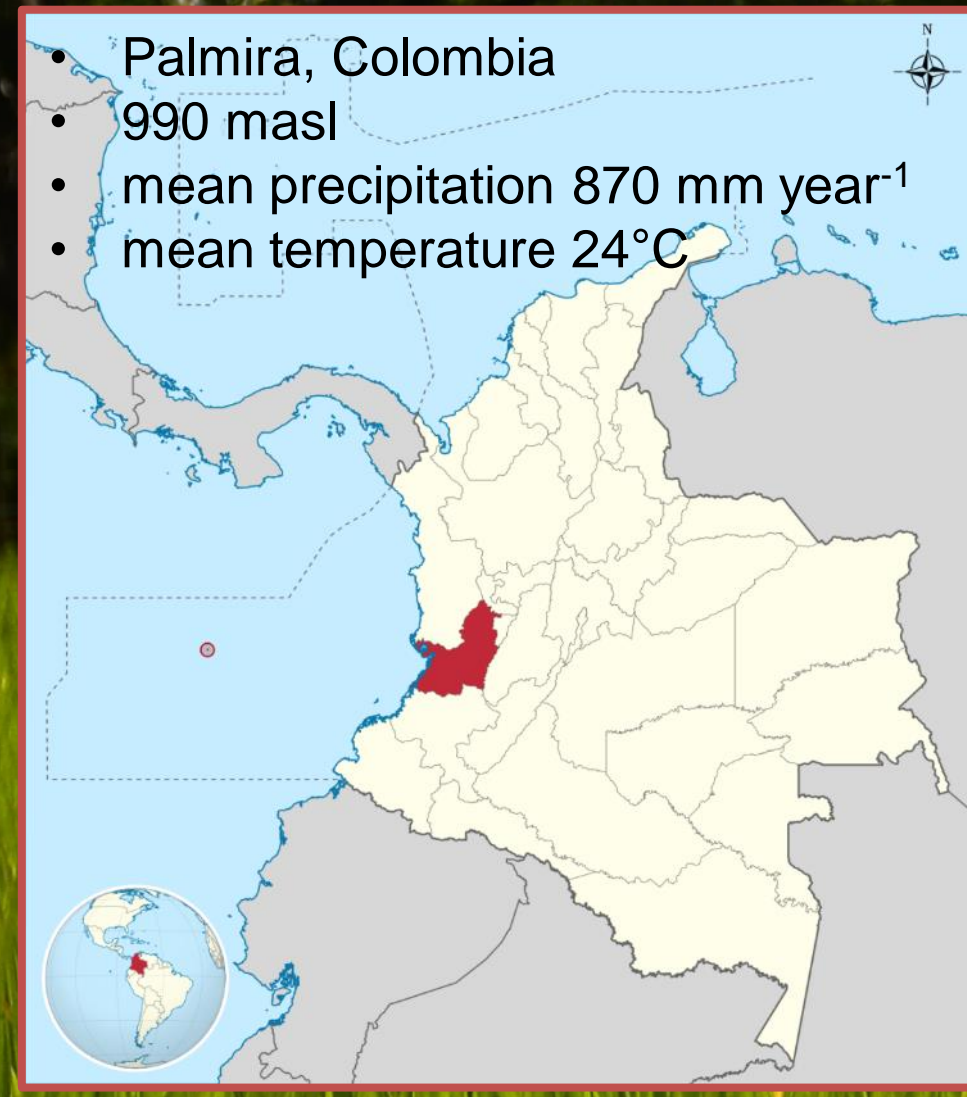


Soil macrofauna as indicators of soil quality in improved (silvo)pastoral systems in the tropics

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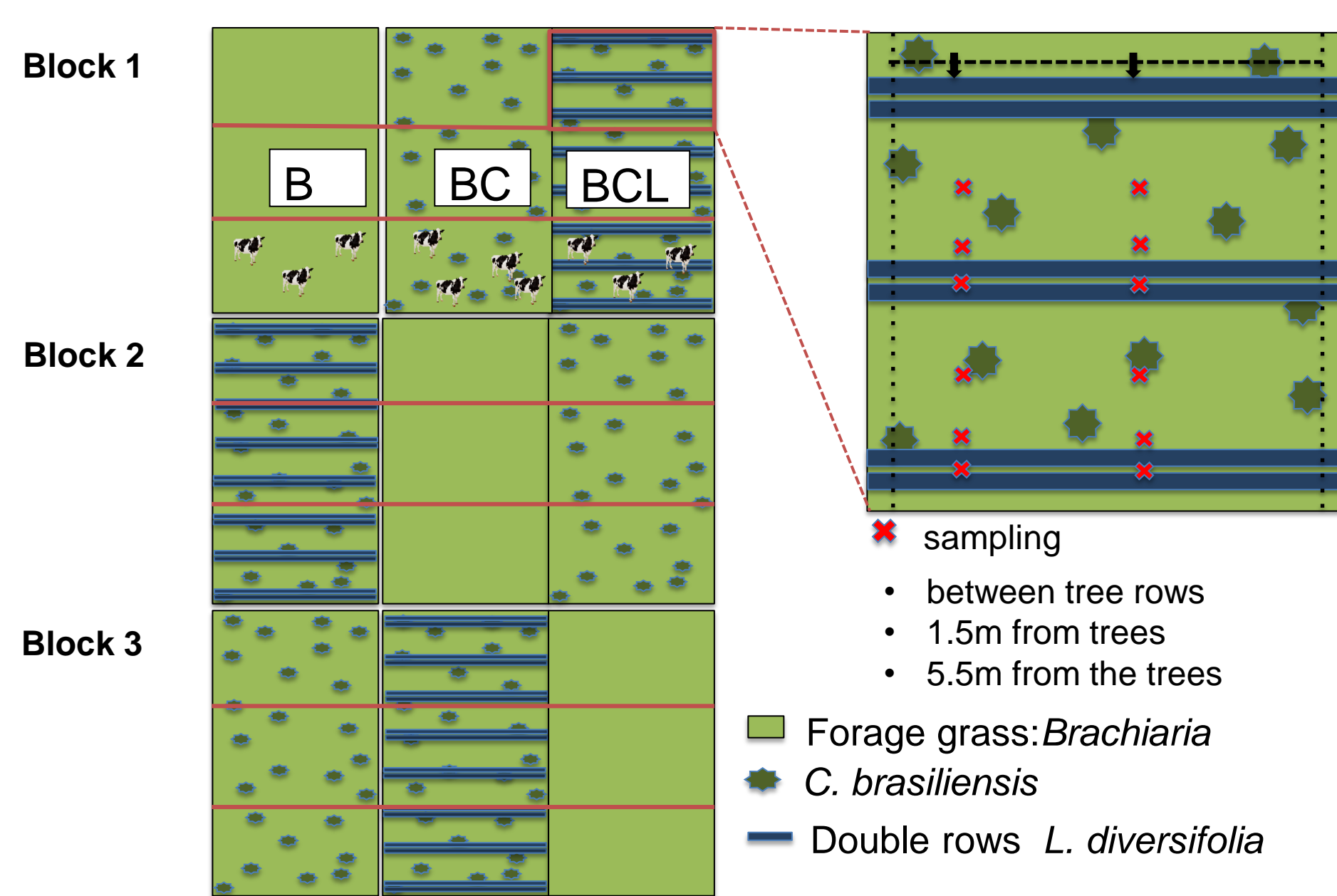
INTRODUCTION

Silvopastoral systems are environmentally and economically beneficial alternative to cattle pastures formed by single grass species. The incorporation of trees, especially legumes, in pastures has several positive effects on soil properties and nutrient cycling while creating more favorable microclimate for the animals and increasing productivity. Soil macrofauna, the key element in soil food web regulating ecosystem services, has a direct effect on soil aeration and water movement due to the system of burrows and galleries, and on soil organic matter fragmentation.

The legumes or legume-trees inclusion in the pastures will lead to improved nutrient cycling and increased biological activity resulting in increased accumulation of organic matter and improved soil physical properties within the silvopastoral system.

METHODS

- **B** *Brachiaria* monoculture (B. hybrid Cayman).
- **BC** Brachiaria intercropped with the herbaceous legume *Canavalia brasiliensis*
- **BCL** Brachiaria intercropped with *C. brasiliensis* and strips of the legume tree *Leucaena diversifolia*



Rotational grazing: 21 days in each block
 Each block further split into thirds: 7 days in each third

Soil macrofauna

- 25 x 25 x 10 cm
- hand sorting
- classification

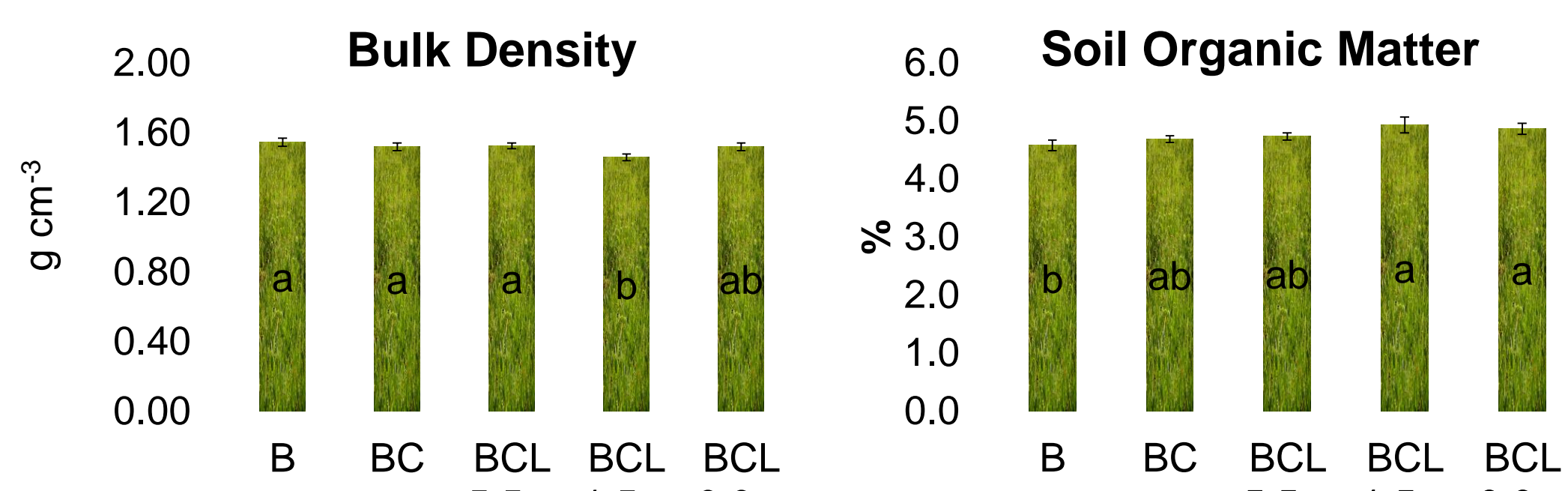


Macroaggregate morphology



RESULTS

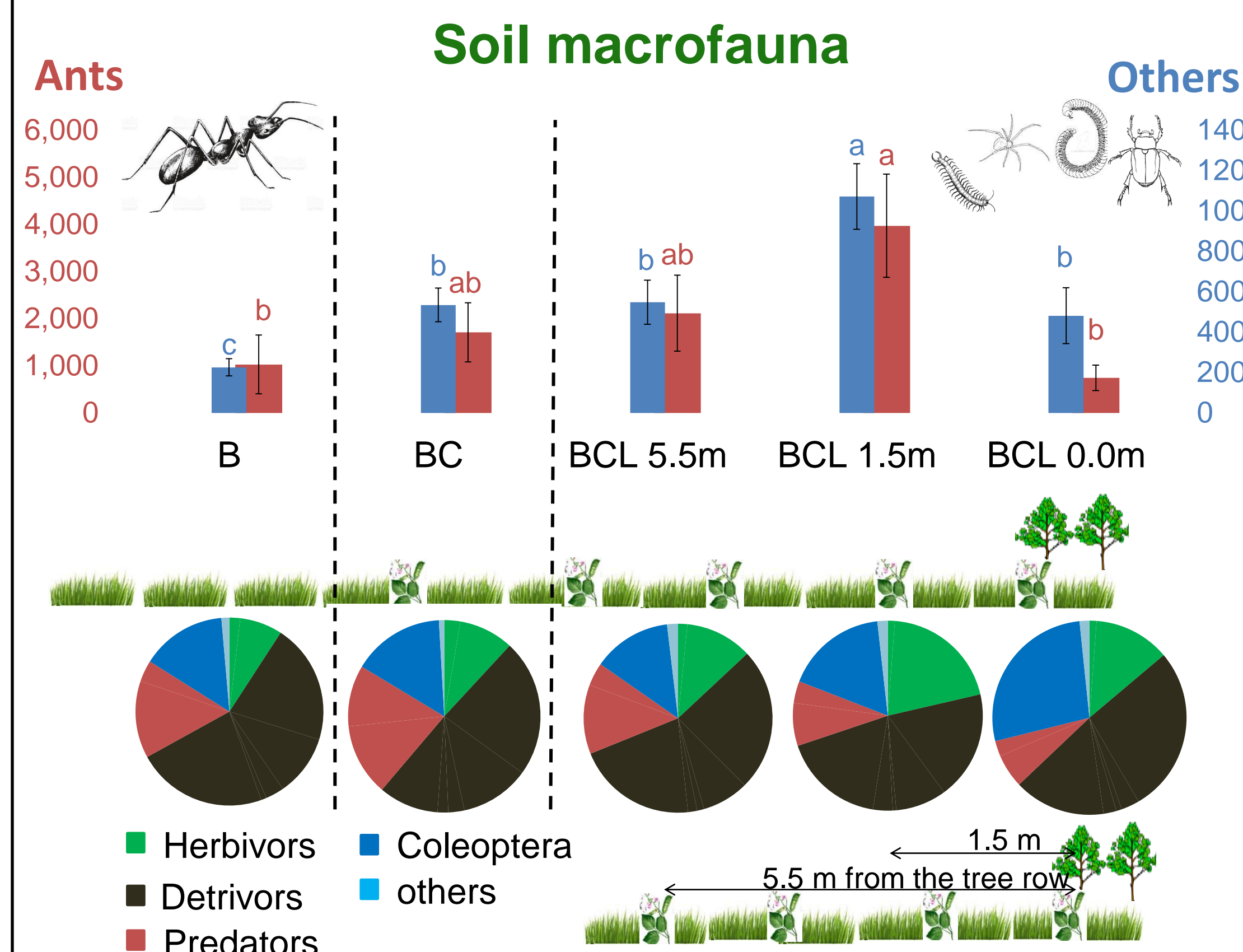
Soil properties



Soil compaction between tree rows results in poor infiltration during rainy season.



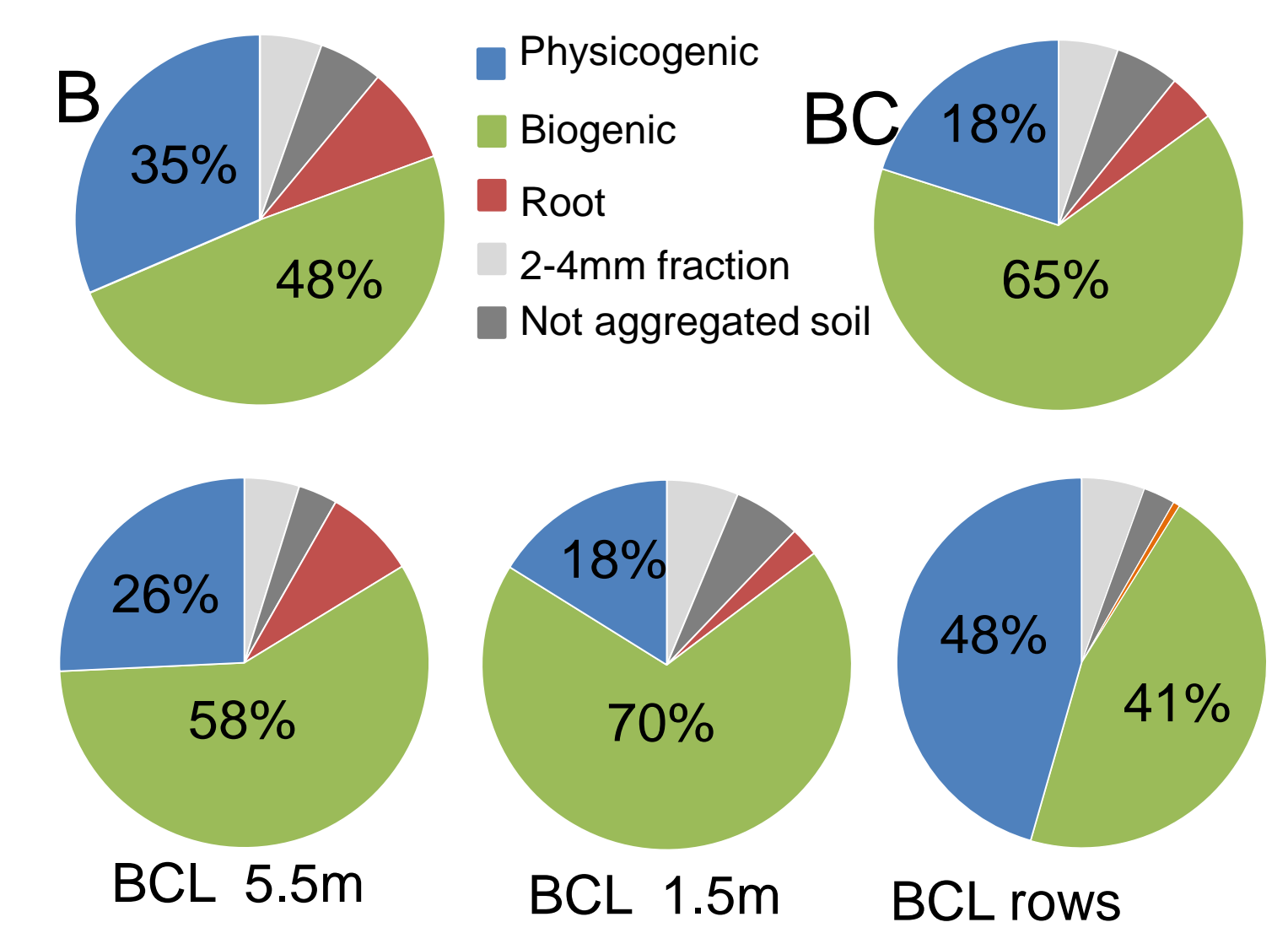
Soil macrofauna



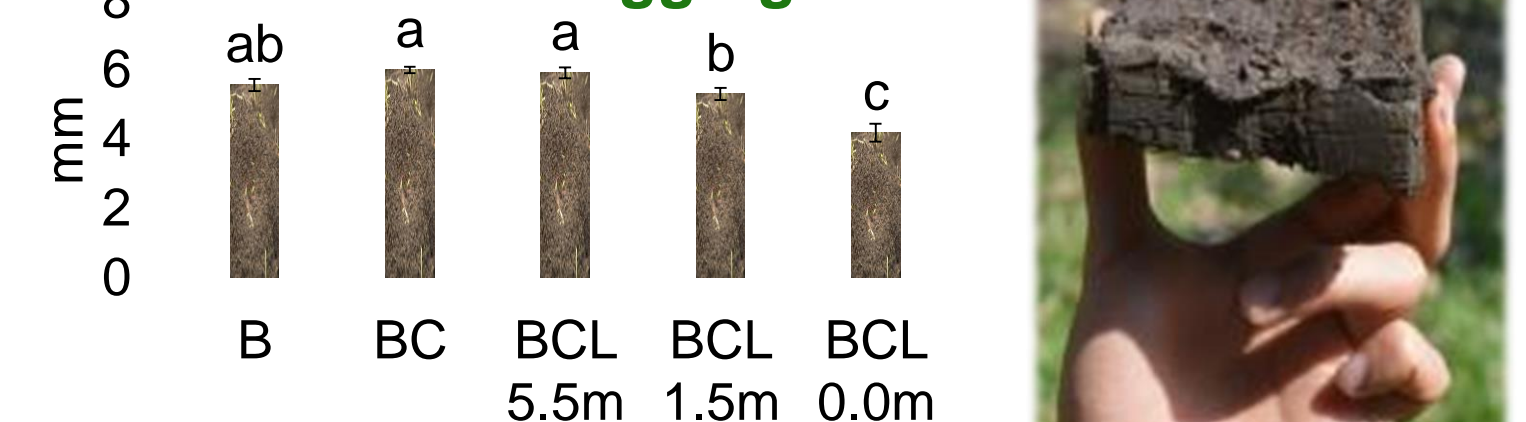
Silvopastoral system, although with the highest abundance of soil macrofauna, was found rather heterogeneous with strong effect of the distance from the tree rows. **The highest abundance was found at 1.5m while the lowest was found under the trees.**



Macroaggregates



Mean weight diameter of water-stable aggregates



CONCLUSIONS

- The increase of soil macrofauna caused by the inclusion of legumes reduce the abundance of physicogenic and **increase the abundance of biogenic macroaggregates.**
- The reduction of soil macrofauna abundance under tree rows, along with the increase of the physical macroaggregates and the reduction of large water stables aggregates, may be explained by the **animal preference** for more palatable *Leucaena* and **search for shade** resulting in **soil compaction**
- Increased productivity of legume-based pastures and the potential to sustain higher densities of animals highlights the importance of an integrated evaluation of spatial heterogeneity and to discuss possible consequences for the management of trade-offs

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REFERENCES

Bottinelli N, Jouquet P, Capowiey Y, Podwojewski P, Grimaldi M, Peng X (2015). Why is the influence of soil macrofauna on soil structure only considered by soil ecologists? Soil & Tillage Research 146:118-124

