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Agro-ecological potential of the cup plant (Silphium perfoliatum L.) from a biodiversity perspective

Stefan Schrader, Quentin Schorpp, Anna Lena Müller, and Jens Dauber
Johann Heinrich von Thuenen-Institute, Institute of Biodiversity, Braunschweig, Germany (Stefan.schrader@thuenen.de)

The cup plant (Silphium perfoliatum L.) is an alternative bioenergy crop that may contribute to a more environmentally friendly production of renewable resources. The potential benefits of the cup plant are the perennial cultivation without tillage and its flowering-characteristics. Hence it can be hypothesized that beneficial organisms are promoted which in turn improves the provision of ecosystem services like soil fertility and pollination.
To date biomass production in Germany is based mainly on cropping systems like intensive maize cultivation that bear a risk for biodiversity and ecosystem services. The importance to counteract this development increases considering the large land requirements for significant generation of energy from biomass.
To what extent cropping of the cup plant meets the expectations of a sustainable biomass production was investigated within a comprehensive assessment of soil fauna communities (earthworms, collembolans, nematodes) including their functional groups as well as pollinating insects (bees and hoverflies) including the quantification of pollen and nectar in cup-plant cultivation systems with a crop management close to agricultural practice.
From the results it became obvious that the cup plant as a bioenergy crop has got the necessary potential to mitigate the negative development of biodiversity and ecosystem services, especially in regions with a large share of maize monocultures. This agro-ecological potential can only be reached if certain agronomic requirements are met, i.e. a late harvest and cultivation periods of at least five years. Under these conditions the landscape context has to be considered. Semi-natural habitats in the surrounding landscape are required for nesting and larval development of wild pollinator groups. The development of biological functions in soil is tied to the land use history i.e. previous land use: Positive developments are expected for conversion of intensively managed crop fields to the perennial cup plant. Whereas a conversion of set-aside fields under marginal soil conditions would not result in an improvement of soil biota performance and soil functioning.