

Extension Education

347 The Missouri Show-Me-Select Replacement Heifer Program: Tracking reproductive performance of heifers and AI sires. J. M. Thomas*, J. M. Nash, N. T. Martin, B. D. Mayhan, M. F. Smith, S. E. Poock, and D. J. Patterson, *University of Missouri, Columbia*.

The Show-Me-Select Replacement Heifer Program has resulted in improved reproductive efficiency of beef herds in Missouri and offers a unique opportunity to collect reproductive performance data on large numbers of heifers throughout the state. Program objectives include (1) implementation of a total quality management plan to enhance health and management of replacement beef heifers; (2) improvement of marketing opportunities for producers while adding value to Missouri-raised heifers; and (3) creation of reliable sources of quality replacement heifers based on management, reproduction, and genetics. Enrolled heifers must meet minimum management standards and follow approved animal health regimens. Prebreeding exams [reproductive tract scores (RTS)] are performed by licensed veterinarians before the breeding season. Additionally, pregnancy diagnoses must be performed within 90 d of the start of breeding and reconfirmed after the end of the breeding season. In recent years, program participants have increased use of fixed-time AI (FTAI) programs in their herds. Data collected from 2010 to 2012 were used to evaluate relationships between RTS and pregnancy outcome after FTAI. The reproductive tract scoring system ranges from 1 to 5: 1 = infantile; 2 and 3 = noncycling/prepubertal; 4 and 5 = cycling/pubertal. Among 8,308 heifers from approximately 120 herds enrolled in 2010–2012, RTS and FTAI pregnancy rate (PR) were as follows: RTS 5 (n = 3,044; FTAI-PR = 57%); RTS 4 (n = 2,496; FTAI-PR = 52%); RTS 3 (n = 2,448; FTAI-PR = 48%); RTS 2 (n = 298; FTAI-PR = 34%); and RTS 1 (n = 22; FTAI-PR = 5%). These data support the practice of establishing prebreeding criteria for identification of heifers that are good candidates for a FTAI program. Additionally, the Show-Me-Select Replacement Heifer Program tracks the performance of FTAI sires utilized among heifers in the program. Among the 10 most heavily utilized AI sires (each with over 200 services respectively), overall FTAI pregnancy rates range from 44.3% to 67.5%. As data continues to accumulate, this information may become a valuable resource for selecting reliable FTAI sires.

Key Words: heifer development, reproductive management, beef cattle

348 The Missouri Show-Me-Select Replacement Heifer Program: Tracking sales and economic impact. J. M. Thomas*, J. M. Nash, N. T. Martin, B. D. Mayhan, D. S. Brown, M. F. Smith, S. E. Poock, and D. J. Patterson, *University of Missouri, Columbia*.

The Show-Me-Select Replacement Heifer Program has assisted program participants in capturing the additional value associated with elite replacement females. The objectives of the program include (1) implementation of a total quality management plan to enhance health and management of replacement beef heifers; (2) improvement of marketing opportunities for beef producers while adding value to Missouri-raised heifers; and (3) creation of reliable sources of quality commercial and purebred replacement heifers based on management, reproduction, and genetics. Over the past 16 yr, 722 farms enrolled 104,918 heifers in the program. Twenty-seven regional extension livestock specialists coordinate the program and work closely with 222 veterinarians involved with the program statewide. Heifers are required to undergo a prebreeding evaluation and must meet minimum health and management standards. Heifers meeting the minimum requirements for enrollment are classified

as Tier 1. Heifers may be further distinguished as Tier 2 if the sire of the heifer meets minimum accuracy requirements for specified traits at the time of sale, including: calving ease direct, calving ease maternal, weaning weight, carcass weight, and marbling. Sales data from fall 2010 through fall 2012 were evaluated. Tier 2 heifers carrying AI sired pregnancies (\$1,967) sold on average for \$329 more per heifer than Tier 1 heifers carrying natural service sired pregnancies (\$1,638). Similarly, Tier 1 heifers carrying AI sired pregnancies (\$1,830) sold for \$192 more per heifer than Tier 1 heifers carrying natural service sired pregnancies. To date, the Show-Me-Select Replacement Heifer Program facilitated the sale of 25,276 heifers in 119 sales from 1997 through December 2012. The aforementioned sales generated interest from 8,063 registered buyers and resulted in \$30 million in gross sales revenue. Heifers have sold into 18 states, including AR, AZ, CO, FL, GA, IA, IL, IN, KY, KS, LA, MO, NE, OK, SC, SD, TN, and TX. The Show-Me-Select Replacement Heifer Program is estimated to have had over a \$65 million impact on Missouri's economy since the program's inception.

Key Words: heifer development, reproductive management, beef cattle

349 Investment analysis of automated estrus detection technologies. K. A. Dolecheck*, G. Heersche Jr., and J. M. Bewley, *University of Kentucky, Lexington*.

Assessing the economic implications of investing in automated estrus detection technologies can be overwhelming for dairy producers. The objective of this project was to create a producer-friendly dashboard tool for investment analysis of automated estrus detection technologies. Farm specific (FS) inputs adjustable by the end user included herd size, milk price, milk yield, feed cost, voluntary waiting period, current estrus detection rate, current conception rate, culling rate, days in milk to stop breeding a cow, cull milk yield, replacement cow cost, and cull cow value. Up to 3 different estrus detection technology systems could be evaluated at one time using system cost, cow unit cost, installation cost, percentage of units to replace per year, maintenance cost per year, estrus detection rate, and conception rate as inputs. Investment analysis results included the following for each system: days open (DO), reproductive cull percent (RCP), years to break even (BE), and net present value (NPV). To demonstrate model utility within an average dairy farm comparing 2 systems, inputs were collected from DairyMetrics (Dairy Records Management Systems, Raleigh, NC), FAPRI (Food and Agricultural Research Institute, Columbia, MO), and published literature. Technology investment and maintenance costs were obtained from technology manufacturers for the AfiTag Pedometer Plus (PP) (S.A.E. Afimilk, Kibbutz Afikim, Israel) and Select Detect (SD) (Select Sires, Plain City, Ohio). The modeled DO and RCP before intervention were 150.70 and 9.56%, respectively. The DO, RCP, BE, and NPV after adopting each system were PP: 118.39, 1.99%, 4.99, and \$15,928, respectively, and SD: 109.56, 0.96%, 7.40, and \$7,023, respectively. Additional breakeven analysis was conducted to determine the estrus detection rate that would result in a NPV of zero for each technology. The resulting estrus detection rates for PP and SD were 59.79% and 65.07%, respectively. Dairy producers considering purchasing an automated estrus detection technology system may use this model as a decision support tool.

Key Words: estrus detection, economic dashboard, precision dairy farming

350 Development of a smartphone application tool to assess and reduce heat stress in livestock. B. Scharf*¹, P. A. Eichen¹, J. S. Travlos², and D. E. Spiers¹, ¹*Division of Animal Science, University of Missouri, Columbia*, ²*Agricultural Electronic Bulletin Board, University of Missouri, Columbia*.

Climate variability is becoming a fact of life for livestock producers with the 3 hottest summers and 10 warmest years on record all occurring in the past 15 years. This increase in ambient temperature has tremendous impact on the agriculture industry with significant losses to livestock production amounting in excess of 1.5 billion dollars during a typical year. Thermal stress indices to help alleviate these losses have existed for years, but are underutilized because they require elaborate combinations of environmental (e.g., weather) and physiological (e.g., body temperature) data. Therefore, a native smartphone application (Apple) was created that combines weather input (current and projected) with individual animal information to aid the producer in the decision-making process to reduce heat strain and improve animal welfare. Features of this application include the ability to enter animal variables (e.g., breed, health) to identify current and future levels of stress for specific environment and animal groups. The framework of the application is built on a 3-tier design with tier 1 comprised of streaming current ambient conditions. The second tier is composed of the characteristics which define the animal and include known determinants of environmental interaction (i.e., health, production level). The final tier allows the user to collect individual animal responses to the environment (i.e., respiration rate) and combine this data with tier 1 and 2, resulting in herd specific suggestions to alleviate heat strain. This information is stored on the phone and also may be sent to a server for later viewing. Ultimately, the goal of this project is not only to develop a smart phone application for extension, but to create a research tool that provides exchange of data between producers and researchers. It also is the conduit for the generation of more specific models in future versions. This project will hopefully provide a framework for others to develop and implement the “extension through a smartphone” approach for solutions to problems facing animal agriculture around the world.

Key Words: heat stress, smartphone application, livestock

351 Estimation of U.S. dairy disease costs through stochastic simulation. D. Liang*¹, L. M. Arnold¹, M. M. Schutz², and J. M. Bewley¹, ¹*University of Kentucky, Lexington*, ²*Purdue University, West Lafayette, IN*.

The objective of this research was to estimate common dairy disease costs using the dynamic, stochastic, simulation farm-level model described by Bewley et al. (2010). This model was constructed using Microsoft Excel (Microsoft, Seattle, WA) and the @Risk Monte Carlo simulation add-in (Palisade Corp., Ithaca, NY). A 170 cow US dairy, with default herd parameters established using DairyMetrics (Dairy Records Management Systems; Raleigh, NC) and published literature, was simulated through 5000 iterations. Total disease costs were summarized in 8 categories: veterinary fees, drugs, discarded milk, lost milk, culling, extended days open, death, and labor. An electronic survey was conducted to provide updated estimates for veterinary fees, drugs, and labor costs associated with clinical mastitis (CM), subclinical mastitis (SCM), ketosis (KT), metritis (MT), lameness (LM), milk fever (MF), left displaced abomasum (LDA), and retained placenta (RP). Forty-one surveys were completed. The survey results and total disease costs are shown in Table 1.

Table 1. Mean (\pm SD) of common dairy disease treatment costs, including drug costs, veterinary fees, and producer labor costs, and total disease costs for different lactations (primiparous and multiparous animals)

Costs (\$)	CM	SCM	MT	KT	LDA	RP	LM	MF
Drugs	73.52 \pm 40.79	48.70 \pm 30.35	90.14 \pm 41.37	75.47 \pm 48.25	139.51 \pm 80.81	67.51 \pm 32.97	77.23 \pm 47.00	62.24 \pm 39.31
Veterinary fees	25.11 \pm 19.86	24.01 \pm 20.07	20.90 \pm 14.49	26.22 \pm 20.17	120.85 \pm 68.24	24.33 \pm 19.36	39.15 \pm 28.48	48.60 \pm 39.99
Producer labor	11.12 \pm 6.42	8.05 \pm 4.81	9.89 \pm 5.12	12.16 \pm 6.60	15.86 \pm 8.85	13.25 \pm 7.70	15.80 \pm 8.69	15.22 \pm 8.81
	LDA	CM	MT	RP	KT			
Primiparous (\$)	470.95 \pm 114.12	352.45 \pm 58.26	311.03 \pm 46.23	294.80 \pm 50.67	162.97 \pm 52.98			
Multiparous (\$)	700.98 \pm 125.18	298.31 \pm 53.76	420.55 \pm 61.55	274.27 \pm 44.65	212.53 \pm 56.00			

Key Words: stochastic simulation, diseases cost, animal health economics

352 Quality Beef by the Numbers: Linking economic incentives with technology adoption. D. J. Patterson*, J. M. Thomas, M. F. Smith, and D. S. Brown, *University of Missouri, Columbia*.

The beef industry is a leading segment of our nation’s economy and efforts to increase the value of beef cattle have widespread effects. In Missouri, the Show-Me-Select Replacement Heifer Program changed production practices related to management of beef heifers. Effects of these changes are realized by producers, veterinary practices, feed dealers, the pharmaceutical and AI industries, and related local economies. The recent addition of Tier Two to the Show-Me-Select Program encourages expanded use of fixed-time AI with genetically superior high-accuracy sires. Adoption of these technologies is resulting in 2 significant outcomes: Increased numbers of genetically superior females, and a similar increase in numbers of genetically superior steer mates. Increased domestic and global demand for high-quality proteins, coincident with the decline in the US beef cow inventory, offers the potential to increase premiums for high-quality beef products. Stacking reproductive and genetic technologies sets the stage for a new programming effort. Quality Beef by the Numbers (QB) streamlines production and marketing of cattle with a focus on high-quality endpoints. The program involves a partnership including the University of Missouri, Irsik and Doll Feed Yard (Garden City, KS), Pratt Feeders (Pratt, KS), Accelerated Genetics, Genex Cooperative, Select Sires Mid-America, and Certified Angus Beef. The program is intended to (1) support the adoption of reproductive and genetic technologies that will add value to beef cattle produced and marketed in the US; (2) provide access to marketing grids that reward producers of high-quality cattle; and, (3) provide beef producers with access to a comprehensive database that will support improvements in management and marketing of cattle from conception to harvest. The QB mission will improve the profitability of beef cow-calf operations by facilitating the adoption of applied reproductive and genetic technologies that add value to beef cattle produced and marketed in the US and contribute to improvements in beef quality to satisfy increasing domestic and global demand for high-quality beef.

Key Words: high-quality beef, AI, high accuracy sires

353 Determining strategies for youth livestock exhibitors to be effective ambassadors for animal agriculture. K. Lancaster*, C. Brady, and M. Tucker, *Purdue University, West Lafayette, IN*.

Youth participants in livestock agriculture are an invaluable, yet largely untapped, resource in establishing positive relationships with the non-agricultural public, especially at fairs and other livestock events where they interact and converse with event visitors. To determine key strategies to teach youth exhibitors to be effective ambassadors for animal agriculture, 8 livestock industry professionals with ties to youth livestock exhibitors were individually interviewed for this qualitative study. Subjects were identified based on recommendations from an expert panel, their professional qualifications and involvement with youth livestock activities. Interview questions were developed after a review of relevant literature, and sought information about subjects' backgrounds, information youth exhibitors should know, common questions asked by visitors, and recommended communication strategies to be used by exhibitors interacting with visitors. Subjects were from diverse backgrounds and had a range of experience in the livestock industry, with all but one employed in an agriculture-related field at the time of the research. Three overarching themes emerged from the interview data: exhibitors must have knowledge about their animals and be familiar with relevant industry issues; exhibitors must be able to answer questions effectively and positively; and exhibitors must be aware that they represent all of agriculture to visitors at the fair. Subjects agreed that general knowledge about the animal, activities taking place at the event, and an understanding of current events and hot topics surrounding animal agriculture were essential for youth exhibitors. They suggested that youth exhibitors prepare for interactions with visitors before the event, use language and terms appropriate to the visitors' experience, and frame answers positively. Also emerging from the research was the importance of exhibitors understanding that they are serving as ambassadors for agriculture and the accompanying need for them to interact with the public in a positive and engaging manner.

Key Words: youth exhibitor, ambassador, livestock

354 Youth motivation to participate in animal-related career development events. C. Brady*, A. Fisher, and N. Knobloch, *Purdue University, West Lafayette, IN.*

Career development events (CDE) are an integral part of many youth animal science extension programs. The purpose of this study was to assess youth motivation for participating in these events. The instrument used was developed based on the expectancy value theory and social cognitive theory, with a 5-point Likert scale measuring agreement to statements (1 = none to 5 = quite a lot). Five factors were tested: Attainment (personal importance of doing well), Cost (negative aspects of participation), Intrinsic (interest/enjoyment of the activity), Self-Efficacy (belief in ability to do well), and Utility (relationship of activity to future goals). The instrument was reviewed by an expert panel, and tested using confirmatory factor analysis and Pearson's correlation. Internal validity was tested on each subscale using Cronbach's α , with coefficients from 0.70-.91. The instrument was distributed to youth participants at State CDE for Dairy Judging (n = 171), Hippology (n = 159), Livestock Judging (n = 143), Meat Judging (n = 198), Poultry and Egg Judging (n = 158), and Livestock Skillathon (n = 267). Utility had the highest mean score of 4.07 ± 0.81 , followed by Cost (3.88 ± 0.97), Intrinsic (3.66 ± 1.00), Self-Efficacy (3.62 ± 0.97), and Attainment (3.43 ± 1.02). Cohen's d test for effect size showed a small effect size between Utility and Cost (0.21), Cost and Intrinsic (0.22), Cost and Self-Efficacy (0.27), and Intrinsic and Attainment (0.22); a small-medium effect size between Utility and Intrinsic (0.45) and Cost and Attainment (0.45); and a medium effect size between Utility and Self-Efficacy (0.50) and Attainment and Utility (0.69). Livestock participants had the highest scores in all categories, with all mean scores over 4. Poultry and Egg had the lowest Utility (3.80 ± 0.78), Self-Efficacy (3.06 ± 0.91), and Intrinsic (2.89 ± 0.89) scores, while Hippology had the lowest Attainment score (3.00 ± 1.09) and Meat Judging had the lowest Cost score (3.64 ± 1.06). This study demonstrates that youth motivation for participation in CDE is multi-faceted, and to some degree event specific. This information can be useful for recruitment and retention of event participants.

Key Words: career development, youth, motivation