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## **Multi-objective optimization of food and feed production chains (with a case study on insects)**

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When considering the optimization of a production chain for food and feed, it is immediately noticeable how no single best solution exists: multiple conflicting objectives need to be balanced and evaluated. Such objectives include economical assessments (costs for energy and feed, capital expenditure, annual production, etc.), sustainability goals (consumption of water, use of chemicals, production of wastewater, GHG emissions, etc.) and societal impacts (number and quality of new jobs created, safety measures for employees, societal acceptance of insect farming, etc.). Rather than aggregating all optimization objectives into one, for example by using a classical weighted sum, a more unbiased approach is multi-objective optimization (MOO). In place of a single solution, MOO algorithms are able to deliver a set of different compromises, each one favoring some objectives against others. By showing the available optimal trade-offs to human experts, MOO makes it possible to explore different scenarios and ultimately make informed choices, visualizing what can be gained and lost by choosing one particular solution over others. The case study considered in this work is a production chain of insects for feed. In order to apply MOO to sustainable insect chains, we identified several objectives for which either computer/mathematical models are readily available, or for which machine learning models can be inferred from data collected by partners in the project. The long-term objective is to provide both private and public stakeholders with different possibilities for the configuration of modern insect production chains.