

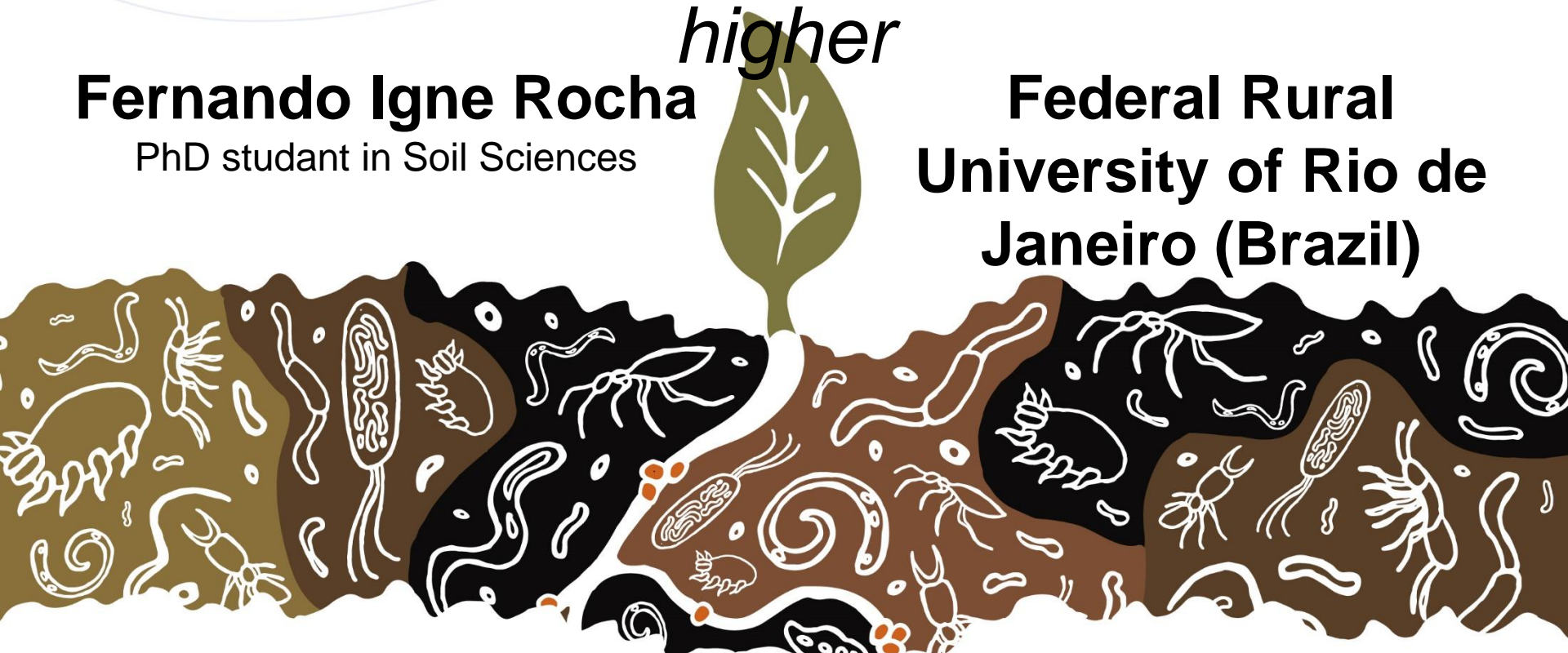
Underestimated biodiversity of edaphic prokaryotic metacommunity in the Western Amazon: *risks may be*

higher

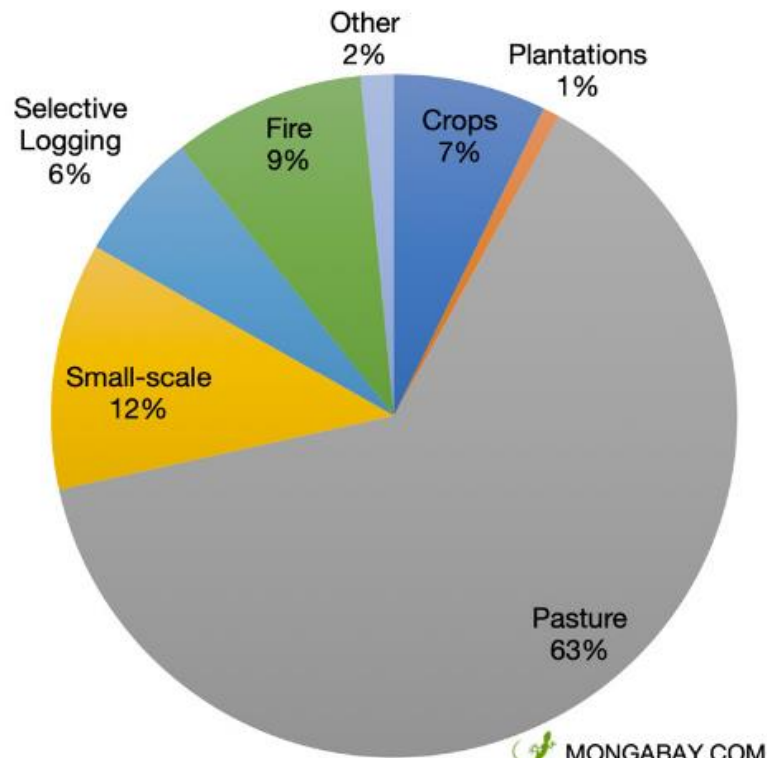
Fernando Igne Rocha

PhD student in Soil Sciences

**Federal Rural
University of Rio de
Janeiro (Brazil)**



Drivers of deforestation in the Brazilian Amazon, 2001-2013



Data source: World Resources Institute using Hansen et al (2019)
 "Other" includes infrastructure, mining, natural disturbance, etc.

- Colonization projects in the 70's ~ Transamazonian road
- New agricultural frontiers;
- Since 2000 ~ $\frac{3}{4}$ of deforestation associated with pasture;
- 1.287 km² deforested area between August 2018 and July 2019
 ~1 Province of Rome

(INPE, 2019)

Old-growth
forest

Selective
logging

Shifting
cultivation

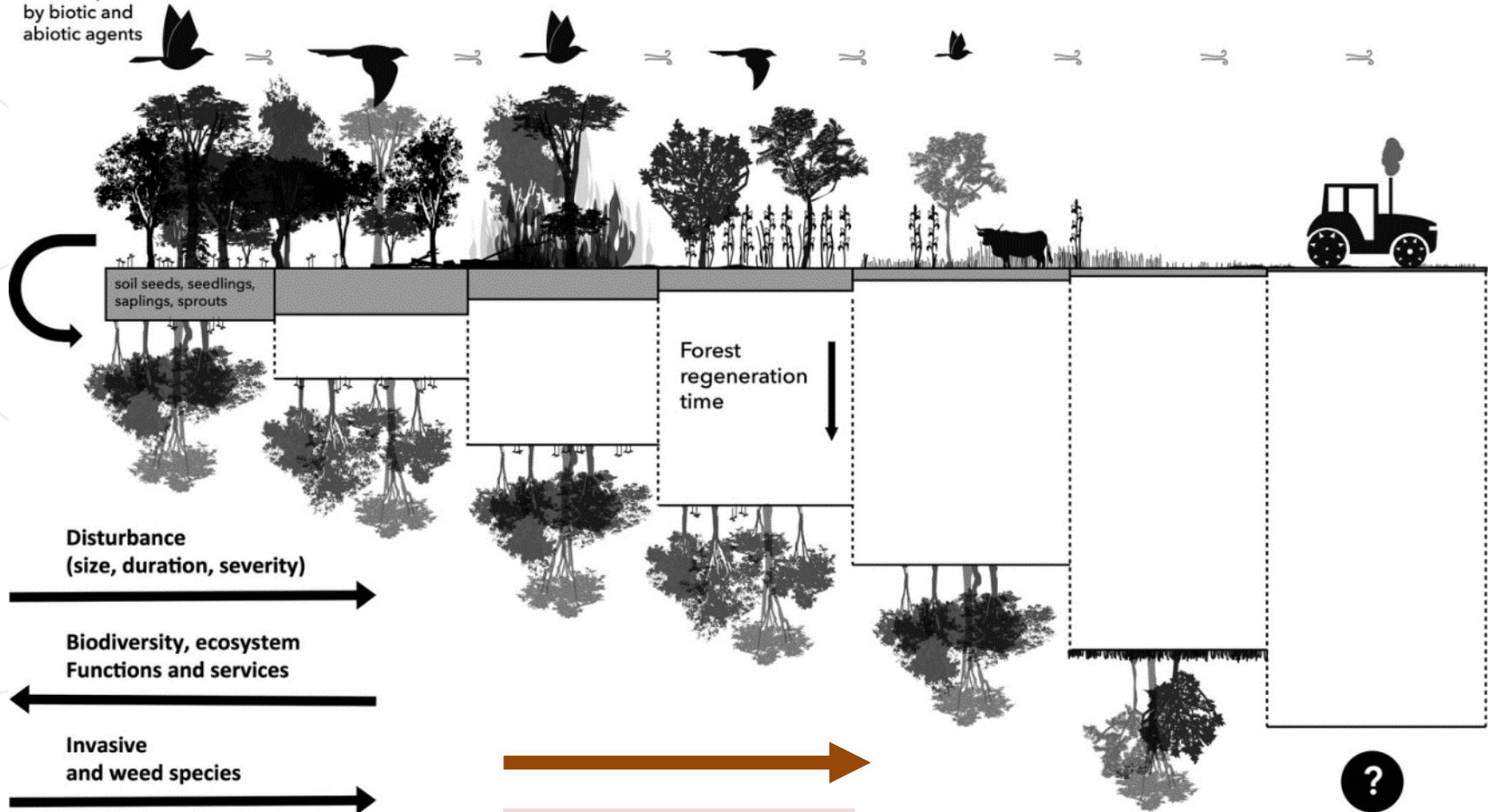
Multi-crop
silvopastoral
systems

Cattle
pastures

Extensive
monocultures

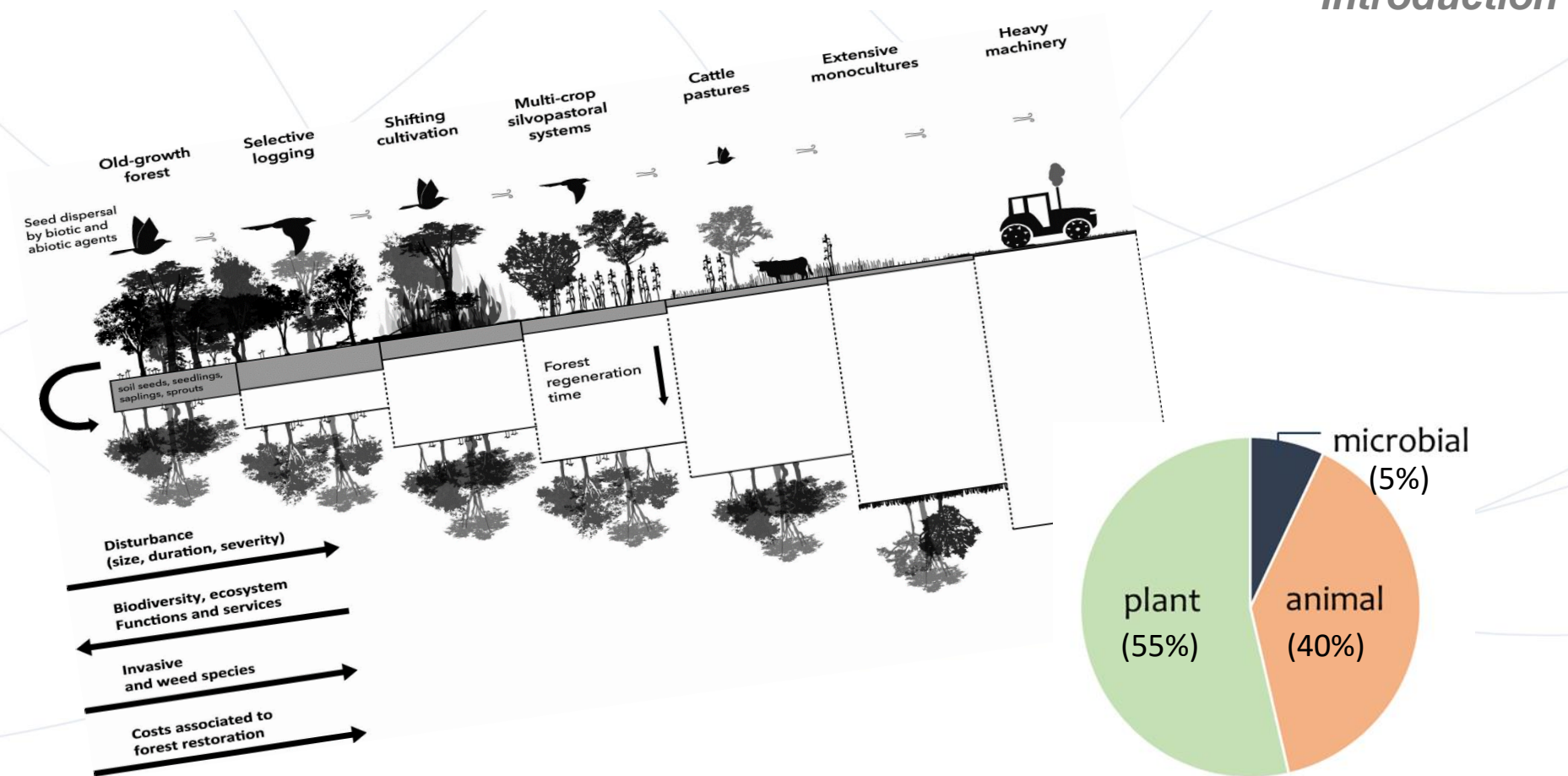
Heavy
machinery

Seed dispersal
by biotic and
abiotic agents



Land Use
Intensity

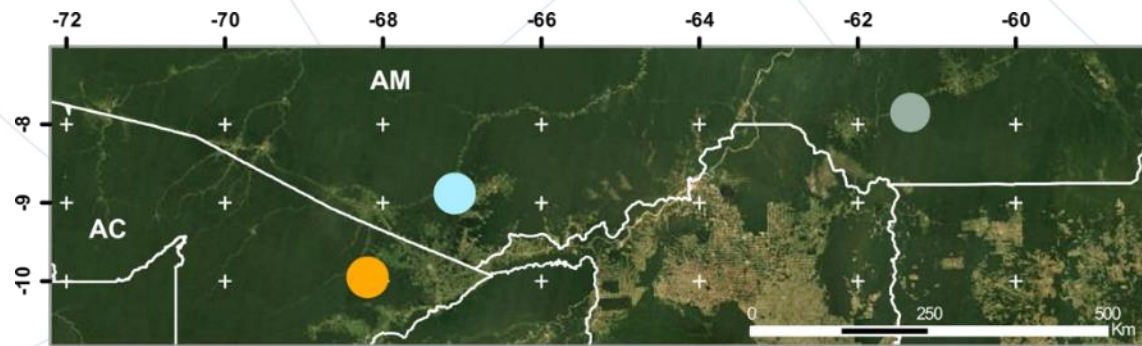




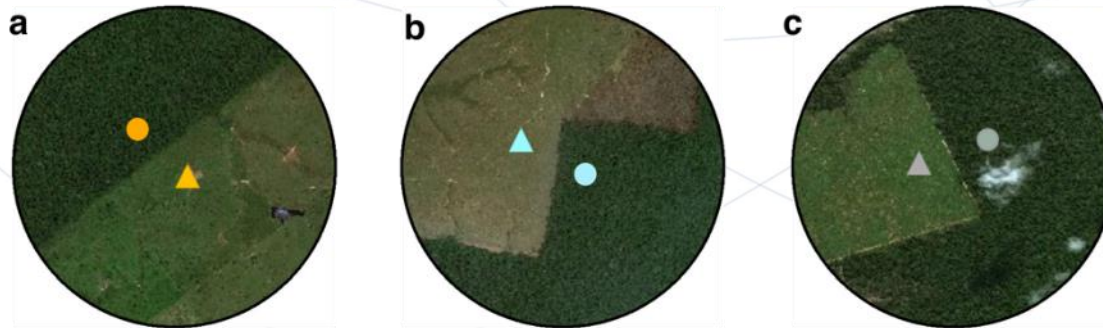
keywords: "biodiversity"; "loss";

Poor understandings of the effects of LUC on soil microbial biodiversity





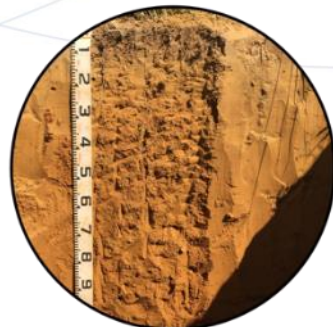
Western Amazonia



- Bujari, AC
- Boca do Acre, AM
- Stº Antônio do Matupí, AM



Luvisols



Ferralsols



Acrisols



Pedodiversity



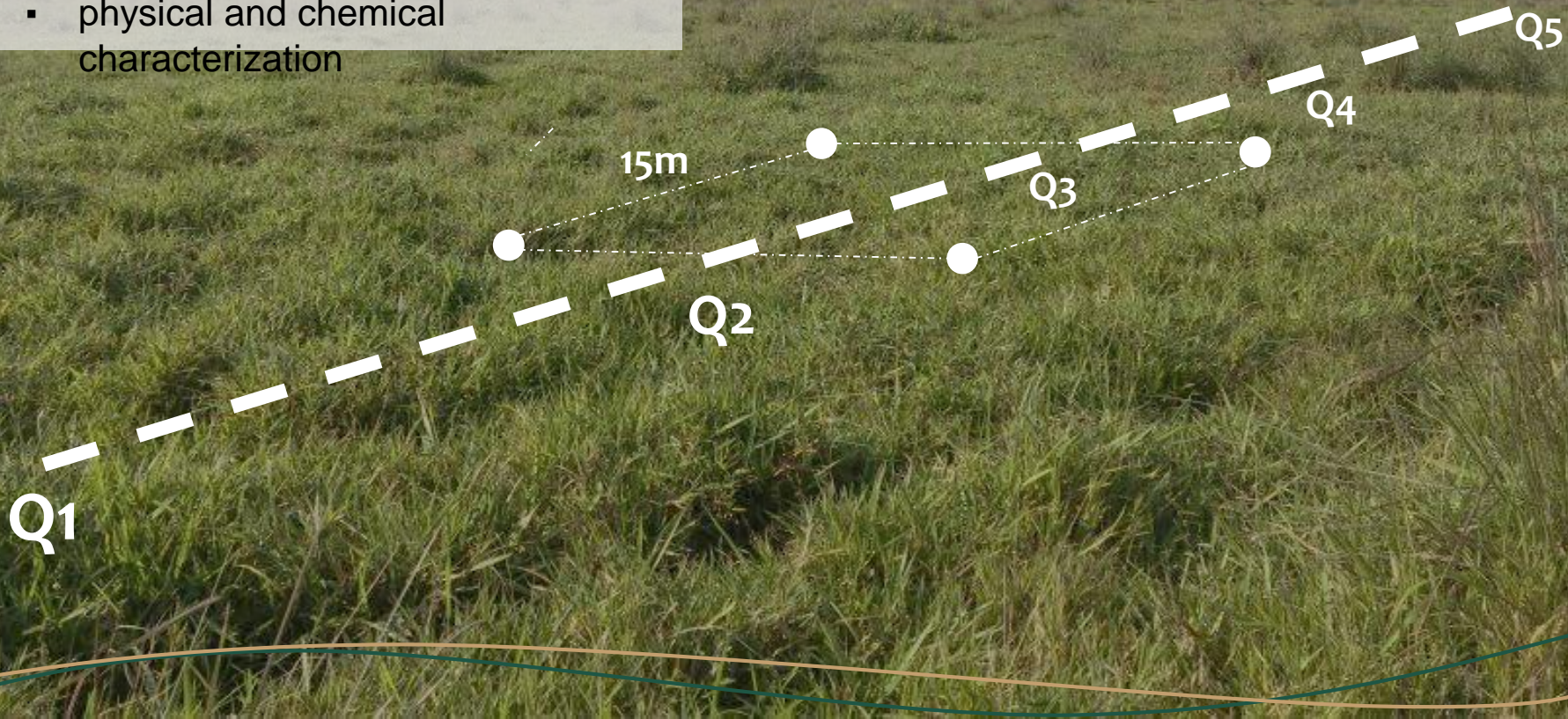
Land Use Systems (LUS):

5 forests

8 pastures

Sample collection:

- 250 m transects with 5 quadrants
- pedological description at Q3
- 4 points per quadrant
- **soil (10 cm)**
 - physical and chemical characterization



Land Use Systems (LUS):

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- 4 points per quadrant
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 - physical and chemical characterization
- **litter**
 - tannin, polyphenols, C, N



Q1

Q5

15

Land Use Systems (LUS):

5 forests

8 pastures

Sample collection:

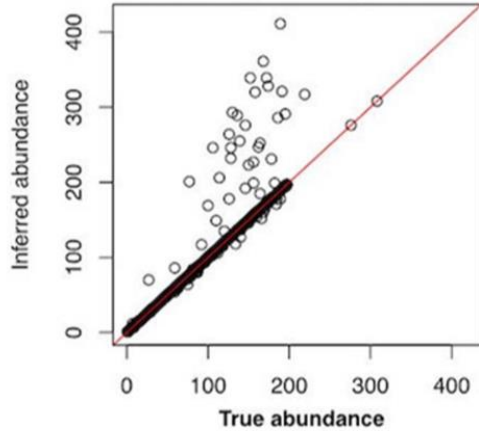
- 250 m transects with 5 quadrants
- pedological description at Q3
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- **soil (10 cm)**
 - physical and chemical characterization
- **litter**
 - tannin, polyphenols, C, N
- **rhizosphere**



Q1

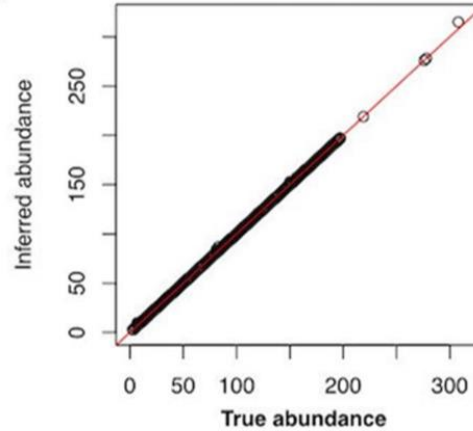


3% OTUs (average linkage)



TP: 978
FP: 272
FN: 77
cor: 0.935

DADA2



TP: 1042
FP: 0
FN: 13
cor: 0.999



(PCR)



(DNA quantification)

Corpora, Brazil) (nov 2017 to

Next
Sequ



IGSB-NGS Core Facility
Argonne National Laboratory, USA

- Data: Kopylova, et al. mSystems, 2016.
- 16S rRNA (V4 region)
~ Bacteria and Archaea

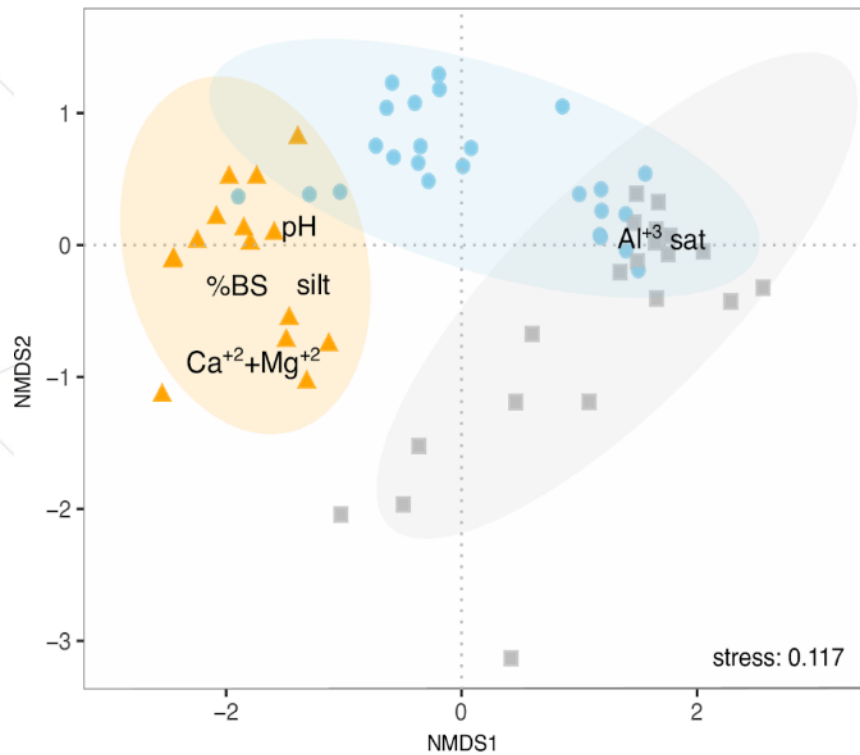


Bioinformatics

DADA²
Amplicon Sequencing. Exactly. Version 1.14
(Callahan et al., 2016)

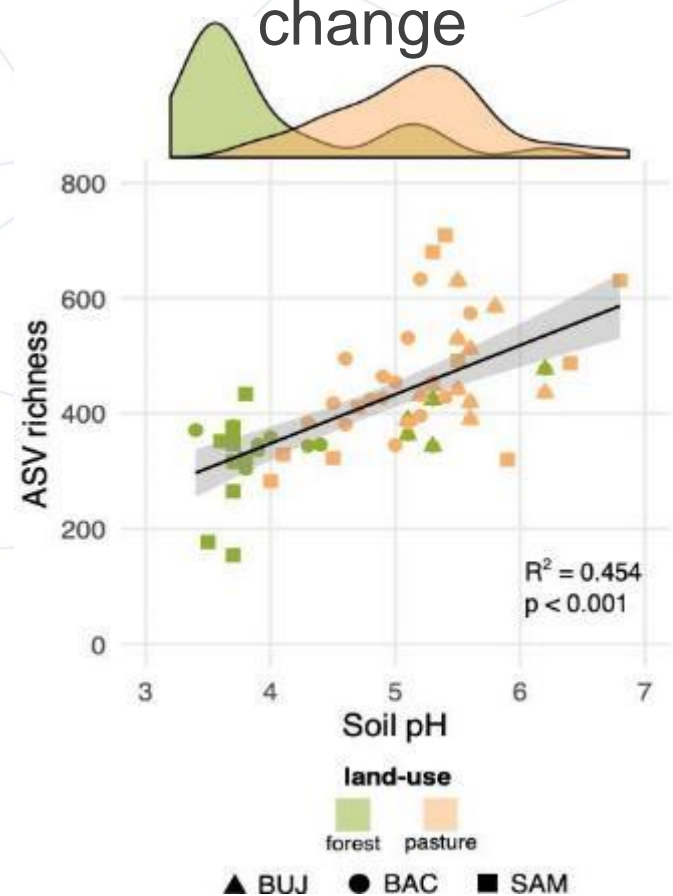


sites ▲ BUJ ● BAC ■ SAM

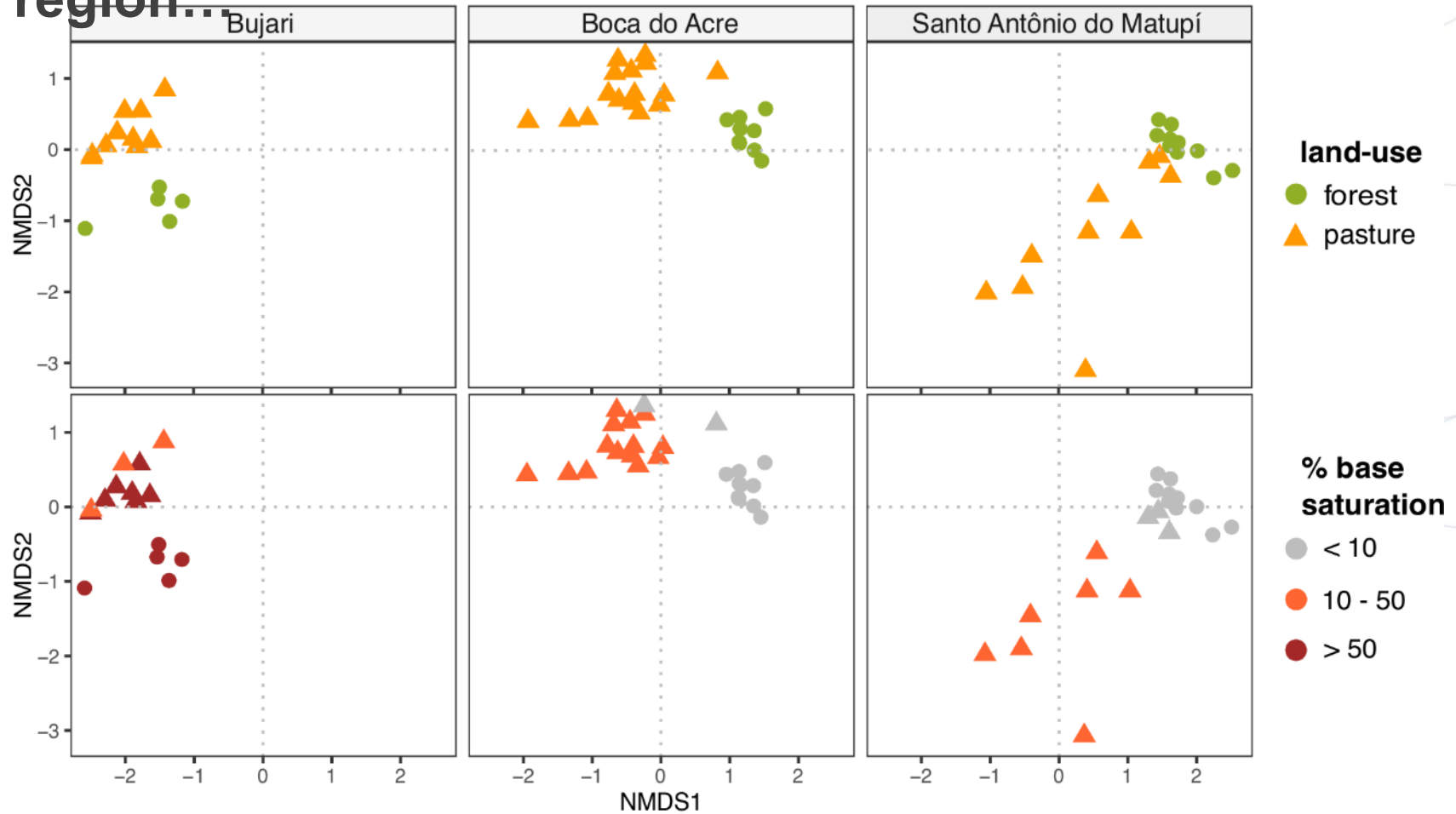


**Soil microbiome
follow interregional
gradient of soil
fertility...**

**... and intra-regional
gradient: land-use
change**



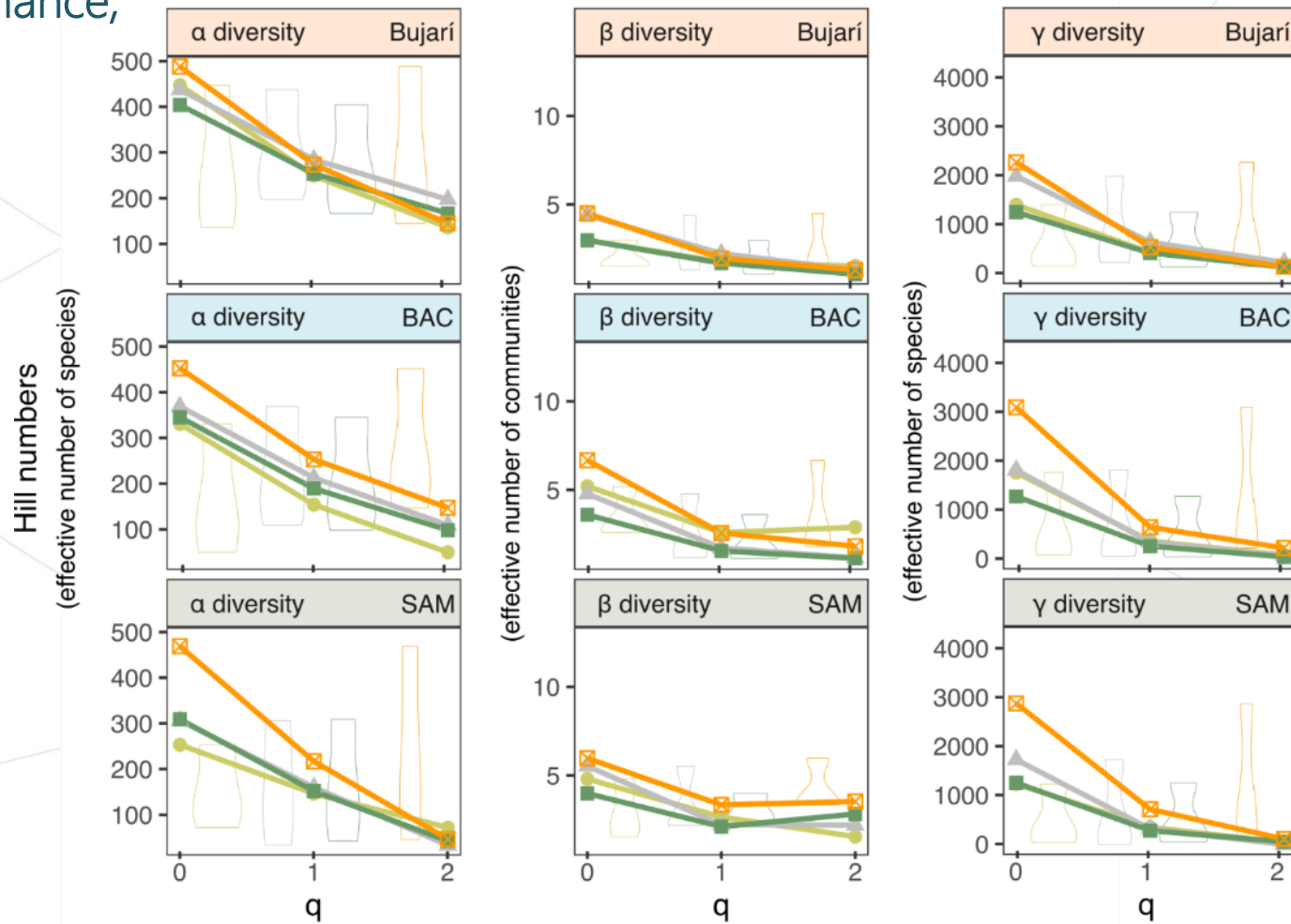
Same trends in each study region...



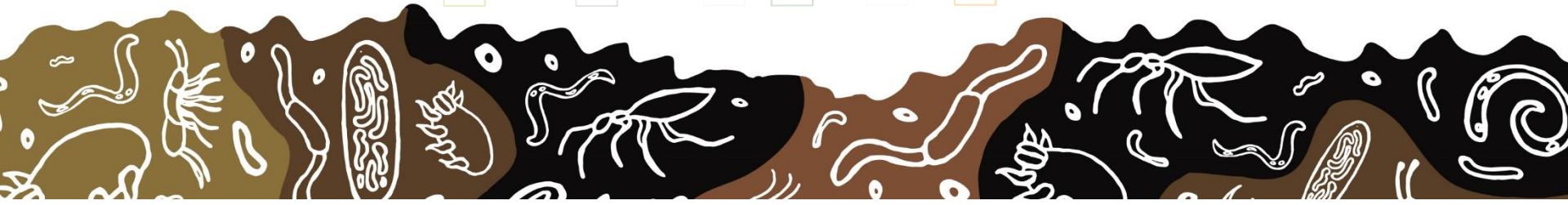
q0 ~ species Richness; q1 ~ Shannon; q2 ~ Simpson's dominance;

Results

variance partitioning



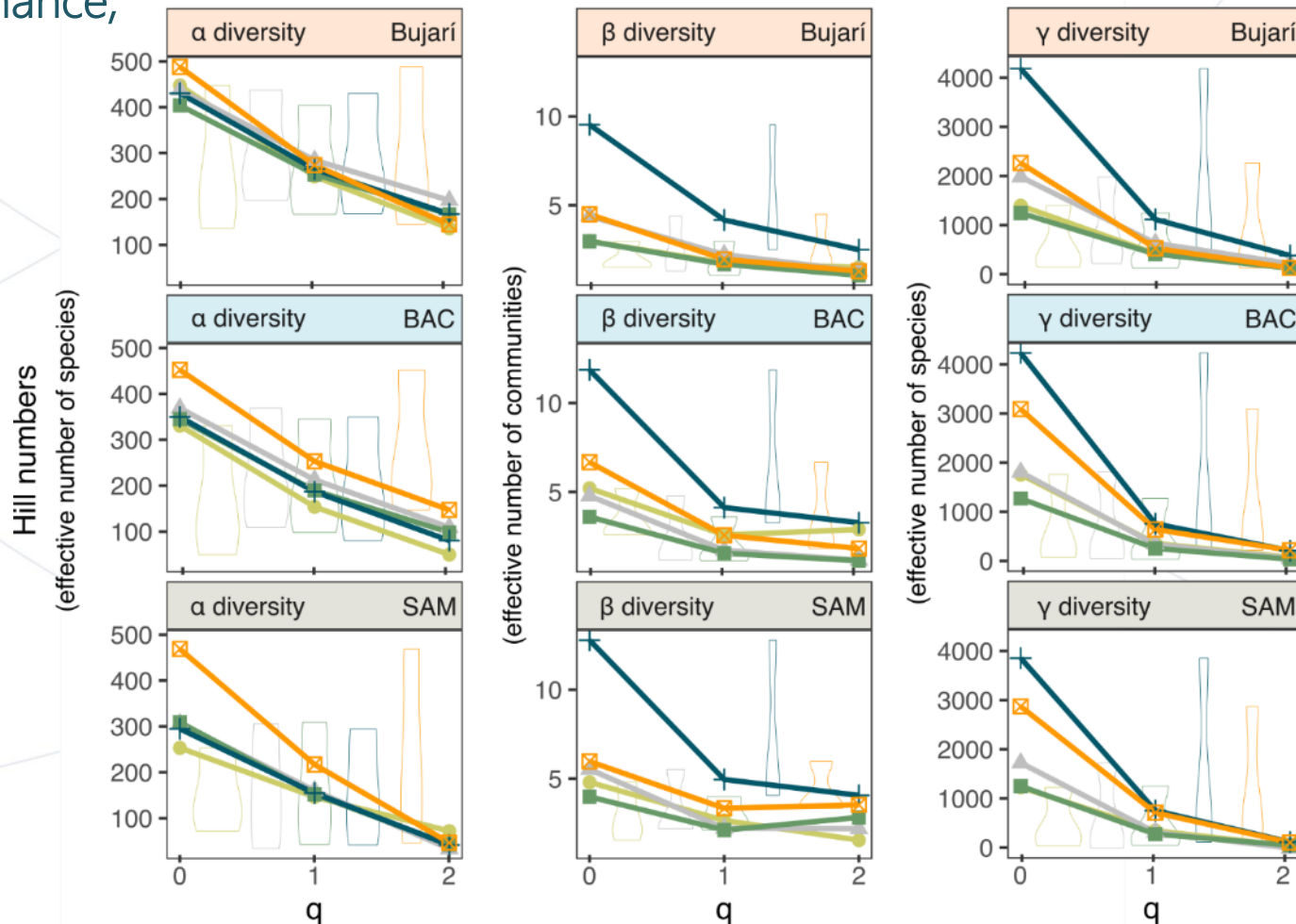
litter rhizosphere forest soil pasture soil



q0 ~ species Richness; q1 ~ Shannon; q2 ~ Simpson's dominance;

Results

variance partitioning



input of soil biodiversity! \blacktriangle \blacktriangle underestimated soil biodiversity!

litter rhizosphere forest soil edaphic env pasture soil



- **Forest-to-pasture conversion determines critical changes in soil microbiota composition and structure;**
- **Gradient of soil fertility determine variations in community structure in the same land use systems;**
- **Bacterial β diversity is increased when considering the whole edaphic environment of the soil** Risks associated with the effects of forest-to-pasture conversion on maintaining soil multifunctionality in tropical ecosystems



Acknowledgements



Embrapa
Agrobiologia



PROGRAMA DE PÓS-GRADUAÇÃO EM
AGRONOMIA - CIÊNCIAS DO SOLO

**IOWA STATE
UNIVERSITY**



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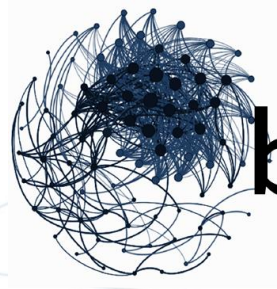
*The National
Academies of*

**SCIENCES
ENGINEERING
MEDICINE**



USAID
FROM THE AMERICAN PEOPLE

Thank you for your attention!



brigado!

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