Geophysical Research Abstracts
Vol. 19, EGU2017-1887, 2017
EGU General Assembly 2017


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

Moritz Nabel (1), Hendrik Poorter (1), Vicky Temperton (1,2), Silvia D Schrey (1), Robert Koller (1), Ulrich Schurr (1), and Nicolai D Jablonowski (1)

(1) Forschungszentrum Jülich, IBG-2:Plant Sciences, Germany (m.nabel@fz-juelich.de), (2) Institute of Ecology, Leuphana University, Lüneburg, Germany

As a way to avoid land use conflicts, the use of marginal soils for the production of plant biomass can be a sustainable alternative to conventional biomass production (e.g. maize). However, new cropping strategies have to be found that meet the challenge of crop production under marginal soil conditions. We aim for increased soil fertility by the use of the perennial crop Sida hermaphrodita in combination with organic fertilization and legume intercropping to produce substantial biomass yield.
We present results of a three-year outdoor mesocosm experiment testing the perennial energy crop Sida hermaphrodita grown on a marginal model substrate (sand) with four kinds of fertilization (Digestate broadcast, Digestate Depot, mineral NPK and unfertilized control) in combination with legume intercropping.
After three years, organic fertilization (via biogas digestate) compared to mineral fertilization (NPK), reduced the nitrate concentration in leachate and increased the soil carbon content. Biomass yields of Sida were 25% higher when fertilized organically, compared to mineral fertilizer. In general, digestate broadcast application reduced root growth and the wettability of the sandy substrate. However, when digestate was applied locally as depot to the rhizosphere, root growth increased and the wettability of the sandy substrate was preserved. Depot fertilization increased biomass yield by 10% compared to digestate broadcast fertilization.
We intercropped Sida with various legumes (Trifolium repens, Trifolium pratense, Melilotus spp. and Medicago sativa) to enable biological nitrogen fixation and make the cropping system independent from synthetically produced fertilizers. We could show that Medicago sativa grown on marginal substrate fixed large amounts of N, especially when fertilized organically, whereas mineral fertilization suppressed biological nitrogen fixation.
We conclude that the perennial energy crop Sida in combination with organic fertilization has great potential to increase the soil fertility of marginal substrates and produce substantial biomass yields.