RES4LIVE
ENERGY SMART LIVESTOCK FARMING
TOWARDS ZERO FOSSIL FUEL CONSUMPTION

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AGRICULTURE & INNOVATION

Open barn ventilation system for a dairy cattle farm

Heat stress in dairy cows occurs more frequently in recent years as an effect of global warming, also in moderate climate zones. Cows can begin to be affected even by ambient temperatures lower than 18 °C. This is not just an issue of animal welfare, but also has an impact on productivity of the cows.

Usually dairy cows in these latitudes are housed in naturally ventilated barns. In summer conditions these barns often require support in air exchange, which can be achieved by various kinds of fans. An alternative can be a tube ventilation system. In such a tube ventilation system tubes are mounted above the rows of lying cubicles in the barn as well as above the walkway at the feeding table. Air from outside the barn is pressed into these tubes with ventilators. The tubes come with air outlet jets that provide fresh ambient air to the barn and can increase air flow rates in the barn.

The tube ventilation system can be enhanced with a cooling option. This is realized with evaporative cooling pads, one per tube, that allow cooling down ambient air that is then transported to a bypass box, where the pre-cooled air can be mixed with ambient air for some temperature regulation. In RES4LIVE temperature drops of up to 5 K could be measured as a result of the maximum pre-cooling level, acting as a proof of concept. The barn climate system operates based on data from environmental sensors in the barn, like temperature and humidity loggers or gas concentration sensors.

A computer simulation of the airflow dynamics in a given barn is required as a prerequisite and ensures that the tube ventilation and cooling system is dimensioned adequately. Since the additional energy demand of this ventilation system (as other ventilation systems) is seasonal with peak demand during summer, these systems synergize very well with photovoltaic systems that provide their peak power in the same conditions where barn ventilation is required.

Evaporative cooling pads (above)

Ventilation and cooling tube with air outlet jets above a row of lying cubicles (right)

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