

## **Sustainable model for agroenergy and feed production through the black soldier fly and microalgae – SMART FEED**

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In the framework of the circular economy, the fly species *Hermetia illucens* (Diptera Stratiomyidae) occupies an important role as it can grow on a broad spectrum of organic substrates, including wastes, converting them into a high value biomass recapturing nutrients. The waste reduction and the bioconversion ability of the larvae are of particular efficiency and the final biomass (larvae), particularly rich in proteins and lipids, can be exploited for different aims, including meals for livestock, biofuel and biofertiliser. The SMART FEED Project, funded by Fondazione Cariplo, intends to develop a local circular economy model promoting the production of larvae of *H. illucens* on the organic fraction of municipal solid waste (OFMSW) to be used as healthy feed for poultry rearing. In addition, another important source of protein, the microalgae, will be produced on the liquid fraction of the digestate to increase the quality, the sustainability and the nutritional value of the insect biomass. Microalgae has been identified as valuable nutritional dietary supplement for animal nutrition, due to the high protein content, high quality of amino acids, vitamins, antioxidants and other substances beneficial for animal health. Thus, a functional and promising feed, which includes larvae and microalgae, will be formulated and tested as a meal for broiler. Anaerobic digestion (AD) of residual wastes can provide the requested energy for the process. The waste loop will be closed by producing fertilisers to be used in a modern agriculture promoting the use of renewable fertilisers by precision farming. This holistic and multidisciplinary approach will allow to deepen the numerous aspects of the whole process. Different work packages will include: (1) characterization of the OFMSW with particular reference to the biological value of the organic components; (2) insect and microalgae production from the OFMSW and their characterization; (3) production of the SMART-feed, assessment of its quality and safety, *in vitro* and *in vivo* digestibility for broiler; (4) Production and evaluation of biogas and fertiliser from the residual OFMSW; (5) assessment of the environmental impact of the circular model; and (6) economic evaluation and estimation of the impact of the SMART-Feed on the regional economy. Particular attention will be turn on the feed quality, safety and the compliance of the final feed.