406 Optimal dairy farm management subject to greenhouse gas emissions constraints. Di Liang*, Thomas F. Rutherford, and Victor E. Cabrera, *University of Wisconsin-Madison, Madison, WI.*

Dairy farm feed allocation decisions seek to maximize farm profit. We present a nonlinear programming model that chooses a robust policies among a set of dairy farm management strategies. In the optimal policy, animal feed may be produced or purchased to meet nutrition and production demands of cow groups in the herd. Nutrition requirements are calculated according to the National Research Council equations, production level, cow group, and lactation number. Farm-produced feed quantity and quality (e.g., total DM, CP, NDF, NE_L, RDP) are simulated with the Integrated Farm System Model using daily weather data. The quality of purchased feeds is established from published research. Based on these, milk sales, the farm-produced feed costs, purchased feed costs and the greenhouse gas emissions from manure and enteric fermentation are calculated. The optimal solution addresses the dual objective of maximizing profit (milk income over feed cost) while limiting greenhouse gas emissions. Farm characteristics (e.g., breed, production level, culling rate, reproductive performance, cropping strategy), feeding strategies (e.g., high or low forage, grazing, CP content, grouping strategy, seasonal diets which address heat stress), and manure management options (e.g., direct field application, lagoon, manure pile) provide detailed control of the dairy management strategies, which characterize an optimal policy. Consequently, the optimal solution provides a list of best feeding strategies and manure management practices according to farm-specific characteristics that maximize profit and minimize greenhouse gas emissions.

Key Words: profitability and environment, feed allocation, optimization modeling

407 A decision support tool for *Escherichia coli* bacterin mastitis vaccine use in dairy cows. Amanda E. Stone*, Tyler B. Mark, and Jeffrey M. Bewley, *University of Kentucky, Lexington, KY.*

The objective of this study was to create a producer-friendly decision support tool to evaluate the economic decision of implementing *Escherichia coli* (0111:B4) bacterin vaccination as a management practice. A partial budget analysis was conducted in Excel (Microsoft Corporation, Redmond, WA) and a producer-friendly dashboard was created (SAP America, Inc. Newtown Square, PA; the dashboard is available at http://afsdairy.ca.uky.edu/J5MastitisVaccine). Farm-specific inputs adjustable by the end user included herd size, milk price, milk yield, vaccine cost, labor cost, feed cost, culling rate from mastitis, coliform prevalence, replacement cow cost, and cull cow value. To demonstrate model sensitivity and utility, 3 example scenarios were evaluated. In all scenarios, vaccine cost was estimated at $4.74 per cow and the rate of clinical mastitis in vaccinated cows was estimated at 8.6%. In the first scenario, a 100-cow herd was modeled with an average clinical mastitis prevalence (48%/year) and milk price ($17.65, calculated from Food and Agricultural Policy Research Institute for years 2015 to 2025). In the second scenario, a 100-cow herd was modeled with an average clinical mastitis prevalence (48%/year) and greater than average milk price ($25.70/cwt, calculated from years 2005 to 2015). In the third scenario, a 1,000 cow herd was modeled with an average clinical mastitis prevalence (48%/year) and average milk price ($17.65/cwt). Labor costs, cull cow price, and replacement cow price were $10/h, $1,000/cow, and $1,500/cow for all scenarios, respectively. The benefit:cost ratio of using a *Escherichia coli* bacterin vaccine was $7.52:$1, $8.51:$1, and $7.53:$1, for scenarios 1, 2, and 3, respectively. The benefit was $8,719/herd/year, $11,552/herd/year, and $87,191/herd/year, for scenarios 1, 2, and 3, respectively. All scenarios evaluated in this project were positive investments. Dairy producers considering investing in a coliform bacterin vaccine may use this as a decision support tool. This work was supported by a grant award from USDA-NIFA-AFRI (2013–68004–20424).

Key Words: economic dashboard, coliform mastitis vaccine, decision support tool

408 The Missouri Show-Me-Select Replacement Heifer Program: Improving heifer development practices and increasing technology utilization through economic incentives. Jordan M. Thomas*, Brianne E. Bishop, Jillian M. Abel, Jared E. Decker, Scott E. Poock, Douglas S. Brown, Michael F. Smith, and David J. Patterson, *University of Missouri, Columbia, MO.*

The Show-Me-Select Heifer Program has resulted in improvements in development programs for replacement beef heifers and increased utilization of technology among participating beef operations across Missouri. Enrollment of heifers in the program has increased steadily in recent years, from 3,020 heifers enrolled in 2010 to 5,867 heifers in 2014. Enrolled heifers undergo a prebreeding evaluation that includes pelvic measurement and a reproductive tract score (RTS). Producers may elect to expose heifers for breeding via AI or natural service (NS), and the proportion of heifers exposed for AI service has increased steadily. In 2010, 68% of enrolled heifers were exposed for AI rather than serviced exclusively with NS; whereas, AI serviced heifers accounted for 91% of enrolled heifers in 2014. Use of ultrasound (US), as opposed to palpation per rectum for pregnancy diagnosis, has also increased in the program. In 2010, 59% of heifers were diagnosed for pregnancy using US, increasing to 72% of heifers in 2014. Use of US facilitates a more accurate determination of whether a pregnancy resulted from AI or NS and may also allow for determinations of fetal sex. Lastly, differences in average sale price among Show-Me-Select heifers indicate a growing awareness among buyers of the value associated with genetically elite females. 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. From 2010 to 2014, Tier 2 heifers carrying AI sired pregnancies ($2,279) sold on average for $213 more per heifer than Tier 1 heifers carrying NS sired pregnancies ($2,066). In summary, continued growth in the Show-Me-Select Heifer Program highlights the importance of economic incentives to drive technology utilization and improve heifer development practices statewide.

Key Words: heifer development, reproductive management, beef cattle

409 Engaging industry personnel in an agricultural education program. Angela R. Mays*, *F.L. Emmert Company, Cincinnati, OH.*

Typically inter-dependent departments usually exist within animal agricultural products businesses. Those personnel in billing, sales, maintenance, production and other areas may not have knowledge or understanding of end product usage in this industry. Consequently,