

Joana Frazão

joana.frazao@wur.nl

Supervisors Mirjam Pulleman, Lijbert Brussard, WUR

Spatial distribution and dispersal of earthworms in complex agricultural landscapes - implications for ecosystem services

Intensive agriculture differently affects earthworm functional groups, thereby affecting associated soil ecosystem services, e.g. organic matter decomposition, soil structure formation and water retention. Within agricultural landscapes, biodiversity at the local scale can be strongly influenced by the landscape context and by interactions between management of agricultural land and (semi-)natural landscape elements. Such spatial interactions depend on the dispersal range and other ecological characteristics of organisms considered, in this case earthworms. So, the potential for restoration of earthworm communities and associated ecosystem services depends on the behavior and life-history traits of species and the dynamics of soil and landscape management.

With this project we aim at developing decision-making tools for management and landscape configuration that support earthworm diversity and the associated ecosystem functions and services. Our main objectives are i) to determine the relationships between landscape, management and earthworm distributions; ii) to link these relationships with earthworm dispersal abilities; and iii) to improve knowledge between land-use and soil ecosystem services, based on a better understanding of earthworm distributions.

We will test the main hypothesis that earthworm communities at the field level are affected by landscape at larger scales and by management at the plot and surroundings. The extent of these effects is largely dependent on intrinsic life-history and behavioral traits of individual species. Our approach builds on i) the analysis of landscape structure and composition (GIS); ii) earthworm distribution surveys within a gradient of landscape complexity, with additional data on management of cropland and semi-natural habitats; iii) analysis of ecological trait databases, iv) lab and field experimentation, for depicting the main environmental pressures for earthworm performance and dispersal and v) spatially-explicit modeling, linking earthworm distributions with associated ecosystem services (where quantifications of ecosystem services will be gathered from other studies).

The acquired understanding will improve modeling spatial relations between land-use (changes) and earthworm-mediated ecosystem services. Such knowledge will provide the basis for decision-support tools for enhancing earthworm-mediated ecosystem services in complex landscapes.