

# Soil macrofauna under laying hens grazed fields in two different agroecosystems in Portugal

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**Abstract:** Chickens can improve soil chemical properties, promoting its fertility. Nevertheless, its effects on soil macrofauna are poorly known. This work assessed the effects of grazing Portuguese indigenous laying hens on soil macrofauna of two different agroecosystems: an organic horticultural field, and a conventional orchard. At the horticultural field, chickens were used to control weeds and their effects were compared with those of two other weed control treatments: mechanical (rototiller) and thermal (flame weeding). At the orchard, hens' effects were compared to a non-aggressive control (orchard sward). Epigeic macrofauna were collected in both locations and earthworms were collected only at the horticultural field. At the horticultural field, relative to the other treatments, in addition to not having a negative impact in the abundance and diversity of macrofauna, grazing contributed to increase earthworms' density in the medium-term, ranging from 150 to 625 earthworms/m<sup>2</sup>. At the orchard, which is an agroecosystem with less soil disturbance than the horticultural field, due to absence of soil tillage, the grazed soils presented lower macrofauna diversity, as well as significantly lower abundance of spiders than the control (4.67 vs 8.67 individuals/sample, respectively), emphasizing the need to apply good grazing management practices.

**Keywords:** soil macrofauna; species diversity; earthworms; spiders; laying hens; indigenous breeds; farm sustainability.

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## 1. Introduction

The food market is nowadays going through a transitional phase, due to a growing effort to produce food with the lowest possible environmental impact, which is clear and emphasized in several reference documents, such as the communications of the United Nations General Assembly regarding the 2030 Agenda for Sustainable Development [1] and the European Union strategies, in particular the CAP Strategic Plans [2] and the European Green Deal [3]. These strategies aim to obtain sustainable food systems that mitigate climate change, prevent biodiversity loss, avoid environmental contamination by reducing or avoiding the use of toxic substances during the production process, reuse the waste in a circular economy perspective, and ensure food security, nutrition, and public health. In this context, crop-livestock integration can be an efficient approach to ensure farm sustainability and, therefore, to respond to the existing challenges [4–7]. Chickens