Improved greenhouse gas emission factors for smallholder livestock systems in East Africa

Lutz Merbold[1], Klaus Butterbach-Bahl, Polly J Ericksen, John P Goopy, Daniel Korir, Sonja Leitner, Paul Mutuo, Phyllis W Ndung'u, Alice Onyango, Jesse Owino, David E Pelster, George N Wanyama

#AgriGHG Berlin
10-13 September 2018

1. Context

- GHG emissions estimates for livestock systems in East Africa are based on IPCC Tier 1 (default) methodology
  - ➢ considerable uncertainties around GHG emissions from African livestock systems are expected
- Accurate GHG emissions estimates are necessary
  - ➢ following the Paris Climate Agreement (COP21), reliable mitigation options need to be identified
- Climate smart agriculture (CSA) and sustainable intensification of livestock systems in Africa to achieve food security and SDG contribution
  - ➢ reliable estimates of GHG emissions from livestock systems are essential

2. Approach

Where:

Nandi and Bomet counties in Western Kenya

Data collection period:

3 months (manure management surveys), and

1 year data collection in order to collect data for Tier 2 emission factor calculation per county (see pictures A – D)

Variables/Frequency:

Surveys on manure management done for approx. 340 farms per county

Animal related measurements were done in approx. 120 farms and for > 1000 cattle per county

- Liveweight (5x per year) - 4 liveweight flux values
- Farm size assessments (5x year)
- Milk quantity/quality (5x year)
- Feed basket including subsequent wet chemistry (each season)
- Locomotion with GPS collars (for selected animals and approx. 1 week per season)

3. Findings

Results reveal that Tier 2 methane emission factors (EF) for different cattle classes differ from Tier 1 default estimates for both counties in Kenya, Nandi and Bomet counties and the individual agroecological zones (AEZ) respectively (Figure 1 a and b).

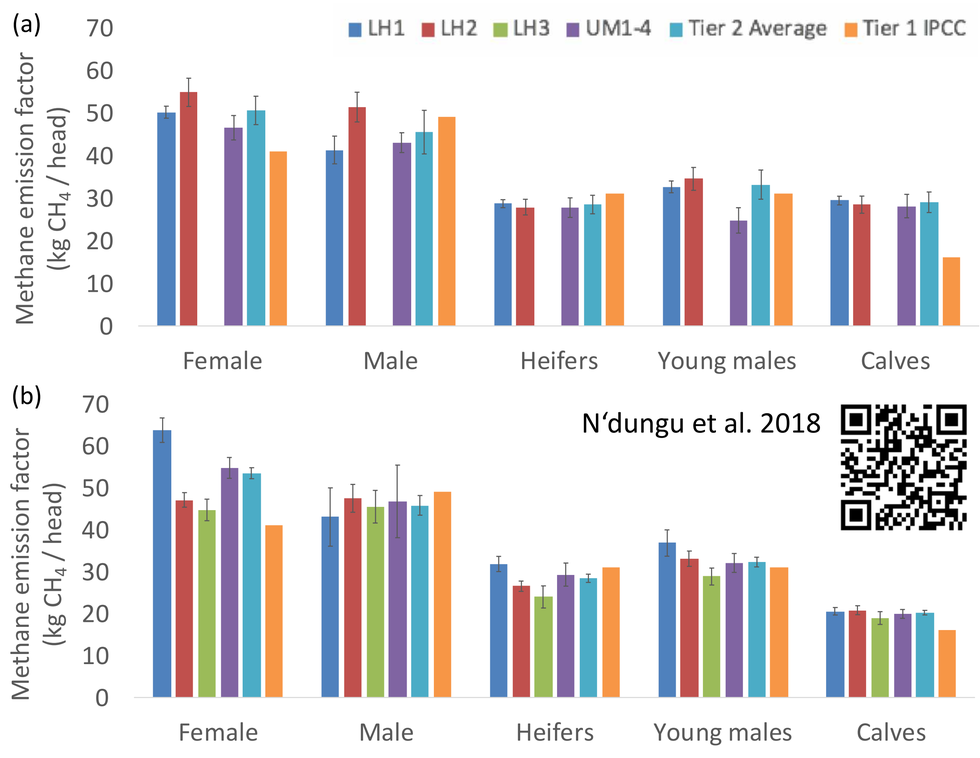


Figure 1: Methane emission factors for (a) Nandi county and (b) Bomet county disentangled by agroeco-logical zone (AEZ – different colors) and cattle category.
Female and male cattle >2 yrs, heifers and young males 1-2 yrs, and calves <1 yr.
AEZs were identified on the basis of altitude, rainfall, temperature and predominant land use. LH = lower highlands and UM = upper midlands, numbers denote climate properties after Jaetzold and Kutsch 1982.
Tier 2 Average is the mean of AEZs, Tier 1 values are numbers for unspecified African cattle.

Different EFs occured predominantly due to the variation in live weights, feed sources and feed availabilities over the course of the one year observation period (Figure 2).

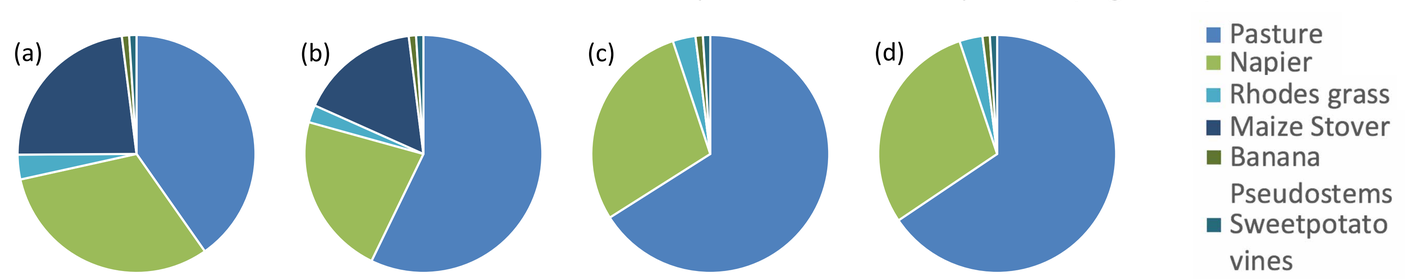


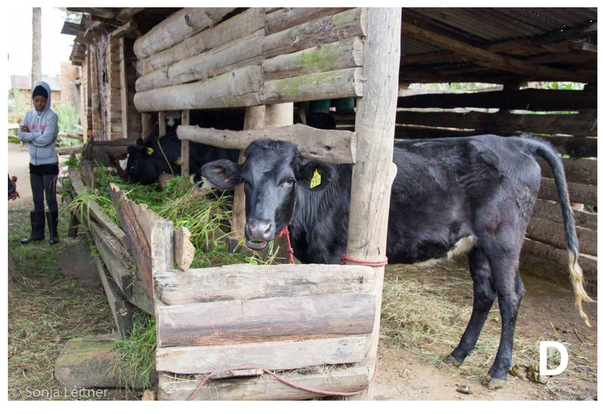
Figure 2: Variation in feed sources over 4 seasons: (a) hot dry, (b) long rains, (c) cold dry and (d) short rains in AEZ LH1 in Bomet county. Pasture is a commonly as mixture of grasses.

Manure emission factors (not shown) are higher than IPCC Tier 1 estimates (all manure is deposited in rangelands) and does not account for manure management (ie. heaping). However, our survey data shows that more than 99% of the farmers manage their manure.

4. Conclusion & Outlook

Our findings highlight the necessity for region specific and accurate GHG emission estimates from smallholder livestock systems in East Africa to achieve reliable national reporting under the Paris Climate Agreement and identification of mitigation options.

More data are crucially needed, including other livestock production systems, different animal classes and more climatic regions.



(A) Mazingira staff and smallholder farmer during regular farm visits, (B) live weight measurement using portable scales, (C) slurry lagoon, and (D) cattle barn within a zero-grazing unit.

[1] corresponding author
Lutz Merbold
Email: l.merbold@cgiar.org ● Box 30709 Nairobi Kenya ●
Nairobi , Kenya ● mazingira.ilri.org

IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELPMENT

Mazingira Centre

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE