ENTERIC METHANE EMISSIONS OF PERI-URBAN DAIRY FARMS DURING THE WET SEASON IN SOUTHERN BENIN

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Background and Aims

- Enteric methane (eCH_4) emitted by ruminant livestock, especially lactating cows, is a major environmental pollutant worldwide.

- Six pasture-based dairy farm types (FT) were identified in the peri-urban areas of South Benin (Fig. 1) and characterized as follows: Small-Herds-Zebu cattle (FT1); Small-Herds-Taurine cattle (FT2); Medium-Herds-Zebu cattle (FT3); Medium-Herds-Taurine cattle (FT4); Large-Mixed-Herds-Taurine-Zebu cattle (FT5); and Medium-Mixed-Herds-Taurine-Zebu cattle (FT6).

- Quantification of their eCH4 emissions is lacking, but necessary for reliable national methane emission inventories.

→ We estimated eCH_4 emissions from different animal categories (bull, cow, steer, heifer) across the different FTs.
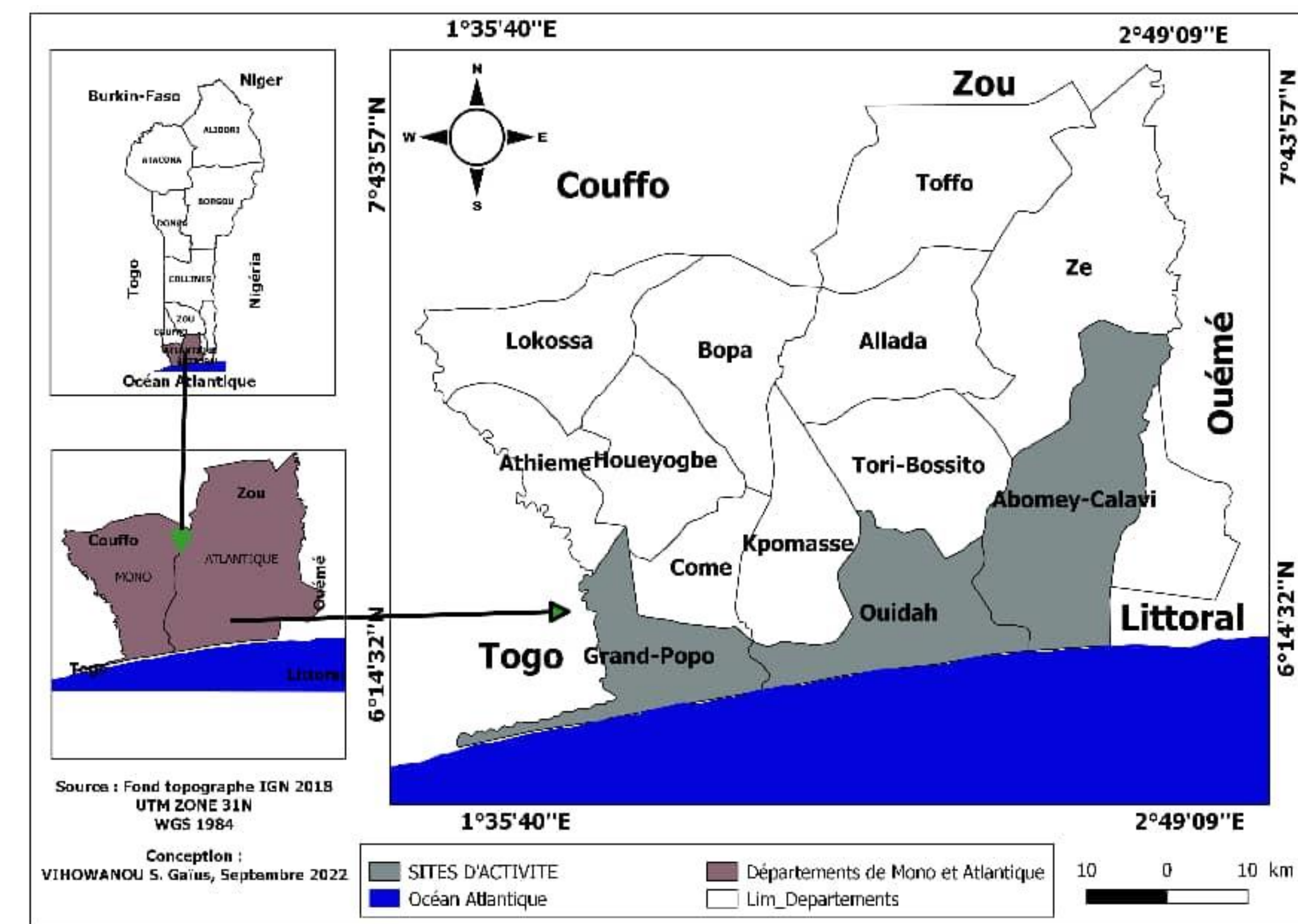

Fig. 1. Map of South Benin showing the study area

Material and Methods

Fig. 3. Cattle grazing on natural vegetation in a peri-urban area

- One animal per category and herd selected.
- Prediction of live body weight (LBW) from linear body measurements (Fig. 2)
- Grazing behavior (Fig. 3) monitored for 3 consecutive days.
- Assessment of daily grazing duration; bite counts and hand-plucked bite mass (Fig. 4)
- Feed dry matter intake (DMI) estimated as a function of grazing behavior and metabolic body weight ($MW = LBW^{0.75}$)

Fig. 2. Animal body measurement

Fig. 4. Monitoring a grazing cow

- Gross Energy Intake (GEI) was predicted via near-infrared spectroscopy.
- eCH_4 emission factors and emissions for each animal category were estimated using GEI and IPCC Tier 2 approach, and compared across FTs.
- All statistical analyses were performed with R software.

Results

- DMI (kg/d) varied ($p<0.05$) between FTs for all animal categories, ranging from 0.9 - 2.3 in steers, 1.9 - 4.7 in bulls, 1.4 - 2.8 in heifers, and 1.7 - 3.6 in lactating cows.

- Lowest GEI (MJ/kg MW/d) occurred in FT1 bulls (0.20) followed by FT3 cows (0.23); highest GEI ($p<0.05$) was observed in FT2 steers (0.72).

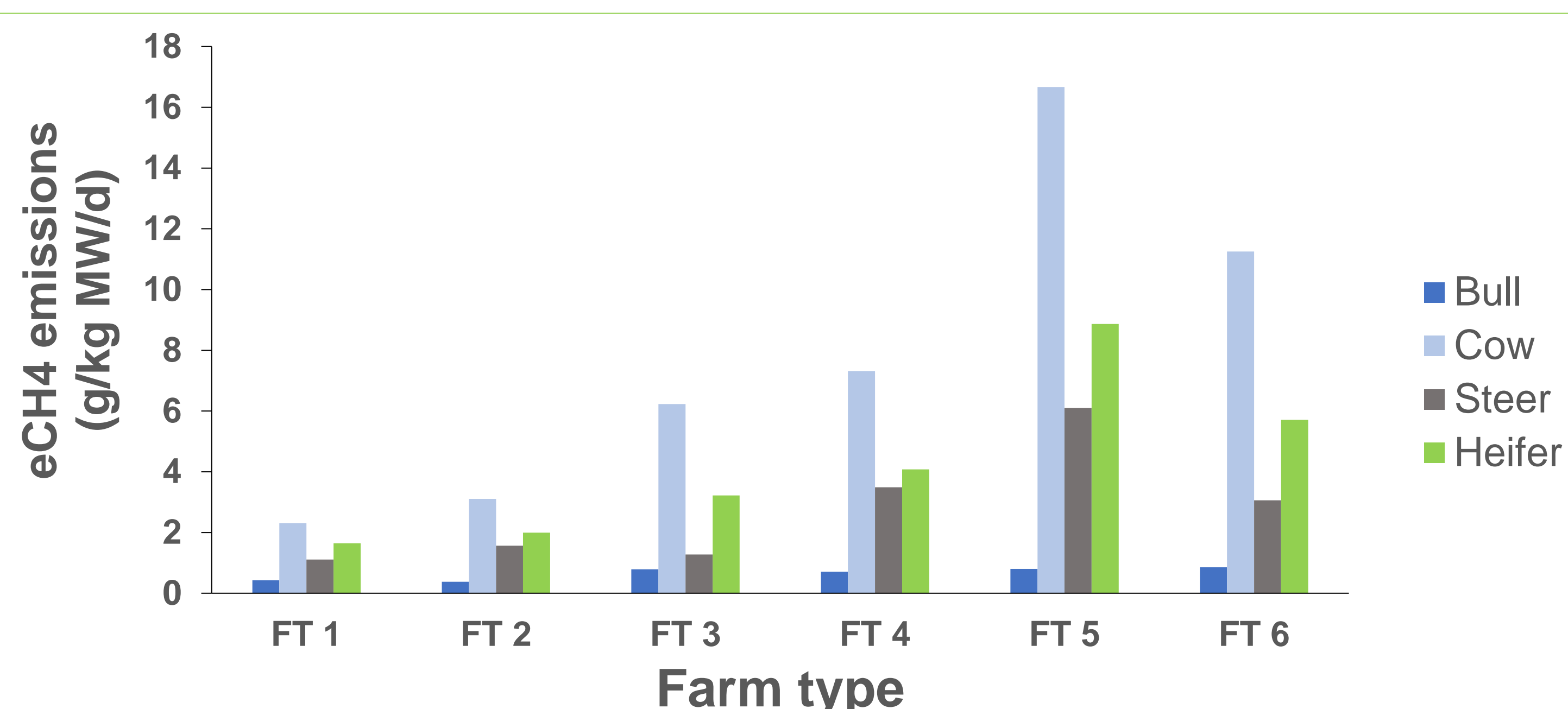- Highest eCH_4 emissions (g/kg MW/d) were recorded in lactating cows (16.7) and heifers (8.9) of FT5 (Fig. 5).

Fig. 5. eCH4 emissions by animal category and farm type

Conclusions

- A switch to small herds of taurine and zebu cows reduces eCH_4 emissions on peri-urban dairy farms in southern Benin.
- These farm types are adapted to local conditions and should be selected to increase regional milk production.