GHG EMISSIONS FROM LIVESTOCK HOUSING

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The greenhouse gas (GHG) emissions from animal production can be divided into emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The largest source of CO_2 emissions in livestock buildings is the animal's respiration, which is generally not a large portion of the GHG total. Thus, CH_4 and N_2O are the primary GHG of interest for animal agriculture and it is well known that these two gases are respectively, 21 and 310 times more potent GHG than CO_2. There is a need to quantify the GHG emissions from livestock / poultry production systems since very limited GHG emission factors exist for animal buildings. The short term benefits of this information will be important to governmental agencies and policy makers who will need to assess the global warming impact from production animal agriculture. Long term benefits of the quantification of GHG emissions will allow animal producers, researchers, public and private technology providers, and consultants to develop mitigation strategies to control or reduce the GHG to acceptable levels. Baseline levels of GHG need to be established to be able to evaluate the effectiveness of proposed mitigation technologies. Also, GHG emission data will allow producers to participate in the new carbon trading markets.

Real time methane (CH_4) emission measurements were collected from a turkey barn, two dairy buildings, and a pig finishing barn all located in Midwestern U.S. during 2008 and early 2009 by the University of Minnesota's BBE Dept. Methane concentrations were determined by the addition of a methane analyzer (Model 55C – Thermo Scientific, Waltham, MA) and a zero gas generator (Teledyne model 701), and an air compressor to other gas and particulate matter (PM) analyzers and associated air sampling systems, installed in separate environmentally-controlled trailers located adjacent to the sampled animal buildings, for three separate air emissions monitoring projects. Airflow rates (emissions = concentrations x airflow) were calculated by monitoring the barn's fan run times plus using a Fan Assessment Numeration System or (FANS) units to measure airflow for individual fans. Airflow measurements for each fan were calculated using the building static pressure (recorded every minute) and the appropriate fan curve equation.

The study measured real time methane emissions from commercial dairy, turkey, and pig production barns in the Midwest. When expressed on a gram of CH_4 per day per animal unit (AU= 500 kg) or g/d/AU basis, the results from this study compared well with data reported in the literature. A methane emission average of 220 g/d/AU was found for two dairy barns during nearly 6 month of sampling compared to values of 275 to 320 reported in previous work. The limited data for methane emissions collected in a pig barn was equal to a mean of 120 g/d/AU while literature values for a similar type of pig building (slatted floor with manure storage) varied from 70 to 190. Only the turkey CH_4 emission data found in this study (average of 40 g/d/AU) did not compare to previous research (no methane emissions in a broiler house with very dry litter conditions.