2017 EAAP Conference in Tallinn, Estonia, Aug 26-Sep 1. Session 23 **– Insects in a circular economy.** *Reducing wastes, creating / converting low grade to high grade protein, upgrading biomass to high quality products, biodiversity, reduction of water usage, land use, LCA.* The title, authors and the abstract must not exceed 2500 characters (including spaces).

Larvae of Black Soldier Fly upcycle pig manure into highly valuable fat and proteins on the farm

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This study aimed to optimize the rearing process of black soldier fly (BSF) larvae on solid pig manure on the farm. The optimal rearing conditions were first studied in climate rooms. Then, pilot scale bioconversion units were constructed and evaluated on the farm.
Lab scale experiments took place in climate rooms. Larvae of the BSF were reared on the solid fraction of fresh pig manure at 21-24-27°C until fully grown. Before transfer to the substrate, larvae were grown on poultry meal for 5 days. Then, feeding frequency (once during the growth cycle, 1/week, every 2-3 days) and feed dose (10-15-20 mg DM/larvae/d) were varied. Fresh manure, harvested larvae, and residual substrate were analysed for dry matter (DM), nitrogen and fat. The optimal settings were applied to BSF rearing on farm in self-constructed bioconversion units. These were placed in an occupied fattening pig compartment. Larvae were immediately transferred to the substrate. Manure was stirred during the rearing process. The units were ventilated at air change rates of 30-114/h during the growing phase and up to 371/h during substrate drying. Emissions of NH_3, CH_4, N_20 and CO_2 were monitored and mass balances were made.
Rearing BSF larvae on pig manure on farm was possible: the indoor air temperature of fattening pigs was sufficiently high. A correct ventilation is crucial to enable automatic harvesting of the full-grown larvae. Harvested larvae had an average DM content of 27-33% which consisted of 45-50% protein and 20-24% fat (lab & pilot scale). Nitrogen from the substrate was transferred into the larvae (±17-21%) and into the air as NH_3 (around 30%, increasing with higher temperature). Increased levels of NH_3, CO_2 and CH_4 were measured compared to indoor air. Bioconversion rates of DM amounted to 13% (max. 15%) at lab scale and to 9-12% at pilot scale. Differences result from higher mortality rates, less favourable rearing conditions (e.g. disturbance by stirring), competition with house fly larvae, immediate transfer to the substrate, and harvest losses. Further optimization of insect rearing on farm is necessary and special attention is required for emission control and economic feasibility.

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Larvae of the BSF were reared on the solid fraction of fresh pig manure at 21-24-27°C until fully grown. Before transfer to the substrate, larvae were grown on poultry meal for 5 days. Then, feeding frequency (all-at-once, 1/week, every 2-3 days) and feed dose (10 15 20 mg DM/larvae/d) were varied. Fresh manure, harvested larvae, and residual substrate were analysed for dry matter (DM), nitrogen and fat. The optimal settings were applied to BSF rearing on farm in self-constructed bioconversion units. These were placed in an occupied fattening pig compartment. Larvae were immediately transferred to the substrate. Manure was stirred during the rearing process. The units were ventilated at air change rates of 30-114/h during the growing phase and up to 371/h during substrate drying. Emissions of NH_3, CH_4, N_20 and CO_2 were monitored and mass balances were made.

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