Experimental setup of manure heap experiment (left) simulating conditions on East African smallholder mixed crop-livestock farms (right).

Context

- 15% of agricultural GHG emissions come from Africa, 25% of which are related to manure.
- Due to low productivity, GHG emission intensities (i.e. emissions per unit of product) in Africa are high compared to rest of the world.
- Reliable emission baselines (e.g. through *in situ* measurements with local breeds fed on local diets) are missing, hampering development of sustainable intensification strategies.

Our innovative approach

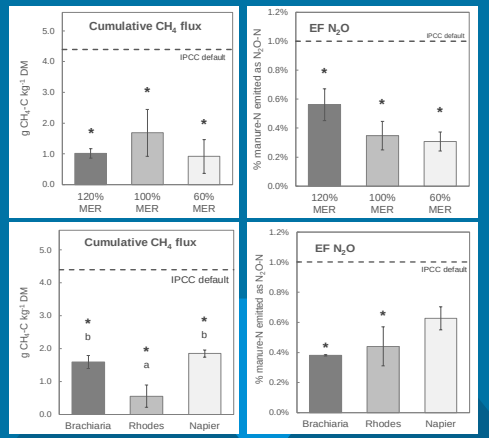
- We conducted two animal feeding trials with Kenyan Boran cattle and incubated fresh manure in uncovered solid heaps typical for smallholder farms.
- Trial 1: Animals were fed on sub-maintenance energy levels (i.e. cows were hungry).
- Trial 2: Animals were fed on local tropical forage grasses (Napier, Rhodes, Brachiaria) without energy or N supplements.

CLIMATE CHANGE & GREENHOUSE GAS REDUCTION

N_2O and CH_4 emissions from cattle manure heaps in Kenya are lower than IPCC estimates

Sonja Leitner, Dónal Ring, George Wanyama, Daniel Korir, David Pelster, John Goopy, Lutz Merbold

- Current IPCC default factors for manure N_2O and CH_4 are too high compared to *in situ* measurements.
- This potentially invalidates current mitigation practices in SSA because baselines are incorrect; also reporting under UNFCCC is biased.
- With improved management, productivity could go up faster than emissions, reducing GHG emission intensities.



Legend:
MER = Maintenance-energy requirement (energy supporting basic bodily functions)
EF N_2O = N_2O emission factor
DM = manure dry matter
N = nitrogen

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Outcomes

- Manure from hungry cows emits less N_2O and CH_4 compared to well-fed cows.
- Manure from Rhodes grass diet had lower CH_4 emissions than Brachiaria or Napier; no difference in N_2O emissions between grasses.
- All manure CH_4 and N_2O emissions were lower than IPCC default values from IPCC 2019 guidelines.
- Manure from all diets had lower N concentrations compared to "European-style" diet, indicating N deficiency of animals and resulting in low fertilizer value of the manure.

Future steps

- These are the first reliable baselines of manure heap GHG emissions reflecting East African conditions.
- Next steps are animal feeding trials with improved diets linked with manure management intervention testing to decrease nutrient losses and improve fertilizer value of the manure.

Partners

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