Energizing marginal soils: A perennial cropping system for *Sida hermaphrodita*

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Motivation:
The cultivation of energy crops on farmland causes land use conflicts. An alternative is cultivation on marginal soil. We investigated the applicability of the perennial energy crop *Sida hermaphrodita* on marginal soil, using organic fertilization and legume intercropping. We investigated the value of digestate fertilization and compared it to mineral NPK-fertilization and an unfertilized control. Further we compare conventional broadcast application of biogas digestate to the application of localized digestate depots.

**Biomass Yield:**
- **Legume intercropping:**
  - Nitrogen derived from atmosphere (Nd, mesocosm) of *M. sativa* +
  - Digestate fertilization increased biological nitrogen fixation of *Medicago sativa*.
  - Legume intercropping increased the total biomass yield.
  - Legumes decreased the biomass yield of *Sida hermaphrodita*.

- **Digestate fertilization:**
  - Increased the soil carbon and nitrogen content in the top 30cm
  - Increased water holding capacity
  - Reduced nitrate concentration in the leachate
  - Increased the soil respiration
  - Reduced the wettability of the marginal substrate compared to mineral NPK fertilization.

- **Localized digestate depot fertilization:**
  - Increased the root system and induced the formation of a root cluster
  - Increased nutrient use efficiency
  - Had no effect on wettability
  - Temporarily had adverse effects on young seedlings of *Sida* compared to digestate broadcast application on marginal substrate.

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**Literature:**