



Energy crop (*Sida hermaphrodita*) fertilization using digestate under marginal soil conditions: A dose-response experiment

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The global demand for energy security and the mitigation of climate change are the main drivers pushing energy-plant production in Germany. However, the cultivation of these plants can cause land use conflicts since agricultural soil is mostly used for plant production. A sustainable alternative to the conventional cultivation of food-based energy-crops is the cultivation of special adapted energy-plants on marginal lands. To further increase the sustainability of energy-plant cultivation systems the dependency on synthetic fertilizers needs to be reduced via closed nutrient loops. In the presented study the energy-plant *Sida hermaphrodita* (Malvaceae) will be used to evaluate the potential to grow this high potential energy-crop on a marginal sandy soil in combination with fertilization via digestate from biogas production. With this dose-response experiment we will further identify an optimum dose, which will be compared to equivalent doses of NPK-fertilizer. Further, lethal doses and deficiency doses will be observed. Two weeks old *Sida* seedlings were transplanted to 1L pots and fertilized with six doses of digestate (equivalent to a field application of 5, 10, 20, 40, 80, 160t/ha) and three equivalent doses of NPK-fertilizer. Control plants were left untreated. *Sida* plants will grow for 45 days under greenhouse conditions. We hypothesize that the nutrient status of the marginal soil can be increased and maintained by defined digestate applications, compared to control plants suffering of nutrient deficiency due to the low nutrient status in the marginal substrate. The dose of 40t/ha is expected to give a maximum biomass yield without causing toxicity symptoms. Results shall be used as basis for further experiments on the field scale in a field trial that was set up to investigate sustainable production systems for energy crop production under marginal soil conditions.