

# Using a Laser Methane Detector® To Assess Enteric Methane Emissions from Indigenous Indian Dairy Breeds

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## Introduction

- Enteric methane ( $\text{CH}_4$ ) is produced by ruminant animals, during feed digestion in the rumen.
- Enteric  $\text{CH}_4$  is a major source of greenhouse gas (GHG) emissions from livestock, especially dairy cattle.
- Dairying in India contributes about 27% of the agricultural gross domestic product (GDP).



Tharpakar Breed



Gir Breed



Kankrej Breed

## Justification and Objective

- Indigenous breeds in India are key in dairy production.
- Determining the impact of indigenous breeds on GHGs is vital in improving breed efficiency.
- The study was conducted to determine differences in  $\text{CH}_4$  concentrations among Indian indigenous breeds

## Methodology

- Study conducted in a dairy commercial farm in Coimbatore, Tamil Nadu, India.
- Twenty dairy cattle from breeds Tharpakar, Kankrej and Gir were selected using randomised block design.
- All animals were on a similar diet with body weights between 210 – 471 (SD, 90.01) kgs.
- $\text{CH}_4$  was measured from selected animals, at a 1-metre distance, using a Laser Methane Detector (LMD).

## Results

- Animal weight showed a significant effect ( $p < 0.05$ ) on  $\text{CH}_4$ .
- This indicates biological variation at individual animal level, probably attributed to genetic or physiological reasons.
- No significant effect ( $p > 0.05$ ) of breeds, age and lactation on  $\text{CH}_4$ .
- Estimated marginal means (emmeans) of  $\text{CH}_4$  concentrations varied among breeds but were not significantly different.

### Emmeans of methane concentrations (ppm-m) across breeds

Indigenous Breed	Emmeans (SD) of $\text{CH}_4$ concentrations
Kankrej	129.96 (23.95) <sup>a</sup>
Tharpakar	164.64 (38.55) <sup>a</sup>
Gir	203.09 (32.73) <sup>a</sup>

SD = Standard Deviation from the mean. Same letter superscript describe methane means as not significantly different.

## Conclusion

- Among indigenous breeds of India, individual animal parameters rather than breed differences are likely to have an influence on enteric methane concentrations.
- Mitigation strategies on enteric methane would focus on individual animal level rather than breed level.



The Laser Methane Detector (left). The LMD on farm, measuring enteric methane directly from dairy cattle (right)

- Measurements were taken for 6 minutes per animal, twice daily after feeding, over six consecutive days.
- Analysis conducted with Linear Mixed Effects (LME) model with  $\text{CH}_4$  as dependent factor, breed, animal weight, age and lactation as independent factors.
- Individual animals were the grouping factor.