

# SOIL MACROFAUNA FIELD MANUAL

Technical level



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*by*

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# Preface

Soil organisms are an integral part of agricultural ecosystems. The presence of a range of a diverse community of soil organisms is essential for the maintenance of productive soils. Soil organisms are responsible for a range of ecological functions and ecosystem services including: nutrient cycling and nitrogen fixation, control of pest and diseases, organic matter decomposition and carbon sequestration, maintenance of a good soil structure for plant growth and rainwater infiltration, detoxification of contaminants. An excessive reduction in soil biodiversity, especially the loss of species with key functions, may result in severe effects including the long-term degradation of soil and the loss of agricultural productive capacity. Soil health and soil quality are fundamental to the sustained productivity and viability of agricultural systems worldwide.

Substantial efforts are underway to strengthen agricultural biodiversity considerations for sustainable agriculture and natural resources management through improved understanding, capacity building, including methods and tools development as well as partnerships and networking. The Country Parties to the Convention on Biological Diversity (CBD) recognized the importance of Soil Biodiversity as an integral and vital and seriously neglected component of biodiversity for food and agriculture known as agricultural biodiversity, through the establishment of an International Initiative for the Conservation and Sustainable Use of Soil Biodiversity. In its decision VI/5, in 2002, the Conference of the Parties to the CBD invited the Food and Agriculture Organization of the United Nations (FAO), and other relevant organizations, to facilitate and coordinate this initiative.

FAO has been gradually supporting efforts and making available information on the importance of soil biodiversity to sustainable agriculture, including forestry, through a number of activities: a website with background information, case studies and linkages to ongoing programmes and institutions; the organization with EMBRAPA, Brazil, of an international technical workshop which led to the development of a Plan of Action to implement the Soil Biodiversity Initiative (SBI) and through liaison with partners and the CBD Secretariat.

The lack of awareness of the importance of soil organisms and their function among agricultural development actors (research, extension, farmers, etc.) led to the development of this Soil Macrofauna Field Manual with the aim to enhance understanding and capacity for soil biological management. The focus on soil macrofauna (invertebrates larger than 2 mm) rather than the whole range of soil organisms (from microorganisms, protozoa, nematodes and small arthropods to larger soil animals) may seem incomplete. Soil macrofauna (the earthworms, termites, ants, beetles, and millipedes, among others), however, is visible as are their effects, and their study provides a suitable entry point for those involved in agriculture to learn about soil life in the field and the impact of various land uses and management practices.

Especially vital is its role, either directly or indirectly, through the production of biogenic structures, in critical ecological processes, such as nutrient dynamics, carbon accumulation (sequestration), etc. A diverse community of soil macrofauna in any farming system ameliorates soil structure and enhances porosity, thus reducing soil compaction problems. without soil macrofauna and the production of biogenic structures the organic matter in the soil surface will not be incorporated. The activities of soil macrofauna and the biogenic structures they produce, help in the incorporation of organic materials in the soil thus restoring levels of soil organic matter and also enhancing nutrient cycling; with a positive impact on plant productivity in crop, pasture and forest lands. Soil organic matter also enhances rainwater infiltration and soil moisture retention thereby reducing risk of erosion and drought. Soil macrofauna also play a role in activating soil microorganisms (bacteria and fungi) and through their activities improve soil health and reduce the incidence of pests and soil-borne pathogens. Finally, some indigenous human populations even use soil macrofauna as a food resource and a source of local medicinal products in combination with plant extracts.

This manual aims to make available information on soil macrofauna and management approaches to help farmers and service providers (extension, research, non governmental organizations, project staff, etc) assess soil health status, and to develop adapted management practices to sustain and improve soil quality under a range of different farming systems.

# List of acronyms

C	Carbon
Ca	Calcium
CO <sub>2</sub>	Carbon dioxide
Fe	Iron
GHG	Greenhouse gas
K	Potassium
Mg	Magnesium
Mn	Manganese
N	Nitrogen
Na	Sodium
P	Phosphorous
S	Sulphur
SOM	Soil organic matter