

ABSTRACT

National greenhouse-gas (GHG) inventories in most developing countries, and in countries in Sub-Saharan Africa in particular, use default (Tier I) GHG emission factors (EFs) provided by the Intergovernmental Panel on Climate Change (IPCC) to estimate enteric methane (CH₄) emissions from livestock. Because these EFs are based on data primarily from developed countries, there is a high degree of uncertainty associated with CH₄ emission estimates from African livestock systems. Accurate Tier II GHG emission reporting from developing countries becomes particularly important following the Paris Climate agreement made at COP21, which encourages countries to mitigate GHG emissions from agricultural sources. In light of this, the present study provides improved enteric CH₄ emission estimates for cattle in Nandi County, Western Kenya, representing a common livestock production system found in East Africa. Using the data from measurements of liveweight and liveweight change, milk production and locomotion collected from 1143 cattle in 127 households across 36 villages over three major agro-ecological zones covering a full year, we estimated total metabolic energy requirements. From this and assessments of digestibility from seasonally available feeds, we estimated feed intake and used this to calculate daily CH₄ production by season, and, subsequently, created new EFs. Mean EFs were 50.6, 45.5, 28.5, 33.2 and 29.0 kg CH₄/head.year for females (>2 years), males (>2 years), heifers (1–2 years), young males (1–2 years) and calves (<1 year) respectively, and were lower than the IPCC Tier I estimates for unspecified African adult cattle, but higher for calves and young males. Thus, using IPCC Tier 1 EFs may overestimate current enteric CH₄ emissions in some African livestock systems.