and industry initiatives among food producers and processers, a work book curriculum was developed and a series of half-day workshops were conducted in 5 regions of Missouri. In addition to providing basic information about the importance of food defense as a mechanism to help ensure the safety and security of the US food supply, the workshop included training on risk assessment, countermeasure development, construction and implementation of a food defense and a response plan. Workshop participants (n = 81) were surveyed to evaluate the quality of the curriculum, pre- and post-training attitudes, knowledge gain and anticipated behaviors. Participants included livestock producers (15%), crop producers (4%), food processors (22%), producers targeting production to local food systems (35%), and others (25%) that included animal nutritionists, and inspectors/regulatory personnel. Two-thirds of respondents (n = 59) indicated their operation employed only family members or less than 6 individuals. Seven percent of operations had > 100 employees. Prior to the workshops, 22% of respondents (n = 63) were not familiar with the term ′food defense′ while 42% had either written or were familiar with the basics of a food defense plan. 83% of respondents (n = 74) indicated the information was valuable to their operation. A 6-point Likert scale was used to evaluate knowledge gain. More than 90% of participants indicated with scores of 4 or higher (4 = somewhat agree, 5 = agree, 6 = strongly agree) that they could assess risks, describe basic steps, develop a food defense and response plan. Perimeter security was most often cited (19%) as a vulnerability followed by limiting access to internal areas/processes (14%). Following the workshop and development of their own food defense plan, 42% of the participants had an increased awareness of food defense and 50% planned to either implement or maintain their plan.

Key Words: food defense, curriculum, extension

82 Documenting a 60-year trend in improved efficiency for the United States swine industry. M. S. Carlson*, J. A. Lory, R. E. Massey, B. Young, J. Zulovich, S. Edwards, R. Plain, and T. J. Safranski, *University of Missouri*, *Columbia*.

Swine production practices have evolved significantly over the past 60 years. In the mid 1940s, all phases of swine production typically occurred outside on dirt lots and pasture; by 2006, 94% of US commercial production had been moved into buildings. The objective of this project was to use statistical data from state and federal agricultural agencies and a literature review to assess the impact of these changes on the cost of production, herd health, feed efficiency and environmental efficiency for grow-finish pigs. Since 1945, the quantity of pork produced in the United States more than doubled from less than 10 to more than 23 billion pounds annually. Cost of production ($/cwt) has decreased with decreased feed costs more than compensating for increased housing and energy costs. Pig mortality decreased and some parasites such as lungworm (*Metastrongylus* spp.) and kidneyworm (*Stephanurus dentatus*), that once infected 55–95% of pigs, are now rarely seen. Daily gain (kg/d) and feed efficiency (gain to feed) improved from 0.7 to 0.89 and 3.8 to 2.6, respectively, over the past 60 years. Improved animal efficiency combined with increased crop production per hectare increased the pork produced per hectare by more than 200% over the period. Through better diet formulation, feed preparation, genetic selection and management, phosphorus excreted by pigs fed to recommended levels decreased over 50% per kg of pork produced. In summary, current production methods have increased production while reducing the land required for pork production.

Key Words: production efficiency, swine industry, herd health

84 A survey of the economic, environmental, public policy and production issues facing animal agriculture in Louisiana. T. A. Lavergne*, S. M. DeRouen, and G. M. Hay, *LSU AgCenter*.

Beef, dairy, and poultry producers/growers, personnel in allied industries, state agencies, and LSU AgCenter, as well as other leaders in these industries were surveyed on various issues affecting animal agriculture in Louisiana to determine their opinions on these issues. Respondents were asked to rate 10 items within 4 categories of issues: economic, environmental, public policy, and production issues. The items were rated from 5 (extremely important) to 1 (not important). Of the 230 respondents, 85 worked in the beef industry, 71 worked in the dairy industry, and 74 worked in the poultry industry. For economic issues, the overall average ratings ranged from 4.2 to 4.3 for all groups surveyed. “Rising input costs” received the highest rating for economic issues. For environmental issues, average ratings ranged from 3.3 to 4.0 for all groups surveyed. “Public perception of the environmental effects of animal agriculture” received the highest rating for environmental issues. For public policy issues, the overall average ratings ranged from 3.0 to 4.0 for all groups surveyed. “Consumer confidence in food and animal product safety” received the highest rating for public policy issues. For production issues, the overall average ratings ranged from 3.7 to 4.0 for all groups surveyed. “Improving production efficiency” received the highest rating for production issues. Respondents rated most items as moderately, substantially, or extremely important. Economic issues received the most substantially important and higher ratings. The responses indicate that economic, environmental, public policy, and production issues are important to these respondents involved in Louisiana’s animal industries.

Key Words: animal agriculture, environmental issues, economic issues

85 The value of poultry litter to crop producers in South Georgia. C. S. Dunkley* and D. L. Cunningham, *University Of Georgia*.

A survey was conducted to assess the value of poultry litter to crop producers in South Georgia. Respondents were asked 23 questions pertaining to poultry litter use and their farming operations. The questions included; the amount of litter they applied each year, the cost of poultry litter, the cost of inorganic fertilizer, the amount of land they applied litter and inorganic fertilizer to and the length of time they have been using poultry litter. Of the 165 respondents 75.49% of them grew row crops, specifically peanuts, pecans, cotton and corn. The remaining respondents grew forage crops and vegetable crops. When asked whether or not they used poultry litter, a total 50.3% of the respondents stated that they used poultry litter while 49.7% of them did not use it. Of the total respondents who used poultry litter 75.64% of them used poultry litter and inorganic fertilizers as nutrient sources while 24.26% of them used only litter as their nutrient source. When asked about the amount of soil amendment they added each year, about a half of the respondents applied up to 500 lbs of inorganic fertilizer per acre while about 93% of the respondents who used litter applied 2 tons per acre. The amount of money the growers paid per ton for litter ranged from $10 to $55 compared with $500 to $1200 per ton for inorganic fertilizer. Approximately

11% of litter users traveled over 100 miles to obtain the litter compared with 0.78% of inorganic fertilizer users who had to travel a similar distance. More inorganic fertilizer users (14.63%) applied more than once per year when compared with litter users (5.08%). The responses from this survey indicates that crop producers in South Georgia have found poultry litter to be of substantial value for their operations and will travel far distances to acquire the product.

Key Words: poultry, litter use, litter value

86 Testing foam depopulation equipment in the field. D. P. Hougentogler*, E. R. Benson, R. L. Alphin, and C. A. Kinney, *University of Delaware*, *Newark*.

Foam depopulation is currently one of the available options for mass emergency depopulation of floor reared poultry. Conditions including water, foam concentrate, and equipment can change the quality of the foam. Foam quality impacts depopulation efficacy. A method for evaluating foam quality in the field was developed and tested. Foam expansion rate, flowability, and drawdown time are key characteristics to making good foam. These can be evaluated using 2 simple tests. To test foam expansion in the field, a known amount of water and container of known size to generate foam into is required. Expansion rate will vary depending on the foam generation equipment used, but should follow USDA and AVMA standards for foam depopulation. Draw down time and flowability can be tested using flow over time. The field test developed to evaluate foam using a funnel and graduated cylinder measures the amount of foam flow over a given time period. This method uses a 1 L funnel with a 6.3 mm (1/4 inch) outlet, a stopper, and a 2 to 3 L graduated cylinder. Once the funnel is filled, unplug the stopper and measure the time it takes for 99% of the foam to pass through the discharge hole. A range of good flowability would allow 0.3 L to 0.9 L of foam to flow within 60 and 120 s. Foam flowability was used to develop a simple go-no go graphic that can be used in the field to evaluate foam quality. The impact of water quality was also tested using this procedure. While testing salt, hard, and brackish water, with this method it showed that they did not inhibit the production of good quality foam.

Key Words: foam, mass emergency depopulation, poultry

87 Assessing the potential economic value of an automated temperature monitoring system using stochastic simulation. J. M. Bewley*[1,2] and M. M. Schutz[2], [1]*University of Kentucky*, *Lexington,* [2]*Purdue University*, *West Lafayette, IN*.

Numerous automated temperature monitoring systems (ATMS) are marketed to dairy producers. However, the economic benefits of ATMS have not been studied. The primary objective of this research was to identify factors that influence the profitability of investment in an ATMS. An expert opinion survey was conducted to provide estimates of potential improvements arising from adoption of this technology. Experts ranked benefits of ATMS as follows: ability to monitor heat stress, mastitis detection, estrus detection, metritis detection, pneumonia and respiratory disease detection, improved animal well-being and pregnancy detection. A stochastic simulation model of a dairy farm was utilized to perform a Net Present Value (NPV) analysis. This model was developed to evaluate investments in Precision Dairy Farming technologies and was constructed to embody the biological and economic complexities of a dairy farm system within a partial budgeting framework. The @Risk add-in (Palisade Corp., Ithaca, NY) for Microsoft Excel was utilized to account for the stochastic nature of key variables by Monte Carlo simulation. The model comprised a series of modules, which synergistically provide the required inputs for profitability analysis. Benefits of ATMS were estimated by assessing the impact of its use on estrus, mastitis, metritis, and respiratory disease detection rates. In addition, the expert opinion survey results were used to calculate the associated reductions in the negative effects of disease for mastitis, metritis, and respiratory disease. Using model assumptions, the mean NPV of investing in this ATMS was $404,333 ± 208, 474 ranging from -$217,892 to $737,335. The NPV was greater than 0 in 930 of 1000 iterations. Stochastic price variables having the most influence on NPV were milk price, corn price, slaughter cow price, soybean price, and replacement cow price. More importantly, the percentage of estrus events identified using the technology had a considerable impact on investment profitability. Investment in an ATMS may be profitable, but results will be herd-specific.

Key Words: temperature monitoring, investment analysis, precision dairy farming

83 Missouri Goat Camp: Collaborative effort to enhance successful goat production projects by Missouri youth. E. L. Walker*[1], B. Fay[2], H. Swartz[3], and C. Clifford-Rathert[3], [1]*Missouri State University*, *Springfield,* [2]*Univesity of Missouri*, *Greenfield,* [3]*Lincoln University*, *Jefferson City, MO.*

Goat production continues to be the fastest growing segment of Missouri livestock production, and is becoming popular for Missouri 4-H and FFA members. Meat goat participants in Missouri 4-H has increased from 457 in 2007 to 748 in 2008. Current numbers show a total of 1171 members involved in 4-H goat projects. Budget cuts are being proposed for post-secondary education which would severely limit educational programs for youth and adults. As a way to off-set costs and enhance development of goat production, goat camps (GC) have been designed and established jointly by Missouri State University (MSU), University of Missouri Extension/4-H (UME), and Lincoln University (LU). Currently camps are held in Jefferson City at the LU Carver Farm and Springfield at the Darr Agricultural Center. Topics covered include ethics, showmanship skills, selection of goats, quality control, marketing, diseases, parasite management, and reproduction. Promoting more youth-oriented programs like these will ensure quality producers will abound in future years. All topics and instruction culminates with 4-H and FFA youth receiving certification for goat quality assurance, at the same time the adults are also being educated as an added benefit. Participants of the most recent joint camp, the 2010 GC-Springfield, were surveyed resulting in 119 respondents. The camp lasted approximately 6 h with breaks and lunch provided by the organizers. The structure consisted of 7 instructional, 25 min round robin sessions. Survey respondents included 71 youth and 48 adults. Speakers were rated at an overall mean of 1.05 ± 0.18 (1 = educator seemed prepared, 2 = somewhat prepared, 3 = not prepared) and a 2.78 ± 0.61 regarding length of activities (1 = too short, 2 = too long, 3 = just right) and all respondents reported they would recommend the clinic to others. In 2009, 189 participants attended 2 camps hosted by LU consisting of both youth and adults. As more people become interested in goat production and budgets decline, it will become necessary for more joint extension and service activities to occur between major educational entities.

Key Words: goat, youth, Missouri