1189 The role of vermiculture (earthworms) in the sustainability of dairy farms. R. Lyons*, E. Lindner, and A. De Vries, *University of Florida, Gainesville, FL.*

In a rapidly growing world, agricultural producers must evolve and adapt to feed the global population while considering the operation's efficiency and sustainability. The dairy industry is under intense pressure to reduce the environmental footprint of production, with carbon and manure management at the forefront of these concerns. In response, the dairy industry has committed to neutralizing greenhouse gas emissions by 2050, while also promoting water recycling and reducing runoff. Liquid storage of manure is a leading contributor of greenhouse gas emissions from the industry, leading to air and water pollution. Vermiculture, which is the use of earthworms to break down manure, poses an interesting opportunity for dairy producers to better capture and cycle nutrients through their operation. Vermifiltration systems utilize nature's principles of gravity and microbial metabolism to aerobically treat wastewater, while capitalizing on the value of manure, called vermicompost, and carbon credits in current markets. Although not yet widely adopted, several pilot studies have shown a significant potential of vermifiltration to reduce the concentration of organic matter, nutrients, and solids in dairy wastewater. These research trials have indicated significant reductions in ammonia, methane, and nitrous oxide emissions ranging from 72% to 100% from wastewater and manure management systems. Aside from this system's efficiency in treating wastewater, it also provides advantages in low cost and labor inputs when compared with other alternatives. The implementation of vermiculture systems in dairy operations provides a viable solution to improve operation sustainability and provide another source of income for producers.

Key Words: sustainability, vermiculture, manure management

1190 Embryo loss in the dairy industry. M. Griow* and G. Carpenter, *Iowa State University, Ames, IA.*

Embryo loss in the dairy industry can be significantly detrimental to reproductive efficiency and farm profitability. Embryo loss primarily occurs within the early stages of gestation. A meta-analysis was conducted on 19,723 pregnancy diagnosis records in dairy cows. It was found that pregnancy losses occur in approximately 27% of early embryonic stages (19–32 d) and 13% in the late embryonic stages (30–45 d). Initial pregnancy diagnosis occurs during the late embryonic/early fetal stage of gestation. This means up to 27% of pregnancies could be lost before the initial pregnancy diagnosis is confirmed. Reproductive efficiency is pivotal in determining a dairy herd's profitability, as it directly affects optimal milk production as well as culling decisions. High-producing dairy cattle are especially susceptible to embryo loss due to the negative energy balance they experience and the hormonal distributions that may affect embryo viability. The factors relating to pregnancy losses are put into 2 categories: infectious and noninfectious. Some key contributors to embryo loss include physiological imbalances, nutritional deficiencies, heat stress, genetic predisposition, and infectious diseases. The consequences of embryo loss go beyond reproduction, having an economic impact, reduced herd reproductive efficiency, and increased veterinary and management costs. However, there are many strategic management and preventative practices that can help mitigate the risk of embryo loss. Those key interventions include optimizing nutrition, improving heat stress management, enhancing reproductive management, implementing enhanced control over infectious diseases, and improving genetic selection. Recognizing that embryo loss is important for maintaining reproductive productivity is key to guaranteeing long-term sustainability within the dairy industry.

Key Words: embryo loss, reproductive efficiency, high-producing dairy cattle

1191 Use of precision dairy technology to evaluate body condition scores. W. Robey* and D. Winston, *Virginia Tech, Blacksburg, VA.*

Body condition score (BCS) is a widely recognized tool in the dairy industry, aiding in herd health management by assessing body fat reserves in dairy cows. Different scoring systems exist globally, but all follow the principle that lower scores indicate thinner cows, whereas higher scores signify heavier animals. Body condition scoring is particularly critical around calving, as cows naturally lose condition due to hormonal changes and lactation demand. Maintaining an optimal BCS at calving (3.0–3.5 on a 5-point scale) is essential for productivity, reproductive performance, and overall health. Deviations from this range can lead to reduced milk yield, metabolic disorders, and compromised feed intake. Despite its importance, traditional BCS methods are labor-intensive, subjective, and impractical for large-scale dairy operations. Emerging automated BCS technologies utilizing 3D cameras offer a promising solution. These systems can capture multiple scores per day, improving monitoring precision and eliminating human subjectivity. Studies have demonstrated that multi-camera setups enhance accuracy by evaluating numerous body regions, surpassing the limitations of single-camera approaches. Automated systems have also proven more sensitive in detecting BCS changes, identifying variations significantly earlier than visual assessments. One study found that whereas manual scoring required 44 d to detect changes, refined automated methods could do so in 12 d. Such advancements enable earlier intervention for metabolic diseases and optimize transition cow management. Although automated BCS systems significantly enhance accuracy and efficiency, challenges remain, including calibration for extreme BCS values and the need for broader validation across different breeds. However, the potential benefits—such as improved animal welfare, reduced labor demands, and enhanced dairy management—underscore the value of these technologies. As refinement continues, integrating automated BCS scoring into dairy operations will facilitate more precise, real-time decision-making, ultimately improving herd health and productivity.

Key Words: body condition score

1192 Individual versus pair housing in dairy calves. A. C. Hebert* and C. C. Williams, *Louisiana State University, Baton Rouge, LA.*

Management of newborn dairy calves is critical to their growth and survival. Although much emphasis is placed on colostrum in the first 24 h of life, other management factors are also important. The type of housing can have an impact on health and productivity of the preweaning calf. Individual housing is most often used on US dairy farms, with approximately 70% of producers choosing this type of housing. However, interest in pair housing calves is on the rise. Some important things to consider are how each of these methods affects both the producer and the calf. This includes effectiveness, simplicity, health, socialization, and freedom from both fear and stress. While housing methods do not