

Functional root community traits and tropical forest transformation

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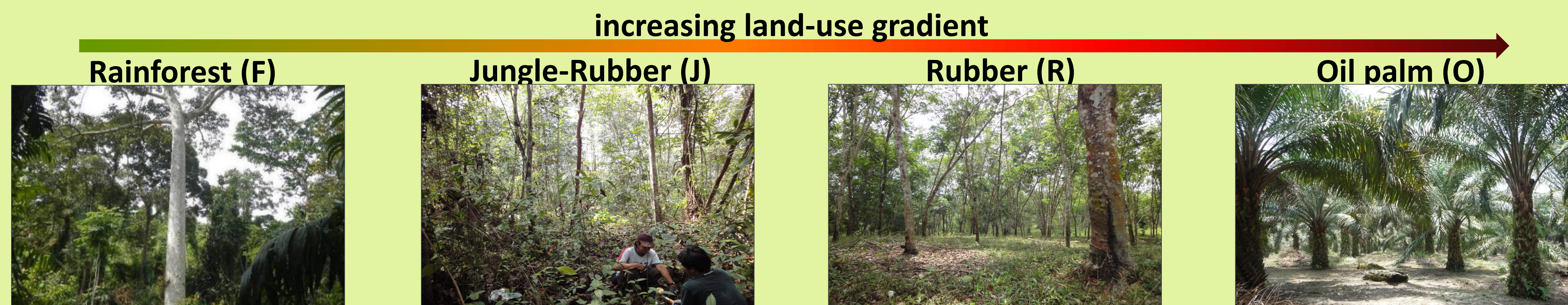
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The effect of forest transformation on root functional traits is unknown. Here, we hypothesized that chemical and performance traits of root communities vary with forest transformation and that degradation of traits is linked with loss of ecosystem functions.



Root community traits as indicator for transformation of rain forests to oil palm and rubber plantations

Sampling and Processing

Soil cores were sampled in all 32 core plots.



1: Sampling in a rubber plantation.



2: soil corer and hammer.



3: equipment (A) and soil core (B).

Analyses of root vitality and ectomycorrhizal (EM) colonization were conducted. Arbuscular mycorrhizal (AM) spore abundance in soil and AM root colonization were determined.

Vital root tips

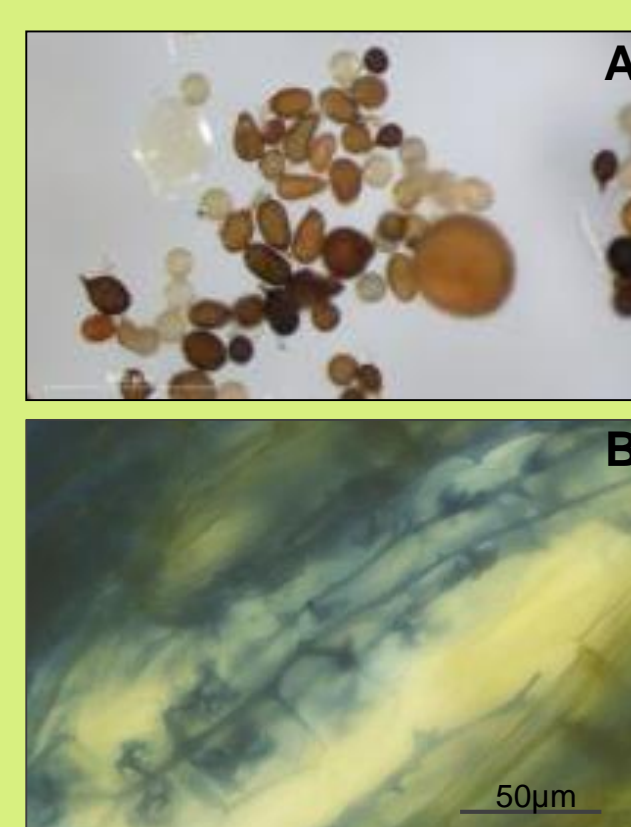


5: EM root tip from J.

Dead root tips



7: Dead root tips from O.

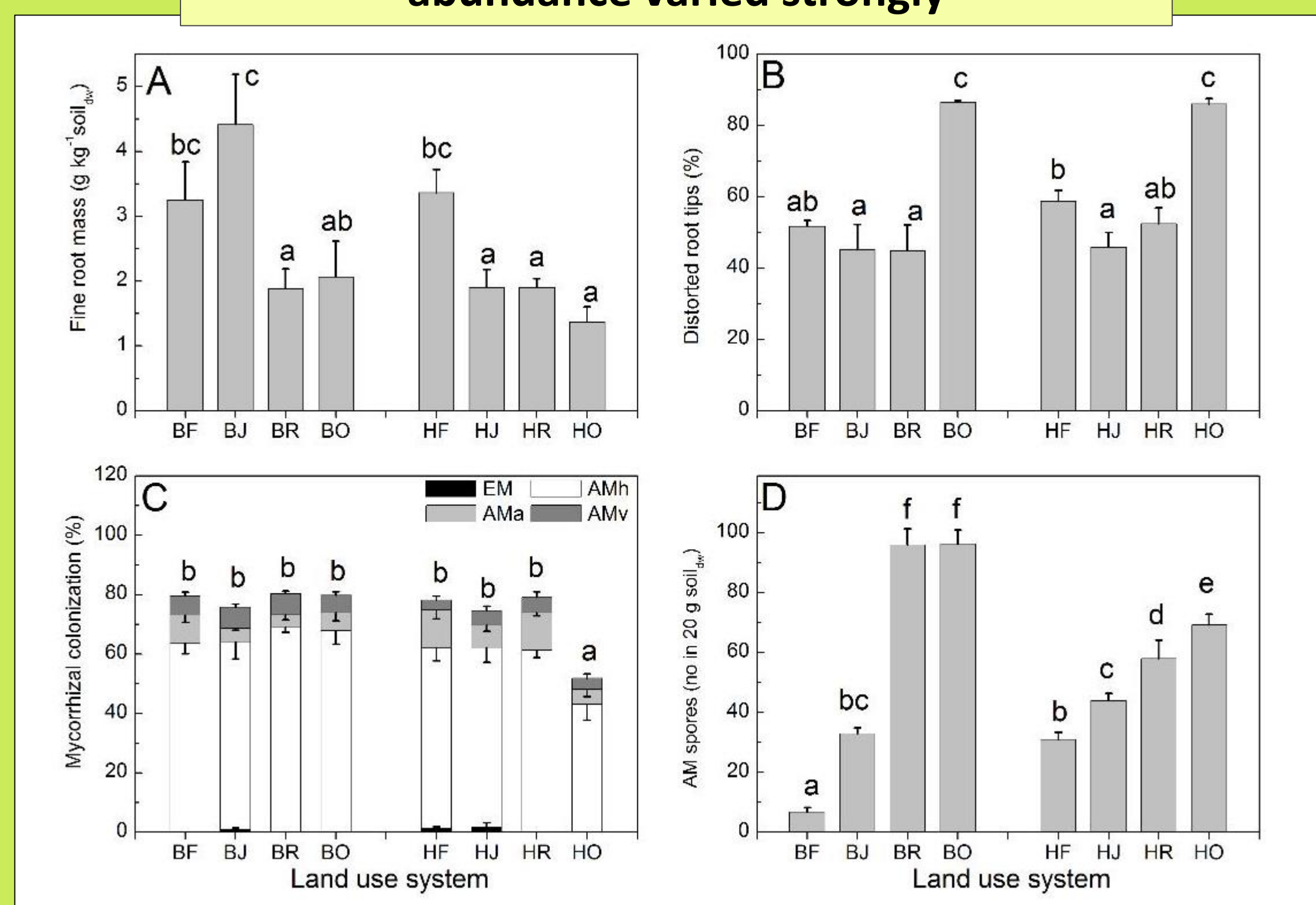


8: AM spores (A) and AM arbuscles (B) in F.

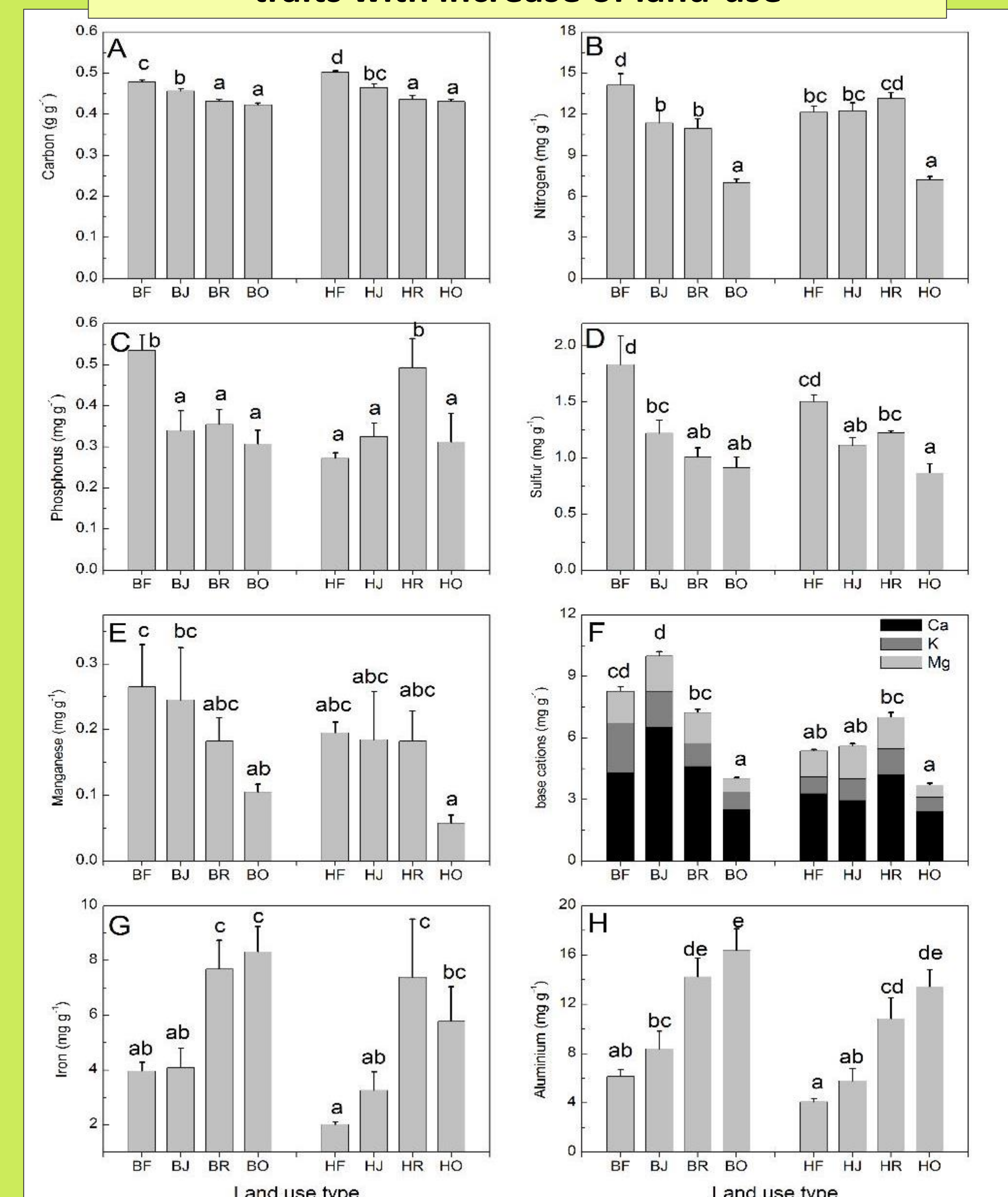
Root biomass was measured. Element analysis of fine roots, soil and leaf litter samples were carried out.

Results

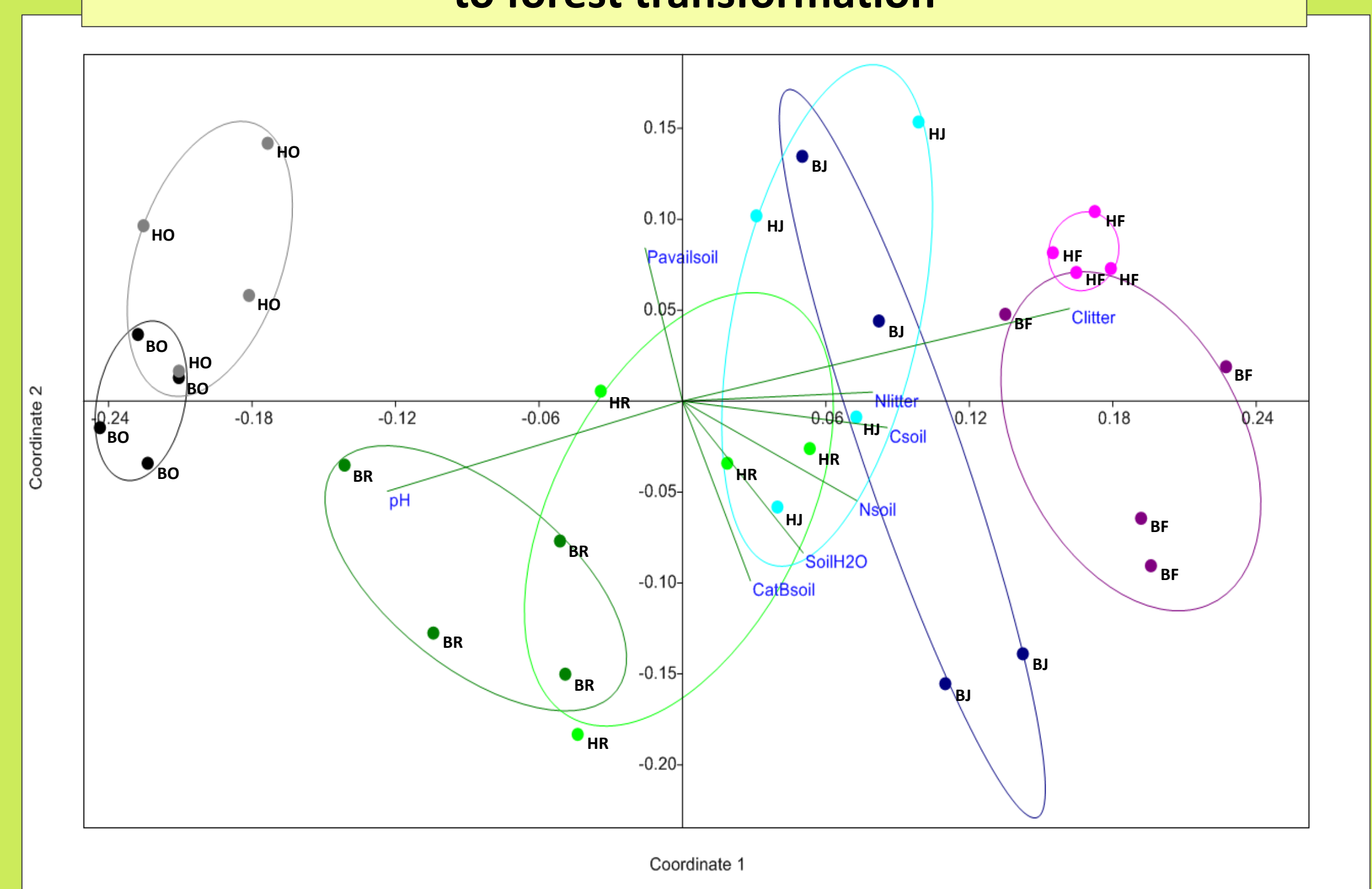
EM fungi were rare, AM colonization was unaffected by land-use system, but AM spore abundance varied strongly



Decrease of positive chemical root community traits with increase of land-use



Root community functional parameters (RCFPs) are related to forest transformation



Conclusions

We found a decline of positive RCFPs (e.g. biomass, nutrient concentrations) in mono-culture oil palm plantations and an accumulation of toxic elements in oil palm roots and a higher root mortality. Our results suggest that land management that improves root vitality may enhance the ecological functions of intense tropical production systems.