Corrected poster abstract: Figure missing in the printed version.

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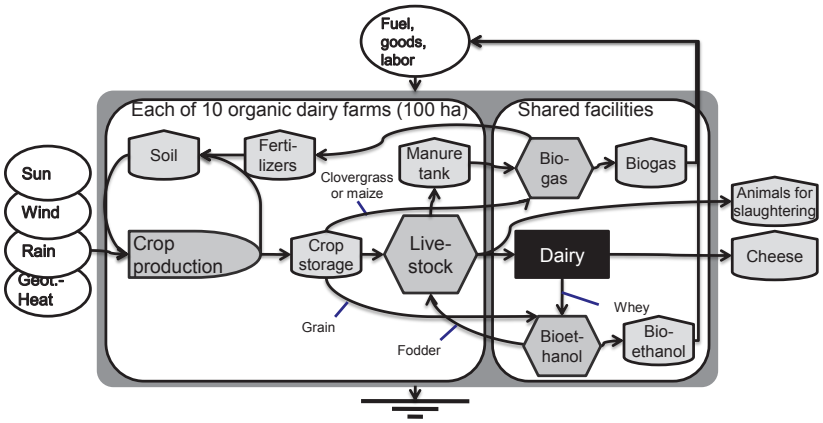
Energy and emergy evaluation of potentials for energy self-sufficiency in Danish organic dairy farms by production of biogas and bioethanol



The contemporary food production and thus human life supporting system is in crisis. One obvious way to enhance agricultural resilience is for farms to increase self-sufficiency with necessities such as fuel, fodder and fertilizer. Our research seeks to uncover these potentials for Danish organic dairy farming.

The setting is a theoretical model of a farm-cooperation of 10 farms of 100 ha each producing only milk and animals for slaughtering and being self-sufficient with fodder and fertilizer. The question is if they can be self-sufficient with energy by means of shared biogas and/ or bioethanol production facilities. The method is mapping of energy, emergy (embodied energy measured in solar energy joules) and mass flows in different scenarios, that are based on empirical data from Danish dairy farms concerning mix of crops, crop yields, livestock input/ output and fuel and electricity consumption.

In various scenarios different utilization of the produced crop is tested. Biogas is produced from manure and either clover grass or maize, and the effluent is fed back to the fields as fertilizer. In another scenario bioethanol is produced from grain and whey originating from the dairy cheese production, and the effluent is fed back to the livestock as a protein-rich fodder. The figure illustrates the overall boundaries of the studied system, and the different energy and mass flows that are included in the study.

Results compare the different scenarios in terms of mass, energy and emergy flows, thus including direct and indirect energy. Overall resource and energy efficiency are evaluated.

Research to broaden the scope of self-sufficiency to include processing, distribution and selling thus examining the tradeoff between economy of scale and energy used for distribution is in progress; energy used for processing, distribution and trade should be supplied by agriculture as well in order to increase overall resilience of food supply system.