

SPATIAL DISTRIBUTION OF INDOOR CONCENTRATIONS OF GREENHOUSE GASES AND AMMONIA IN A NATURALLY VENTILATED DAIRY BUILDING

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ABSTRACT

Livestock buildings are a main source of gaseous emissions, such as ammonia (NH₃), methane (CH₄), carbon dioxide (CO₂), and nitrous oxide (N₂O). Determination of spatial distribution of indoor gaseous concentrations is a particularly difficult task. Therefore, this study aims to investigate indoor concentrations of NH₃, CH₄, CO₂, and N₂O and analyzing their spatial distribution. Continuous measurements of indoor gaseous concentrations were carried out in a naturally ventilated dairy building. Ventilation rates were estimated and emission rates were quantified. Consequently, the results were compared with each other by performing correlation and regression analysis to develop the functions that estimate relationships among these gases. A multiple t-test was conducted for all gases to detect whether the indoor concentrations at different measuring points vary significantly from each other. Sensitivity analysis was conducted to assess the influence of the uncertainty of individual assumptions on the overall results of ventilation and emission rates. The results illustrated that spatial distribution of indoor gaseous concentrations is not uniform, where concentrations at the leeward side of the building were significantly higher than the concentrations at the windward side. The emissions factors were 1.8, 10.2, 351, and 0.1 g h⁻¹ AU⁻¹ for NH₃, CH₄, CO₂, and N₂O, respectively.

Keywords: *Spatial distribution, indoor air quality, air distribution, built environment, natural ventilation, greenhouse gases, ammonia, livestock buildings.*

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