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Functional importance of earthworm burrowing in field depending on soil tillage

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Functions of earthworm burrow systems

Primary functions: (1) habitat for earthworms (2) protection from predation (3) protection from UV-radiation (4) space for reproduction and development (5) maintenance of relatively constant conditions.
Secondary functions: (1) gas transport and ventilation (2) water transport and infiltration (3) transport of soluble compounds (4) reduction of erosion (5) improvement of nutrient availability (6) improvement of root growth (7) habitat for other organisms.

Earthworms controlled by tillage systems in arable soil

One central demand in sustainable agriculture is to bring soil use and soil protection in line (SCHRADER 2001). Reduced tillage systems like conservation tillage and direct drill (no-till) improve biological activity due to less mechanical impact and higher amounts of crop residues on or near the soil surface compared to conventional tillage with ploughing.
Field studies revealed significant higher earthworm cast production and more burrow volume and total length of burrows under conservation compared to conventional tillage which is related to higher biomass and abundances of earthworms (LANGMAACK et al. 1999; SCHRADER & LARINK 2003). A significant higher abundance of the anecic earthworm species *L. terrestris* caused an improved hydraulic conductivity under direct drill and conservation tillage (BOLL et al. 2006). Detailed species analysis related to population sizes in arable soil revealed a significant higher cast production of the endogeic *A. caliginosa* compared to *L. terrestris* (SCHRADER & LARINK 2003).

Outcome and conclusions

Reduced tillage systems promote earthworms resulting in

- higher soil turnover
- more functional macropores
- improved hydraulic conductivity

Main drivers of lumbricogenic soil structure development are

- endogeic earthworm species for aggregate formation
- anecic earthworm species for continuous macropore formation

Literature

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