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# Enteric methane measurement

Sara Place, PhD | Animal Sciences

# Enteric methane is the single largest source of methane in the United States

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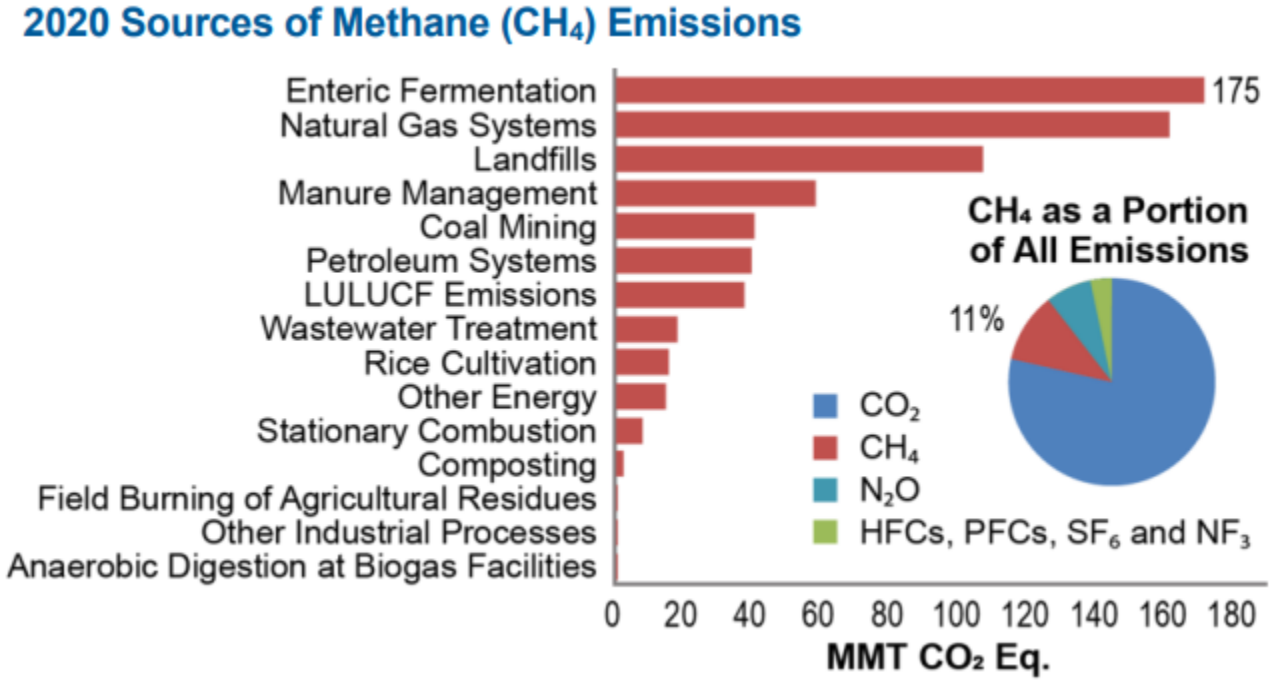
**More about Methane**

$CH_4$ accounted for 11 percent of emissions and has decreased by nearly 7 percent since 2005 and 17 percent since 1990. Emissions increased by nearly 3 percent from 2019 to 2020. Key trends include reduced emissions from natural gas systems due to decreases in emissions from distribution, transmission, and storage; decreases in emissions from landfills due to increased landfill gas collection and less decomposable materials discarded in landfills; and increased emissions from livestock in line with increasing cattle populations.




Source: https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-1990-2020-data-highlights.pdf

# Enteric methane emissions vary with the amount of feed the animal consumes & type of feed (along with genetics, feed additives, etc.)

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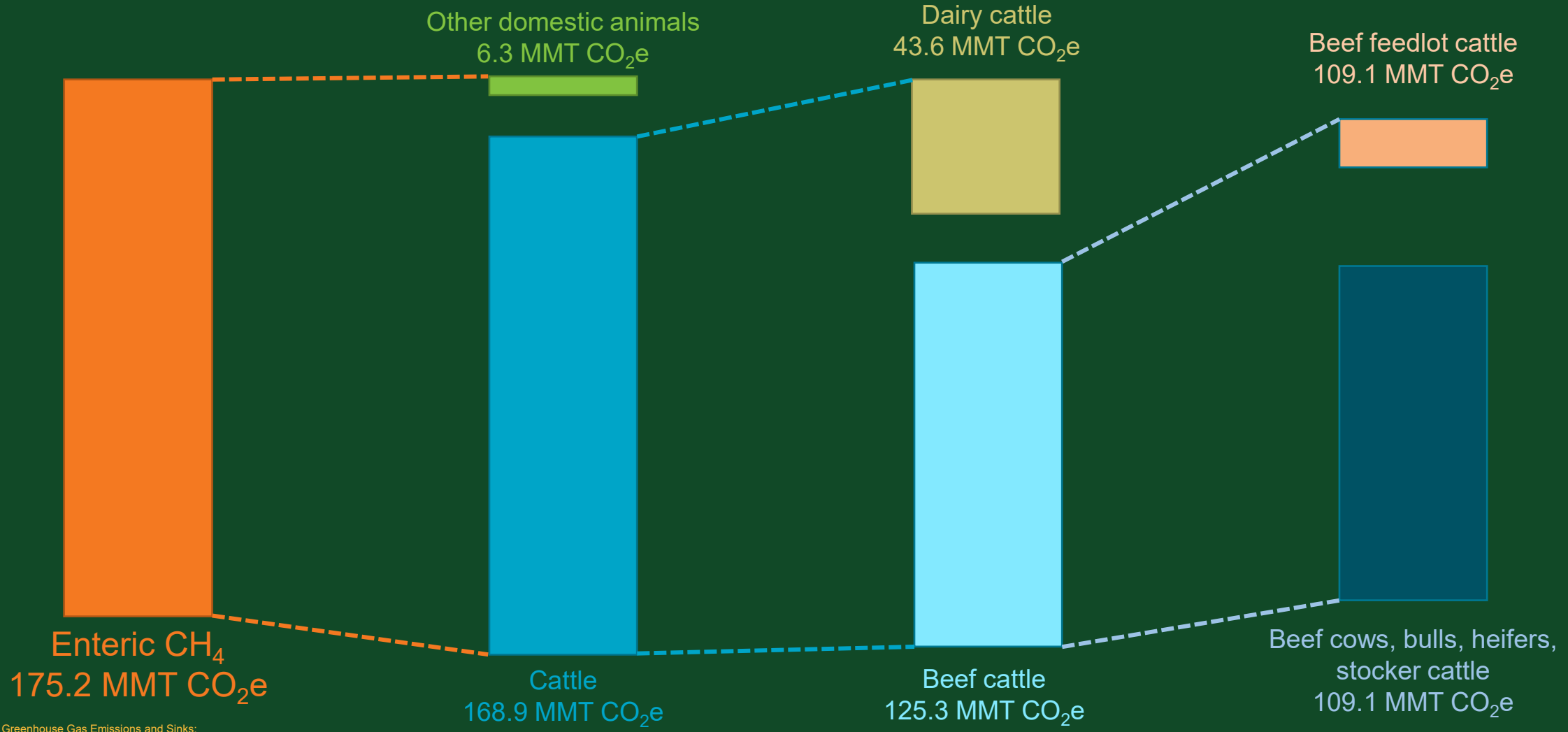


Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020 – Annexes (epa.gov)

# Measurement & prediction systems for enteric methane emissions

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- *In vivo*
  - Whole animal chambers
  - Head box systems
  - Spot sampling systems e.g., C-Lock GreenFeed
  - Tracer gas technique with $SF_6$
- *In vitro*
  - Syringes, batches, continuous culture systems
- Prediction equations and models
  - Empirical
  - Mechanistic
- Micrometeorological methods for pen or operation measurements
  - Open-path lasers/FTIR with inversion-dispersion modeling
  - Eddy covariance
    - Challenges with sources – manure vs. enteric

Storm, I.M.L.D.; Hellwing, A.L.F.; Nielsen, N.I.; Madsen, J. Methods for Measuring and Estimating Methane Emission from Ruminants. *Animals* **2012**, *2*, 160-183. https://doi.org/10.3390/ani2020160

Place, S.E.; Pan, Y.; Zhao, Y.; Mitloehner, F.M. Construction and Operation of a Ventilated Hood System for Measuring Greenhouse Gas and Volatile Organic Compound Emissions from Cattle. *Animals* **2011**, *1*, 433-446. https://doi.org/10.3390/ani1040433

# Thank you!

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