Tropentag, September 18-20, 2019, Kassel

"Filling gaps and removing traps
for sustainable resource management"

Methane Emissions in Dairy Cattle in Dependency of Rural-Urban Gradients

Ana Pinto[1], Tong Yin[1], Marion Reichenbach[2], Raghavendra Bhatta[3], Eva Schlecht[2], Sven König[1]

[1] *Justus-Liebig-University Giessen, Inst. of Animal Breeding and Genetics, Germany*
[2] *University of Kassel / Georg-August-Universität Göttingen, Animal Husbandry in the Tropics and Subtropics, Germany*
[3] *National Institue of Animal Nutrition and Physiology, Inst. of Animal Breeding and Genetics, India*

Abstract

Greenhouse gas (GHG) emissions from livestock farming have being criticised for being a main contributor to climate change. Methane (CH_4) is one of the most important GHGs in dairy farming as it is 25 times more potent than carbon dioxide. Different strategies (nutrition, genetic, management) have been researched to decrease this emission. The aim of the present study was to assess the environmental impact on dairy cattle CH_4 emissions, individually recorded using a mobile laser methane detector (LMD). CH_4 emissions were measured along the rural-urban gradient of the rising megacity of Bengaluru, in the south of India, from June 2017 to April 2018. A simplified survey stratification index (SSI) was calculated based on building density and distance to the city centre. According to this index, three districts were defined, urban (SSI < 0.3), mixed ($0.3 - 0.5$) and rural (SSI > 0.5). Individual overall CH_4 mean, CH_4 eructation and CH_4 respiration were calculated based on 2-minutes CH_4 emissions from 452 cows. The basic statistical model considered fixed effects of lactation number, days in milk, breed, fasting duration prior CH_4 measurement, and temperature humidity index. Random effects were cow, farm, and residual. Effect of location, SSI, access to pasture, and milk yield group were tested stepwise. For the overall mean and respiration CH_4, cows from urban areas responded stronger than cows from mixed and rural areas. Cows kept on pasture emitted less CH_4 than cows mainly or only kept in indoor systems. Highly productive cows had a significantly higher CH_4 output (overall mean, respiration and eructation) compared to cows with medium productivity. Hence, a mixture of cow associated factors and social-ecological descriptors contribute to individual CH_4 output, and in further consequence, to resource efficiency. In a next step, we will consider genetic aspects, in order to infer genotype by social-ecological interactions.

Keywords: Dairy cattle, methane emission, rural-urban farms, survey stratification index

Contact Address: Ana Pinto, Justus-Liebig-University Giessen, Inst. of Animal Breeding and Genetics, Ludwigstr. 21b, 35390 Giessen, Germany, e-mail: ana.pinto-garcia@agrar.uni-giessen.de