Earthworm Communities in Temperate Alley-Cropping Agroforestry Systems

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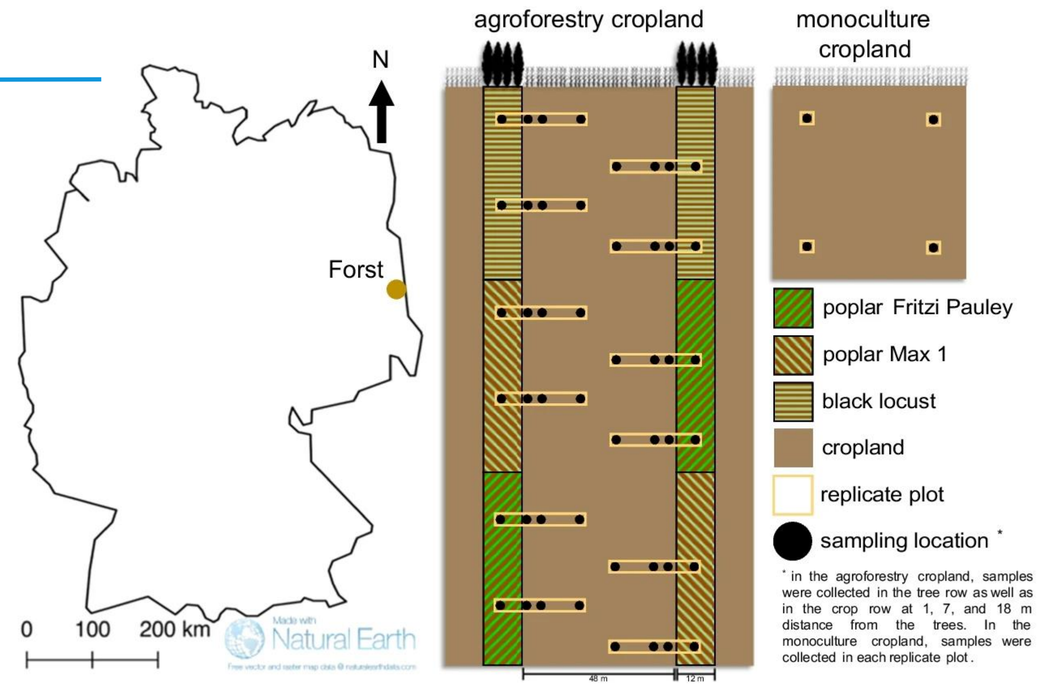
Background

Cropland agroforestry systems combine trees with crops and have numerous environmental advantages over monoculture croplands including promotion of soil life. Alley-cropping agroforestry systems that alternate rows of trees with rows of crops are gaining popularity. This study aimed to investigate tree-species and tree-distance effects on earthworm communities and their soil functions in a temperate alley-cropping agroforestry system.

Study design

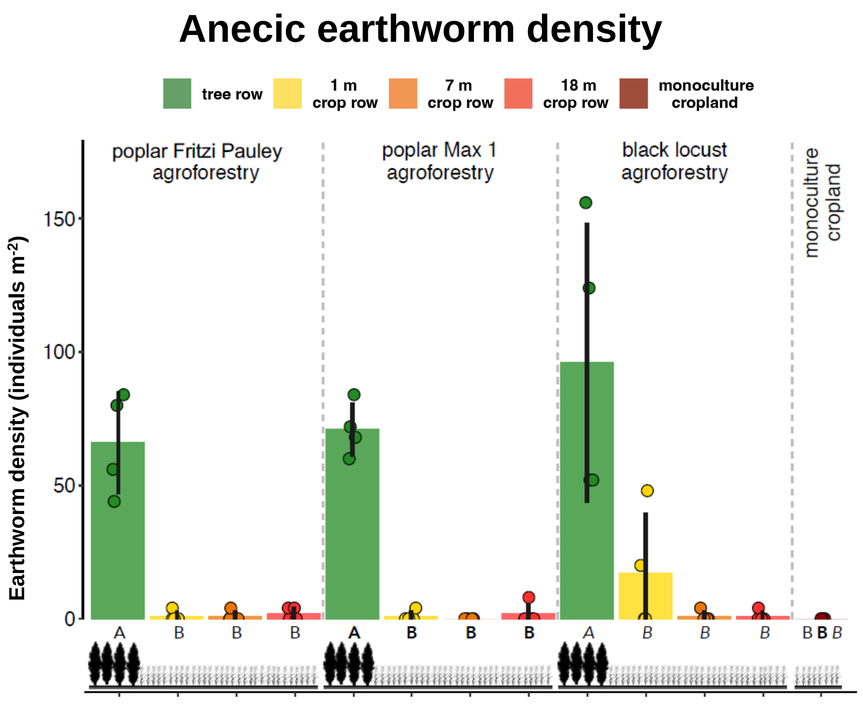
- Alley-cropping agroforestry system with three different tree species
- Sampling in the tree row, in the crop row at 1 m, 7 m, and 18 m distance from the trees and in monoculture cropland
- Earthworm sampling by applying 5 L of 0.01% allyl isothiocyanate (AITC) solution per ¼ m²



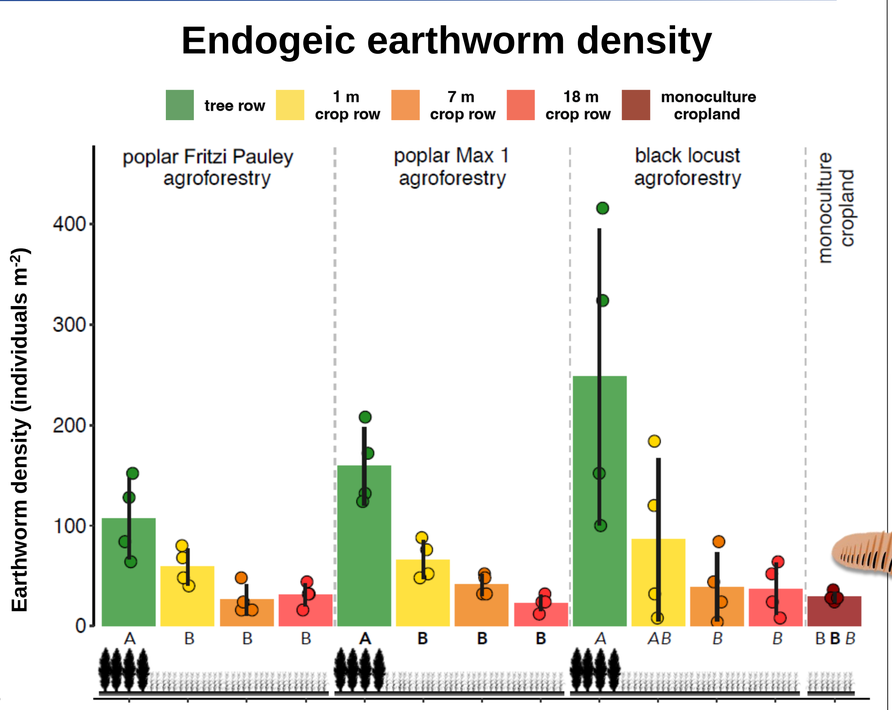
Study site and study design. Location of the study site near Forst (federal state of Brandenburg), Germany and study design

Results

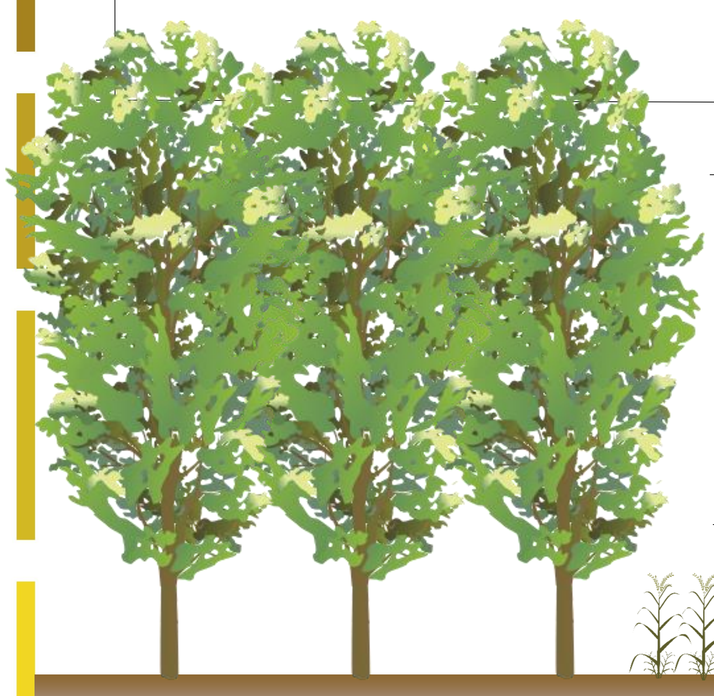
- Earthworm density increased by up to 1,134 %
- Earthworm biomass increased by up to 3,384 %
- Anecic earthworms were only promoted under the trees
- Endogeic earthworms gradually declined with increasing distance from the trees
- Epigeic species only found in close proximity to the trees



Earthworm density of anecic species in the tree row, at different distances from the trees within the crop row and in the monoculture cropland (n = 4).



Earthworm density of endogeic species in the tree row, at different distances from the trees within the crop row and in the monoculture cropland (n = 4).



Conclusions

- Agroforestry promotes diversity, abundance and functions of earthworm communities
- Anecic earthworms are particularly promoted under the trees
- The promotion of endogeic earthworms also extends in the field
- Tree litter input and absence of tillage promote earthworms

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