



An integrated renewable energy system for the decarbonization of a laying hens farm

Intensive livestock farming significantly contributes to greenhouse gas emissions due to its reliance on fossil fuels, especially for maintaining optimal conditions in livestock buildings. The transition to Renewable Energy Sources (RES) is essential for reducing the environmental impact of the EU's livestock sector. Our recent initiative aimed to decarbonize experimental laying hen facilities while enhancing animal welfare by integrating a RES system.

The farm was upgraded with an innovative heat pump (HP) for climate control and a solar photovoltaic (PV) system for power generation. A sensor-based monitoring system was implemented to collect data on the system's performance and indoor conditions over an extended period, focusing on both summer and winter seasons.



Preliminary results are promising. The installed HP effectively maintains adequate indoor air temperatures during heat waves, eliminating mortality and thereby improving animal welfare. Additionally, when paired with the PV system, it reduces electricity consumption from the grid by 20-23%. This reduction leads to significant CO₂-eq savings, with approximately 688 kgCO₂-eq in summer and 314 kgCO₂-eq in winter.



During the testing and fine-tuning period, the HP achieved a Seasonal Coefficient of Performance of 2.42 in summer and 3.65 in winter. These findings underscore the potential for scaling up RES integration in commercial livestock facilities, demonstrating substantial benefits for both energy efficiency and animal welfare.

This project provides valuable insights for practitioners seeking to adopt sustainable practices in livestock farming, highlighting the feasibility and advantages of incorporating RES technologies.



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