Animal Reproduction

THEMATIC SECTION: 38TH ANNUAL MEETING OF THE BRAZILIAN EMBRYO TECHNOLOGY SOCIETY (SBTE)

FTAI AND AI

Impact of using ovulation synchronization protocols for timed AI on increasing reproductive efficiency and reducing CO2 equivalent emissions in cattle

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Research utilizing Life Cycle Assessment (LCA) in milk and beef production in tropical environments demonstrates that factors such as herd diet, genetic composition, and reproductive efficiency significantly influence estimates of CO2 equivalent (CO_2eq) emissions. The objective of this study was to evaluate the impact of using ovulation synchronization protocols for TAI (GlobalGen) on improving reproductive efficiency, productivity, and reducing CO2eq emissions in dairy and beef production programs. The carbon footprint of milk and beef production was estimated based on the LCA. The study followed ISO 14040, 14044 and 14067 requirements. Open LCA® 3.11.1 software was used for data modeling and estimation of CO_2eq. The frontier considered was cradle-to-farm-gate, comprising the stages of animal management, use of natural resources, energy, inputs and waste management, direct and indirect emissions. Regional Brazilian data were collected, including national inventories and production data, focusing on semi-confined dairy systems (Girolando) and full-cycle beef systems (Nelore). The analysis included 11,479,663 protocols commercialized by GlobalGen (annual analysis considered), of which 80% were intended for beef and 20% for dairy production. The number of cows in production were considered as a fixed value to compare the modeled scenarios: SCE-NM) system using natural mating, and SCE-TAI) system adopting TAI. For the dairy system, 595,241 cows in milk were considered (2.7 TAI/cow). The following premises were determined: age at first calving (AFC; months) of 36 (SCE-NM) and 24 (SCE-TAI), calving interval (CI; months) of 16 (SCE-NM) and 13 (SCE-TAI). For the beef system, 4,017,882 cows were considered (1.7 TAI/cow). The following premises were determined: AFC of 48 (SCE-NM) and 24 (SCE-TAI), weaning rate of 60% (SCE-NM) and 80% (SCE-TAI). Quantitative values of inputs for animal feed were estimated. Results were expressed as CO_2eq/liter of milk corrected for fat and protein content (FPCM; dairy system), and kg of beef produced corrected for kg of live weight (LW; beef system). In the dairy system, the footprint decreased from 1.44 to 1.06 kg CO_2eq/FPCM, representing a 37% reduction, along with a 25% increase in productivity. This improvement was attributed to a lower AFC, shorter CI, and genetic gains. In the beef system, emissions were reduced from 41.4 to 27.9 kg CO_2eq/LW, a 49% decrease, accompanied by a 27% increase in productivity due to higher pregnancy rates, earlier calvings, and improved genetics. The main source of emissions was enteric methane, followed by off-farm feed production and manure management. The conclusions highlight that the protocols used for TAI commercialized by GlobalGen enhance productivity and decrease emissions per unit of milk or beef produced. This supports the sustainability of Brazilian livestock production, aligning with global demands for agricultural products with a lower environmental impact.