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Interactive comment on "Understanding soil erosion impacts in temperate agroecosystems: bridging the gap between geomorphology and soil ecology" *by* C. Baxter et al.

Anonymous Referee #1

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Referee Comment

General comments. The review paper by Baxter et al. "Understanding soil erosion impacts in temperate agroecosystems: bridging the gap between geomorphology and soil ecology" introduces a new, important topic for modern agroecological research, which has received little attention so far: the relationship between soil erosion and soil biota. Soil erosion is a major problem in agriculture which increases with land use intensification and climate change. Soil biota are closely linked to soil fertility; the linkages between soil erosion and soil biota are therefore highly relevant. Knowledge about this relationship may considerably improve sustainable landuse management decisions. The topic relates science to practical agriculture, especially to tillage and

crop rotation. All these aspects, which point to a new, important research topic, have been well presented by the authors. However, there are certain aspects which are missing in this fine paper and which could, if considered, improve the review. 1) First of all, there is a lack of a "mechanistic concept", of how soil erosion might interact with soil biota. A more thorough analysis is needed of the connection between soil biota and the soil surface, which is susceptible to erosion. Perhaps a figure, showing the possible interactions, would be helpful, possibly addressing the interactions at different scales, as implied by Fig. 2. 2) Regarding the effects of erosion on soil biota, the distinction between direct and indirect effects is important. Direct effects include transport of soil biota as suggested by the authors; indirect effects comprise consequences of reduced carbon contents in top soils exposed to erosion (e.g. Joschko et al. 1998). 3) A general characteristic of the relationship between soil erosion and soil biota is its bi-directionality. The effect of certain soil biota, especially earthworms, in reducing soil erosion in agricultural soils, have been quantified (Ehlers 1975, Roth and Joschko 1990). In addition, arthropods have been identified as reducing soil surface sealing (Langmaack et al. 2001). These results should be mentioned, and have to be considered in any mitigation concepts. 4) Against the background of these different, highly interesting aspects of the soil erosion-soil biota relationship, the deduction of the topic "nematodes" as the most appropriate model organism for studying this relationship, is not quite convincing. This deficiency relates to the quality of the arguments as well as to the order of their presentation. More arguments are needed to explain the advantage of nematodes over for example earthworms as model organisms. Reasons must be given why, inspite of the interrelationship between soil erosion and soil biota, an organism group has been selected which does not affect erosion rates itself. Regarding the order of arguments, the selection of nematodes as model organisms is mentioned in line 21 of the introduction without giving any reasons. Information about the importance of soil nematodes is only presented in chapter 5, but should precede the presentation of erosion impacts to nematodes (chapter 4). The article needs to my opinion complete reorganization and restructuring, with special emphasis on concen-

trating and logically presenting the arguments for the selection of nematodes as model organisms for the soil erosion-soil biota relationship in agricultural soils. A detailed list of research questions to be addressed, presented at the end of the review paper, would be helpful. Also, the chapter headings should be checked: sometimes the term “soil biota” is used when only nematodes are addressed. It should also be considered whether the very general title of the review could be adapted to the selected model organism group, in order to channel the expectations of the reader. Some specific comments. Abstract: Too general, should be more focussed, taking the above mentioned aspects into account. Introduction. The selection of nematodes as model group should be more elaborated (see above). Soil erosion and sediment budgets. Very good compilation. Soil erosion and climate change. Possibly, this chapter could be omitted. To my opinion, the detailed elaboration of the resilience topic exceeds the scope of this paper.

Technical corrections. Abstract. L 22: ..impacts of biota on erosion ... ?

I look forward to the final version of this important review paper.

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