



Measurement and mitigation of airborne emissions from livestock farms



Projects

EmiMin • Reduction of emissions from livestock farming (funding BMEL / BLE / Landwirtschaftliche Rentenbank) www.ktbl.de/themen/emimin

KfreePig • Pig husbandry re-thought: feces-urine separation, no docking, castration or crating: impact on animal health, behavior, job satisfaction and the environment (Funding BMEL / BLE)

Milkey • Decision support system for sustainable and climate gas optimized dairy production in key regions in Europe (Funding: FACCE ERAGAS) www.milkey-project.eu

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Livestock farming is one of the world's major producers of airborne emissions, especially of climate- and environmentally-relevant pollutants such as methane (CH₄), carbon dioxide (CO₂) nitrous oxide (N₂O), and ammonia (NH₃).

The reduction of these emissions is of enormous importance both for environmental and climate protection as well as in terms of animal welfare.

Emission research, including the development of methods for recording and reducing emissions, has a key role here.

Measuring emissions - proving the efficiency of abatement measures

Accurate measurement of emissions is a basic prerequisite for a successful emissions reduction strategy.

The impact of a mitigation measures can only be proven by measurements with an uncertainty range that is significantly smaller than the expected range of the abatement level.

We are developing reliable and accurate methods for measuring emissions from livestock systems such as naturally ventilated dairy barns or novel animal welfare barns in pig production.

The focus is on both the measurement of emission factors (absolute values), as well as measuring the effectiveness of potential mitigation measures (relative changes).

In addition, we investigate the suitability of simplified methods and low-cost sensor technology for a broad application of monitoring.

Long-term measurements

We have been carrying out high-resolution long-term measurements on emissions and barn climate for several decades.



Measuring equipment

Our measurement tools include two cavity ring down (CRDS) spectroscopes, two Fourier transform infrared (FTIR) spectroscopes, more than 25 ultrasonic anemometers, more than 30 temperature-humidity sensors as well as various low-cost sensors for the measurement of the barn climate and emissions.

Experimental setup for field measurements (Photos: Janke/ATB)



Investigation of the novel emission reduction measure „pig toilet“ in the **KfreePig** project: A porous, circumferential belt (right picture) is integrated in the defecation area. It ensures early separation of feces and urine and ensures that the animals use separate feces and lying areas (photos: Ralf Remmert).

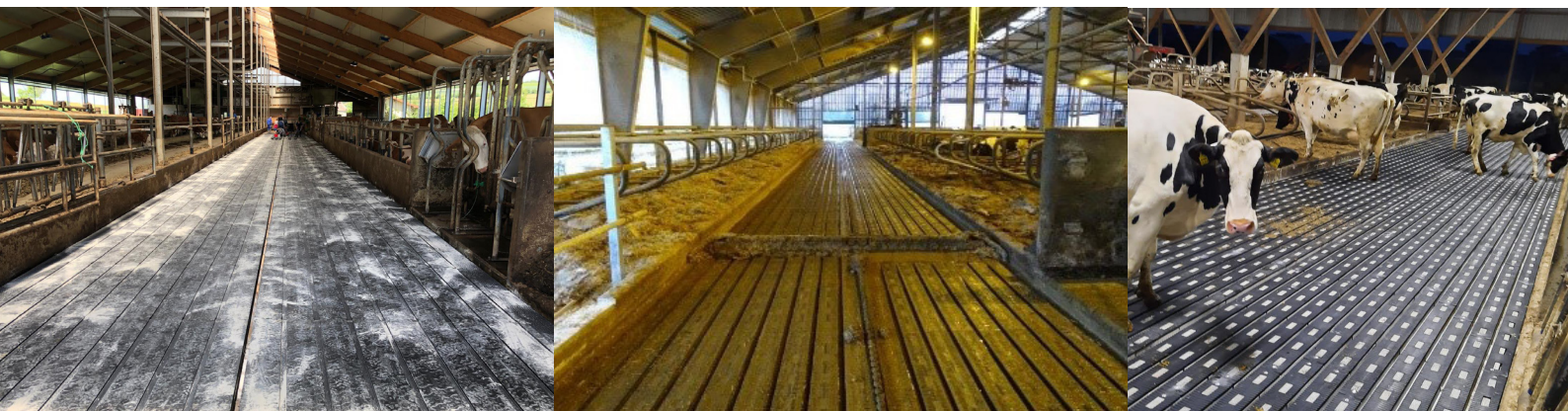
Effectiveness of a pig toilet

In the **KfreePig** project (pig husbandry re-thought: feces-urine separation, no docking, castration or crating), ATB is investigating an innovative measure to reduce emissions and optimize the barn climate. We measure the effectiveness of a so-called pig toilet that allows early separation of feces and urine and we determine a factor for the reduction of ammonia emissions.

Effectiveness of a novel floor for dairy barns

In the joint project **EmiMin** (Emission reduction in livestock farming), practice-ready, process-integrated measures for the reduction of NH_3 , CH_4 and odor in pig and cattle farming are being investigated.

Within this framework, ATB is investigating the effectiveness of a new type of floor in naturally ventilated dairy barns. In three farm barns, each equipped with an old and a new type of floor, we are measuring emissions comparatively over a period of several years. Using close-meshed measurements, it is possible to evaluate the effectiveness of this measure and to deduce a reduction factor.



Investigation of emission-reducing floors in dairy barns on three farms (EmiMin project): Ammonia emissions can be mitigated by early manure-urine separation and an adapted slider system. (Photos: David Janke/ATB)