Supplementary material

Appendix 1: Land use and description of the management unit

Land use	Description of soil management unit	% OM (0-10 cm)	Age (year)	Vegetation
Under tamarind tree	Soil beneath a mature tamarind tree with sustained canopy cover. Shade reduces evaporation and moderates temperature, enhancing organic matter accumulation. Continuous leaf litter enriches nutrients and improves water retention.	2.0 – 3.5	50	Tamarind tree
Forest-like pasture	Secondary forest with moderate to high biodiversity. Protects against erosion and provides continuous organic matter through decomposition.	1.5 – 3.0	NA	Secondary forest with shrubs
Field hedge	Fenced areas with drought-resistant species that prevent overgrazing and degradation. Native herbaceous vegetation promotes gradual organic matter accumulation.	1.5 – 2.5	10	Cacti or sisal with spontaneous plant
Cattle pen hedge	Soil beneath or adjacent to livestock enclosures enriched by animal manure.	1.5 – 5.0	10	Enclosure with cacti or sisal
Half-open pasture	Sparsely vegetated woodlands with low tree density and discontinuous canopy. Limited vegetation reduces organic matter supply while increased light and temperature accelerate decomposition.	1.5 – 2.5	NA	Shrubs and savannah
Open pasture	Sparsely vegetated woodlands with low tree density and discontinuous canopy. Limited vegetation reduces organic matter supply while increased light and temperature accelerate decomposition.	1.5 – 2.5	NA	Savannah composed of herbaceous plants
Fallow crop field	Agricultural fields left uncultivated for at least five years, allowing soil recovery. Natural vegetation regeneration restores organic matter through biomass and litter. Used to enhance fertility, restore ecological balance, and manage pests.	1.2 – 2.5	10	Natural regeneration of invasive herbaceous plants
New crop field	Fields returned to cultivation after at least ten years of fallow. Resting phase improves fertility and productivity. Organic matter accumulated during fallow enhances soil structure and nutrient availability.	1.0–2.0	2	Cassava with corn or watermelon
Old crop field	Fields cultivated continuously for at least ten years without fertilizers. Prolonged use causes marked decline in organic matter and structural degradation.	0.5 – 1.2	10	Cassava

%OM: Organic matter at 0-10 cm depth

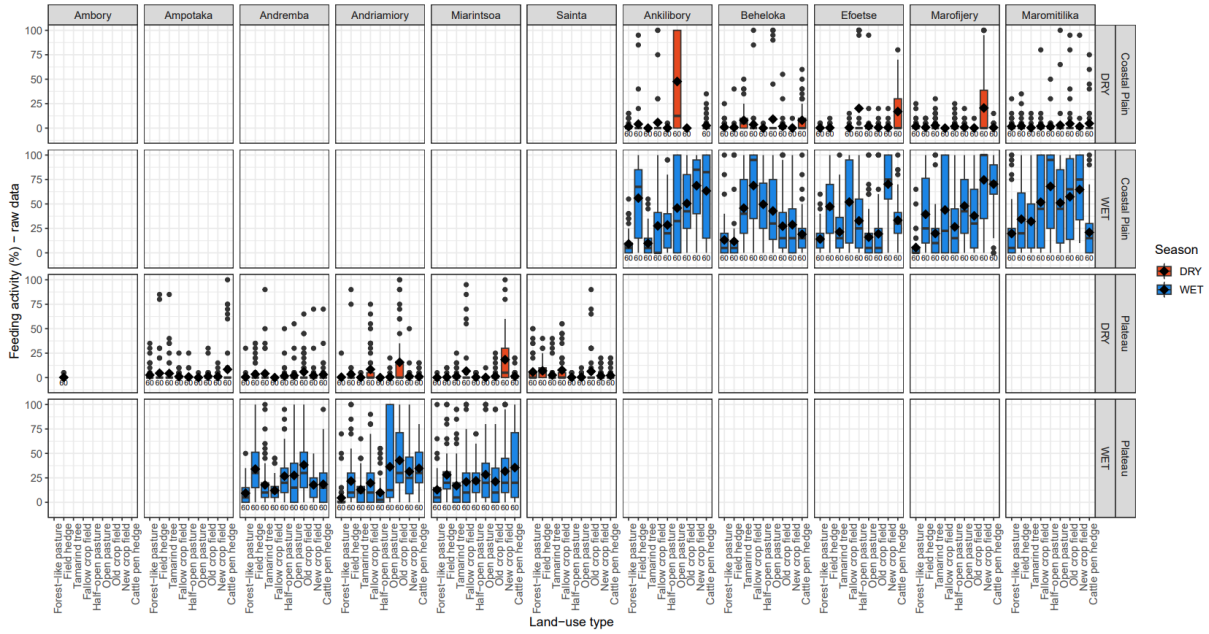

Figure S1: Realized number of bait-lamina strips deployed across nine land-use types in the Coastal Plain and Plateau regions of southwestern Madagascar during the wet and dry seasons. Each strip contained 20 holes used to assess soil faunal feeding activity. Bars indicate the number of deployed strips per land-use type and village combination. Sampling was conducted wherever a land-use type was present in a given village; missing cells indicate absences due to habitat unavailability. Numbers below boxplots indicate number of strips.

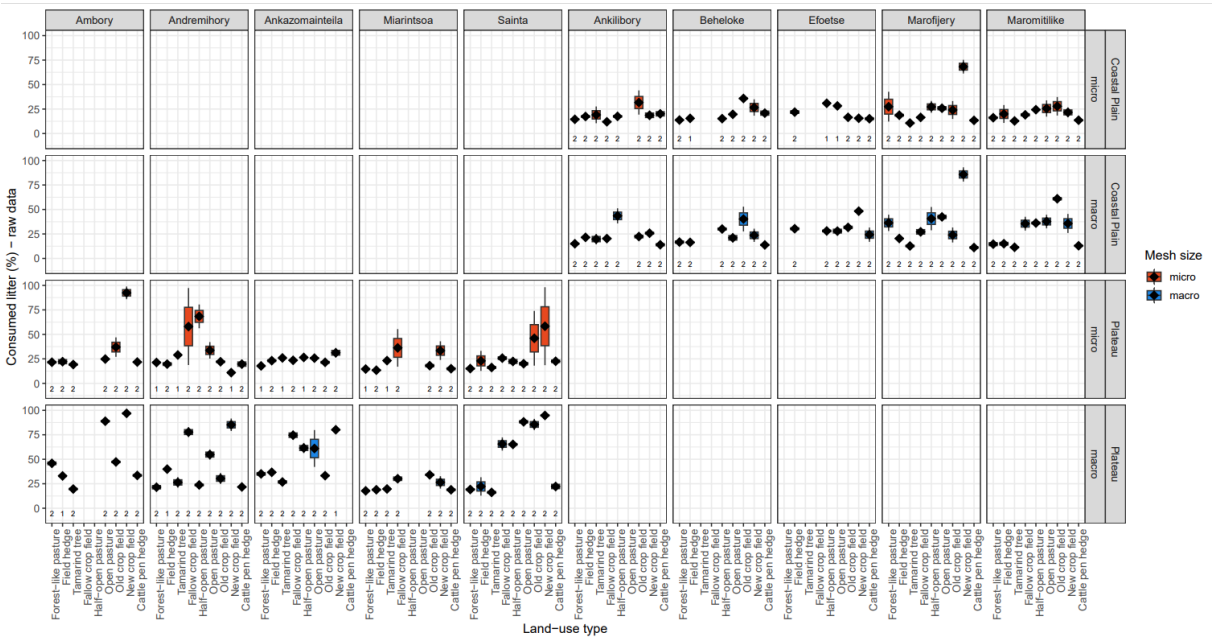

Figure S2: Realized number of fine- and coarse-mesh litterbags used across nine land-use types in the Coastal Plain and Plateau regions of southwestern Madagascar. Each litterbag contained standardized litter material, and two replicate bags per mesh size were deployed in each land-use type per village. Missing cells indicate combinations where a given land-use type was not available or where litterbags could not be retrieved at harvest. Numbers indicate number of litterbags.