MEASURING AMMONIA AND GREENHOUSE GAS EMISSIONS OF DAIRY CATTLE HOUSE IN 60 FARMS OVER EIGHT COUNTRIES

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Abstract:

Historically dairy cattle farming systems have developed under various natural, socio-economic and cultural conditions. Its current diversity must be reflected in the associated gas emission factors. Knowing this diversity would be extremely useful to accelerate the identification and implementation of mitigation strategies targeting national emission inventories. A large number of dairy cattle houses must therefore be monitored. To do so, we improved an existing low-cost method and used it in sixty farms over eight European countries covering a wide range of dairy farming systems. The purpose was to point out “hot spots” and identify good practices. Each farm was visited four times corresponding to the four seasons. Information was collected from the farmer to characterize the mass budget of the dairy cattle house. Temperature and humidity were registered. Indoor and outdoor air samples were done in the building when animals were present. All data was then checked for validity and merged to estimate the ammonia, methane and nitrous oxide emissions. All collected and calculated data were presented by farm in bar graphs characterizing the farming system and showing the diversity of gas emissions. The farm results were compared to the averages of all studied farms. It was possible to group the housing emissions under 12 categories ranging from farms with “much better” emissions than the average, to farms with “high” ammonia, methane or nitrous oxide emissions. Almost all countries had farms in both "high” and "low” emission categories. These categories were not associated to homogeneous animal number, feeding, grazing, housing type (e.g. cubicles, tie stall, deep litter) or area per cow, manure management (liquid and/or solid) or bedding input. In most farms, nitrous oxide emissions corresponded to the national emission factor. The temperature effect on ammonia emission was not observed despite the high range in temperature (outside temperature ranged from −3.2 to +36.0 °C). In some cases, the emission decrease could be related to known factors: increasing the scraping frequency above 12 per day decreased the risk of high ammonia emissions. In other cases, understanding hypothesis could not be proposed: all farms that had installed mattresses for dairy cows had small ammonia emissions whatever the season, the country, the animal and manure management system. Some hot spots were detected: farms that used dried manure as litter increased the risk of high nitrous oxide emissions. We conclude that the proposed measuring method can help to support a strategy of emission reduction as long as the observed results are integrated in national emission inventories.