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Effects of earthworm communities on water infiltration in wet soils with energy crops

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Maize (*Zea mays*) is the most commonly cultivated energy crop throughout Europe. However, its cultivation has severe negative effects such as loss of biodiversity and its delivery of ecosystem services, soil compaction and enhanced greenhouse gas emissions. These negative effects tend to be even more pronounced in wet soils such as pseudogleys. As an alternative to annual maize, the perennial cup plant (*Silphium perfoliatum*) is known to produce a similar yield, especially under waterlogging conditions, while management impacts of its cultivation are assumed to be less harmful to soil biota. Therefore, the aim of the present study was to quantify the provision of ecosystem services (here: control of the soil water balance) delivered by earthworm communities in wet soils under cultivation of cup plant compared with maize and to assess the ecological impact of both energy crops.

Fieldwork was conducted cup plant and maize fields (n = 4) in South Western Germany in spring and autumn 2019. The overall soil type was pseudo gleyic luvisol. All fields are managed for commercial purposes by farmers in the area. Sampling included earthworm extraction with allyl isothiocyanate (AITC) while the infiltration rate was measured simultaneously. Afterwards, hand sorting completed the earthworm sampling. Earthworm species, their abundance and biomass (live weight) were determined.

On average, earthworm abundance and biomass were higher in cup plant fields than in maize fields. In addition, variations in earthworm communities were found. While endogeic earthworms, especially of the genus *Aporrectodea*, were present in all fields, anecic earthworms were more abundant in cup plant fields. Higher infiltration rates were measured in maize fields. Hints to a correlation between the infiltration rates and the functional earthworm groups were found.

Our results suggest that cup plant fields host overall more diverse earthworm communities. These communities are able to produce a wider range of ecosystem services, even though the link between the infiltration and the crops studied in this stud is not yet validated.