Ants as Indicators of Land Use and Soil-Based Ecosystem Services in Agroecosystems of the Colombian Llanos

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Introduction:
- Soils are involved in the provision of many ecosystem services that are of great importance for the maintenance of ecosystem functioning and human societies.
- Soils also are considered a large reservoir of biodiversity that contribute to this functioning.
- Ants in particular fulfill key roles in the maintenance of energy and material flow in soils.
- In addition to their fundamental role as ecosystem engineers, ants have been proposed as indicators of soil quality.

Methods:
- Sampling was conducted in 75 fields along a 150 km transect in Meta Department of Colombia.
- Five common agricultural land uses in the region were surveyed on 15 fields per use (Figs. 2a-e):
  1. Annual crops (maize, soy and rice)
  2. Rubber plantations
  3. Oil palm plantations
  4. Improved pastures (based on Brachiaria sp.)
  5. Semi-natural savannas

Results:
- In total, 5154 individuals were collected, comprised of 91 ant species and 33 genera.
- Management systems exhibited great differences in ecosystem service provision (Fig. 3) as well as ant abundance and diversity (Fig. 4).

Results (continued):
- Fifteen ant species were found to be significantly (P < 0.05) associated with the five indicators of soil-based ecosystem services, according to the IndVal method.
- These indicators could be implemented by technicians to better understand and manage the provision of ecosystem services from soils in agricultural fields.
- Collection and identification of these ant species is likely to be much faster and less expensive than measuring the associated ecosystem services.

Conclusions:
- Our findings support that land use greatly impacts ant communities, via clear effects on their diversity and abundance.
- Some forms of management and proper combinations of different land uses in the landscape could contribute to biodiversity conservation and ecosystem functions at the regional scale.
- Ants can serve as valuable bioindicators for land use impacts and ecosystem service provision, thus offering a valuable tool to help better manage agricultural landscapes.

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