Repositioning of Neotropical Soils Microbiome: Its Time for The Payback

Dr. Daniel Kumazawa Morais

daniel.morais@brmicrobiome.org

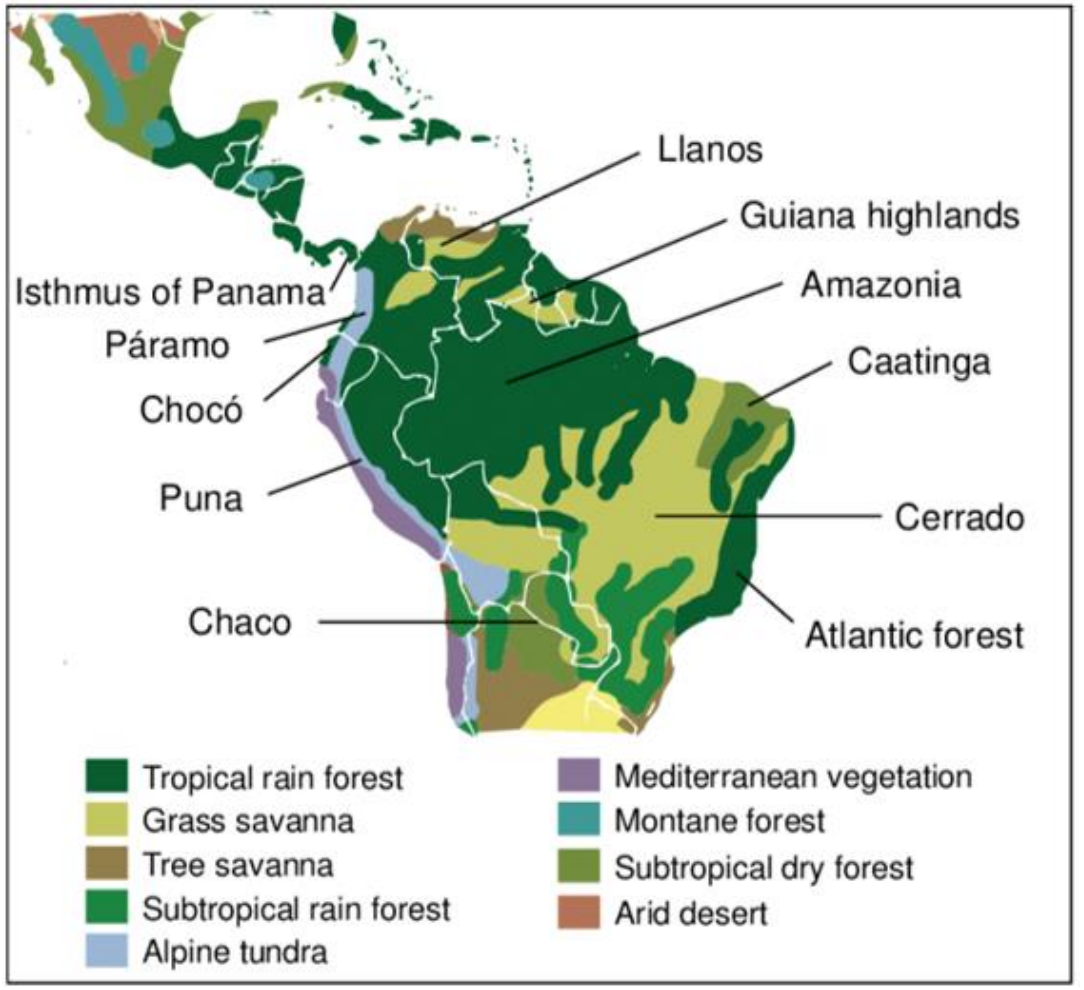
Biological Institute of São Paulo

APTA – Brazil

(IB – APTA) INNOVATION 12/12/2022

Neotropical region Importance

- The most species-rich realm on earth
- High climatic and environmental variability
- Suffers high pressure of anthropogenic activity
- Has the most diverse rainforest on earth



Antonelli & Sanmartín, Taxon. 2011

PDD - Pantropical Diversity Disparity

- Explanations for moist forests diversity

PNAS

2021

Earth history events shaped the evolution of uneven biodiversity across tropical moist forests

Oskar Hagen[a,b,c,1,2], Alexander Skeels[a,b,1,2], Renske E. Onstein[c], Walter Jetz[d,e], and Loïc Pellissier[a,b,2]

[a]Landscape Ecology, Institute of Terrestrial Ecosystems, Department of Environmental Systems Science, Eidgenössische Technische Hochschule (ETH) Zürich, 8092 Zürich, Switzerland; [b]Unit of Land Change Science, Swiss Federal Research Institute for Forest, Snow and Landscape (WSL), 8903 Birmensdorf, Switzerland; [c]Evolution and Adaptation Research Group, German Centre for Integrative Biodiversity Research (iDiv) Halle–Jena–Leipzig, 04103 Leipzig, Germany; [d]Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT 06520; and [e]Center for Biodiversity and Global Change, Yale University, New Haven, CT 06520

RESEARCH ARTICLE | BIOLOGICAL SCIENCES

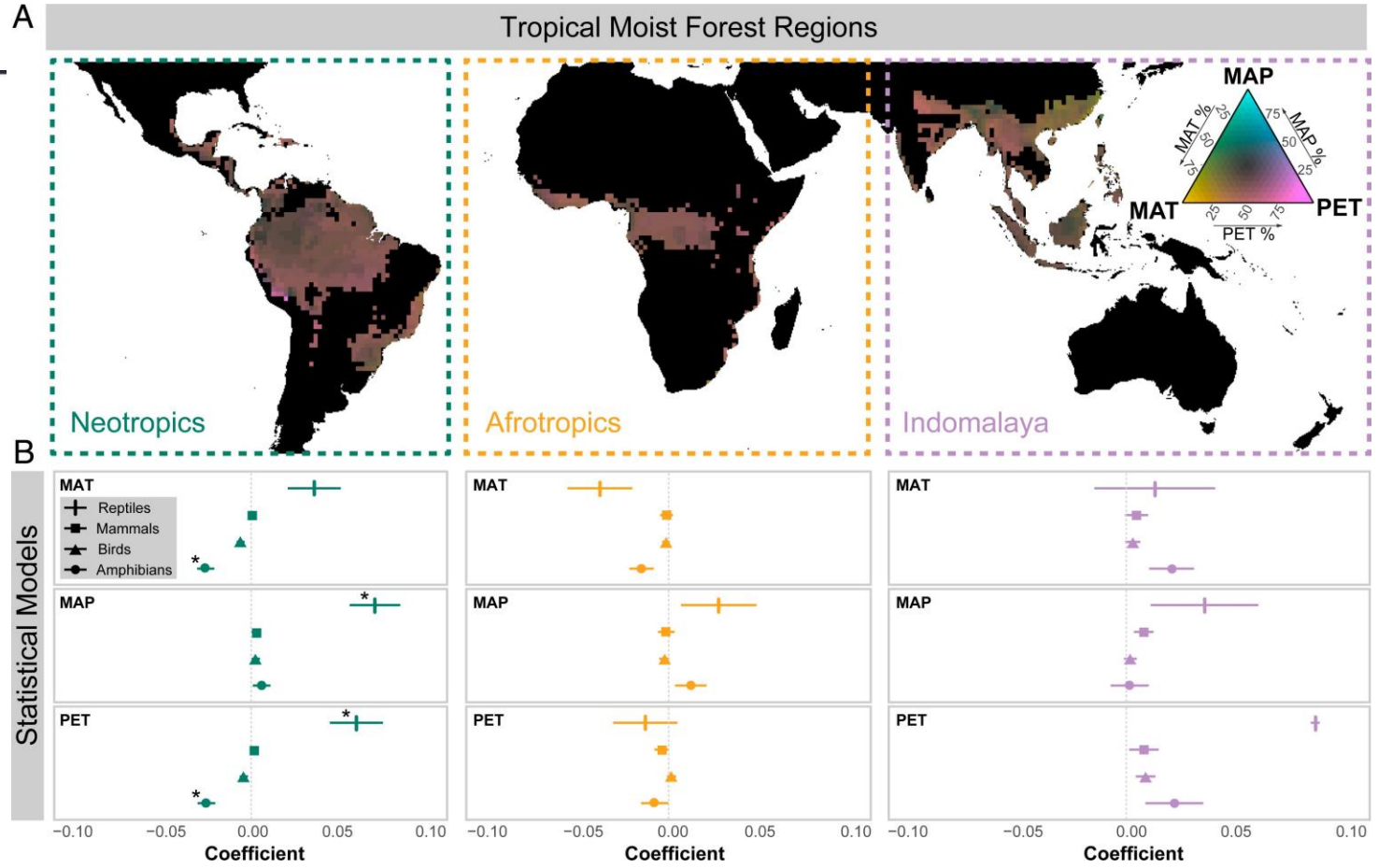
Amazonia is the primary source of Neotropical biodiversity

Alexandre Antonelli, Alexander Zizka, Fernanda Antunes Carvalho, +3, and Fabien L. Condamine

Authors Info & Affiliations

Edited by Scott V. Edwards, Harvard University, Cambridge, MA, and approved April 13, 2018 (received for review August 4, 2017)

May 14, 2018 | 115 (23) 6034-6039 | https://doi.org/10.1073/pnas.1713819115



Neotropics

- Higher diversity:
- Plants
- Vertabrates

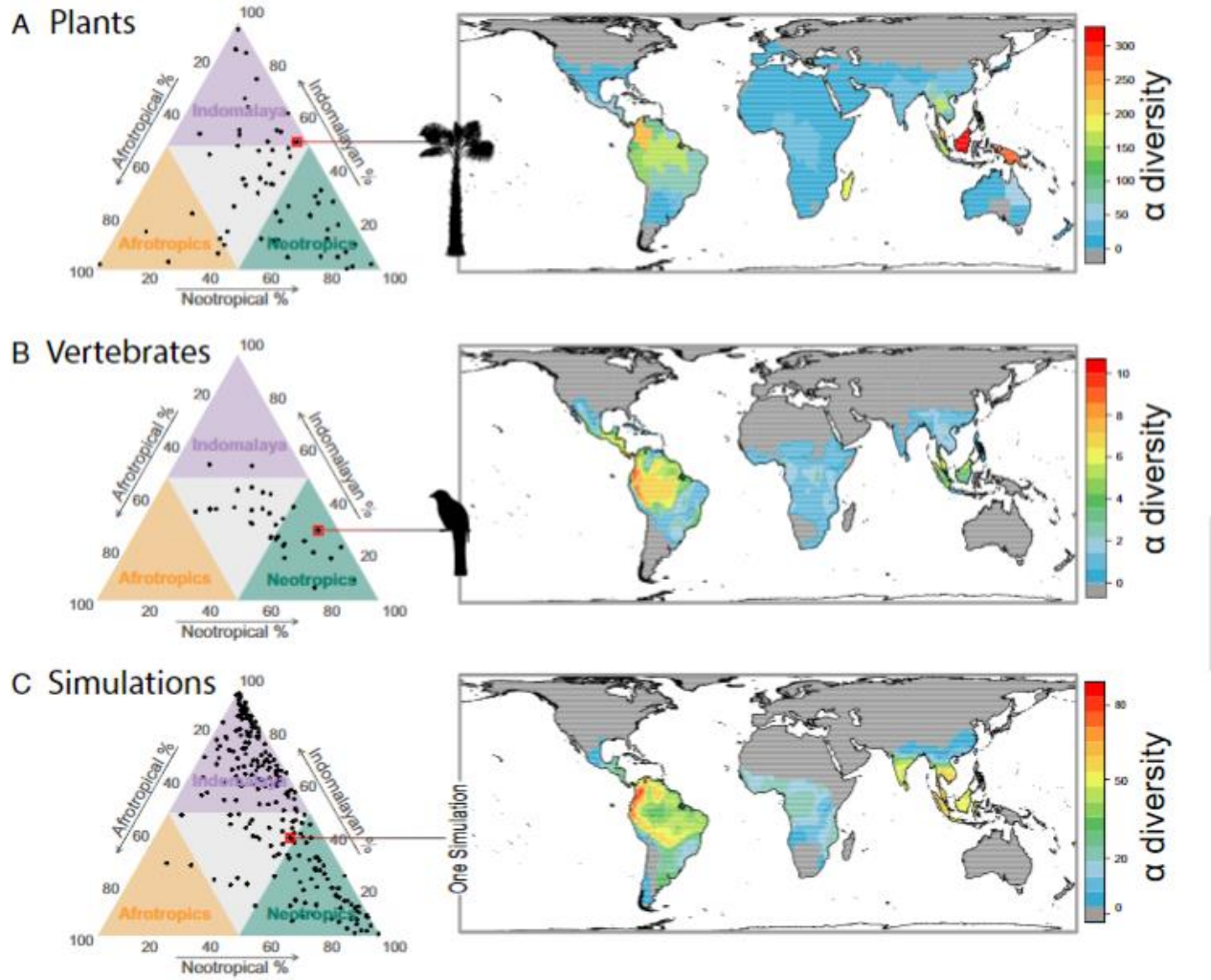
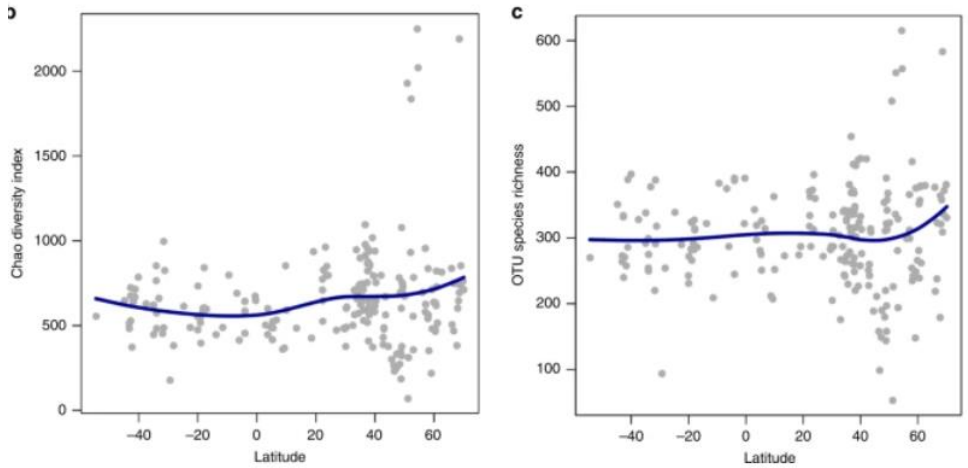
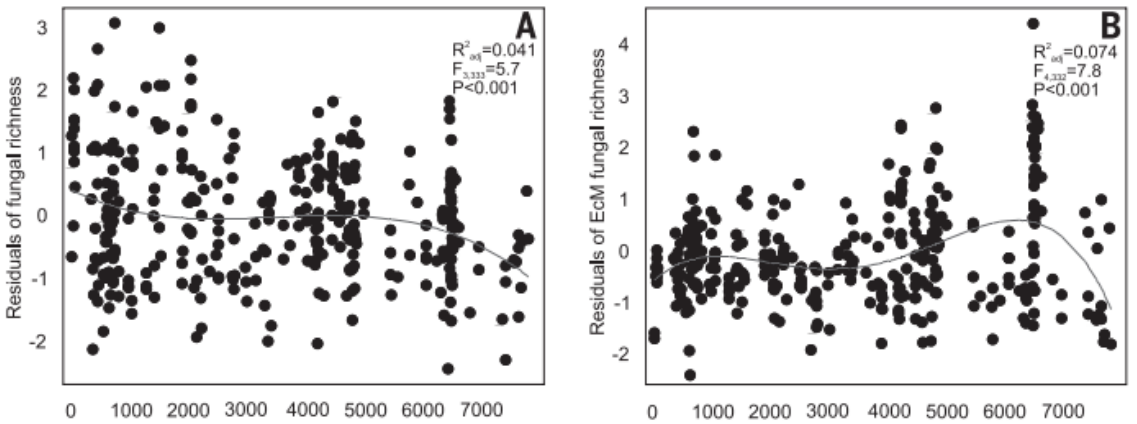
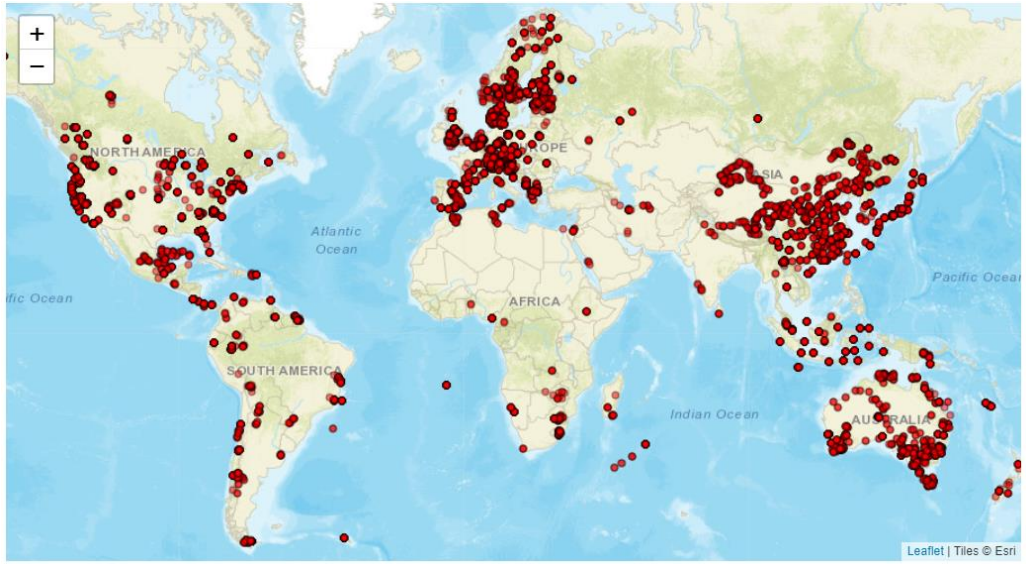


Fig. 1. Evenness of diversity in tropical moist forests across biogeographic regions in pantropically distributed taxa. Ternary plots show the proportions of diversity per clade found in Neotropical, Afrotropical, and Indomalayan tropical moist forests (green, orange, and purple triangles, respectively) for (*A*, *Left*) plant families; (*B*, *Left*) mammal, bird, and amphibian orders and squamate infraorders; and (*C*, *Left*) mechanistic model simulations. Species richness maps highlight examples that show the PDD: (*A*, *Right*) Arecaceae (palms; richness measured across botanical countries), (*B*, *Right*) Trogoniformes (trogons and allies), and (*C*, *Right*) one simulation.

Hagen et al., 2021 - PNAS







Data Descriptor | Open Access | Published: 13 July 2020

GlobalFungi, a global database of fungal occurrences from high-throughput-sequencing metabarcoding studies

Tomáš Větrovský, Daniel Morais, ... Petr Baldrian

Scientific Data **7**, Article number: 228 (2020) | Cite this article

RESEARCH

RESEARCH ARTICLE SUMMARY

Science

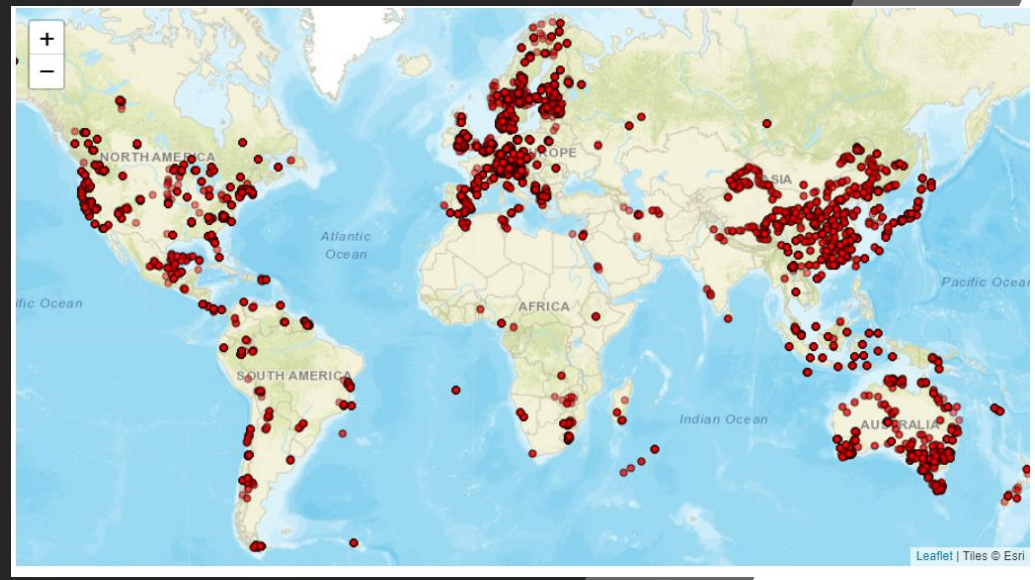
HOME > SCIENCE > VOL. 346, NO. 6213

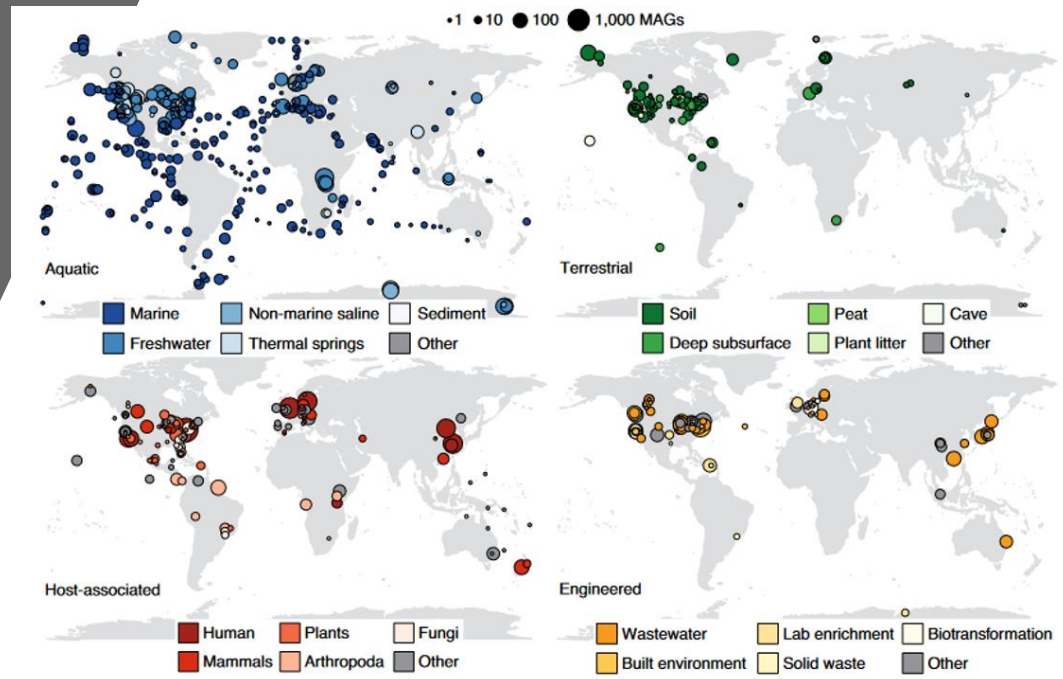
FUNGAL BIOGEOGRAPHY

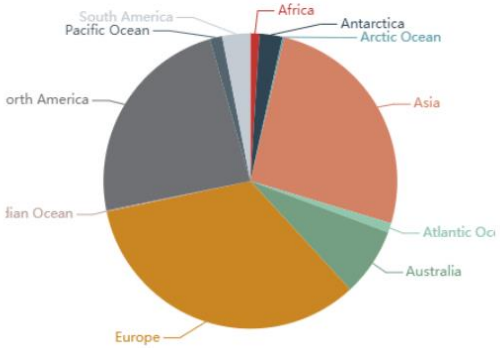
Global diversity and geography of soil fungi

Leho Tedersoo,*† Mohammad Bahram,† Sergei Põlme, Urmas Kõljalg, Nourou S. Yorou,

Sampling effort







nature biotechnology
RESOURCE
https://doi.org/10.1038/s41587-020-0718-6
Check for updates

OPEN

A genomic catalog of Earth's microbiomes

Stephen Nayfach[1], Simon Roux[1], Rekha Seshadri[1], Daniel Udwary[1], Neha Varghese[1],

Data Descriptor | Open Access | Published: 13 July 2020

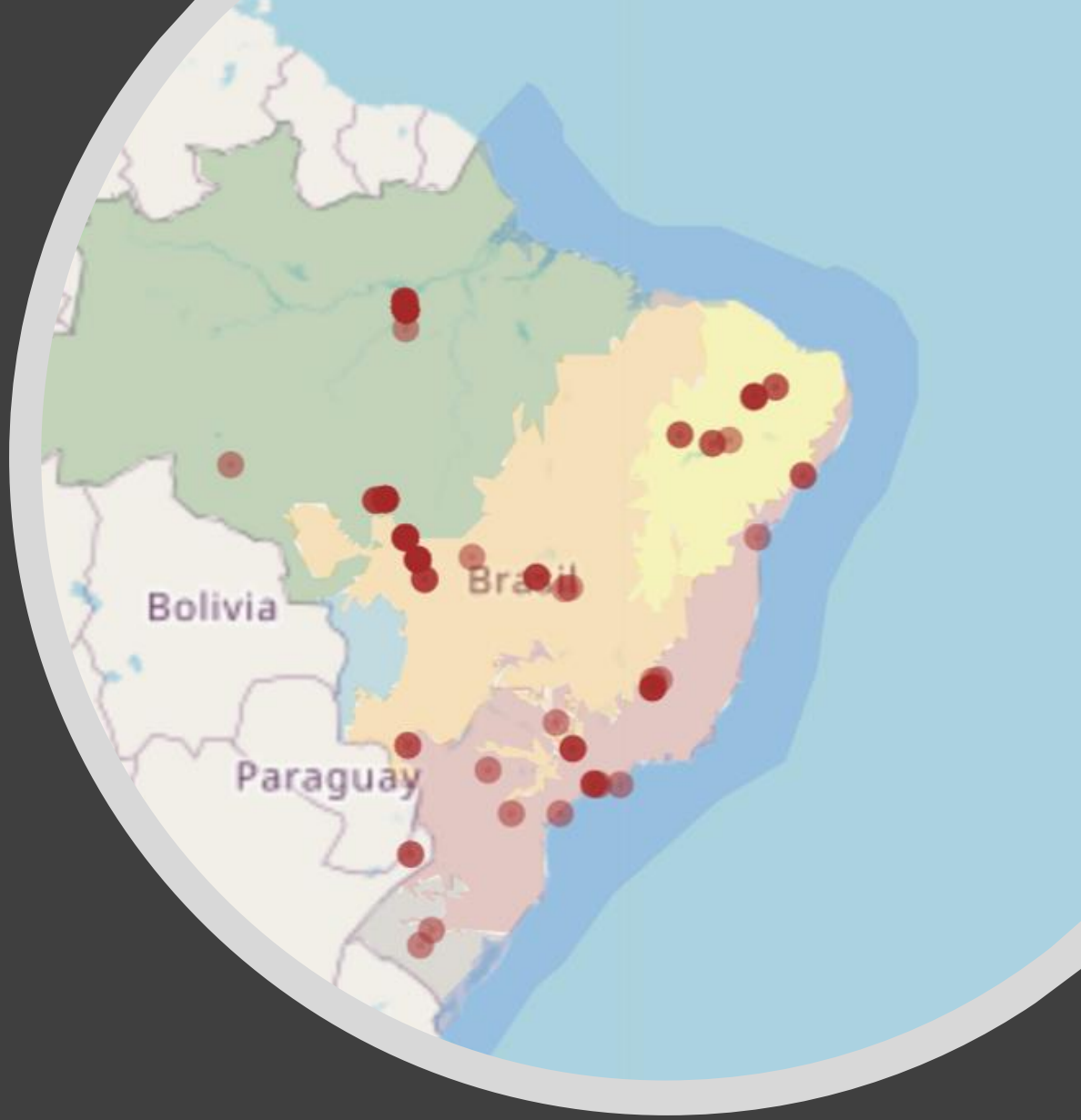
GlobalFungi, a global database of fungal occurrences from high-throughput-sequencing metabarcoding studies

Tomáš Větrovský, Daniel Morais, ... Petr Baldrian + Show authors

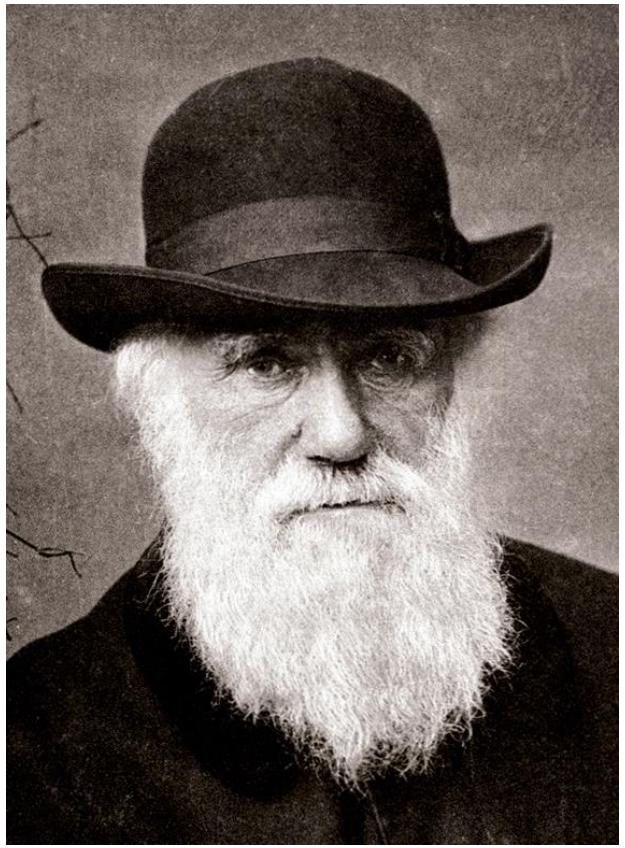
Scientific Data **7**, Article number: 228 (2020) | Cite this article

Current Soil Microbiome Data

- 315 samples and 94 sites
- High definition information about:
  - pH
  - Soil carbon content
  - Water content
  - Soil texture
- Data taken from MG-RAST and SRA, using the Terrestrial Metagenome DB and filters at the DB websites



Why Brazil as the main sampling effort

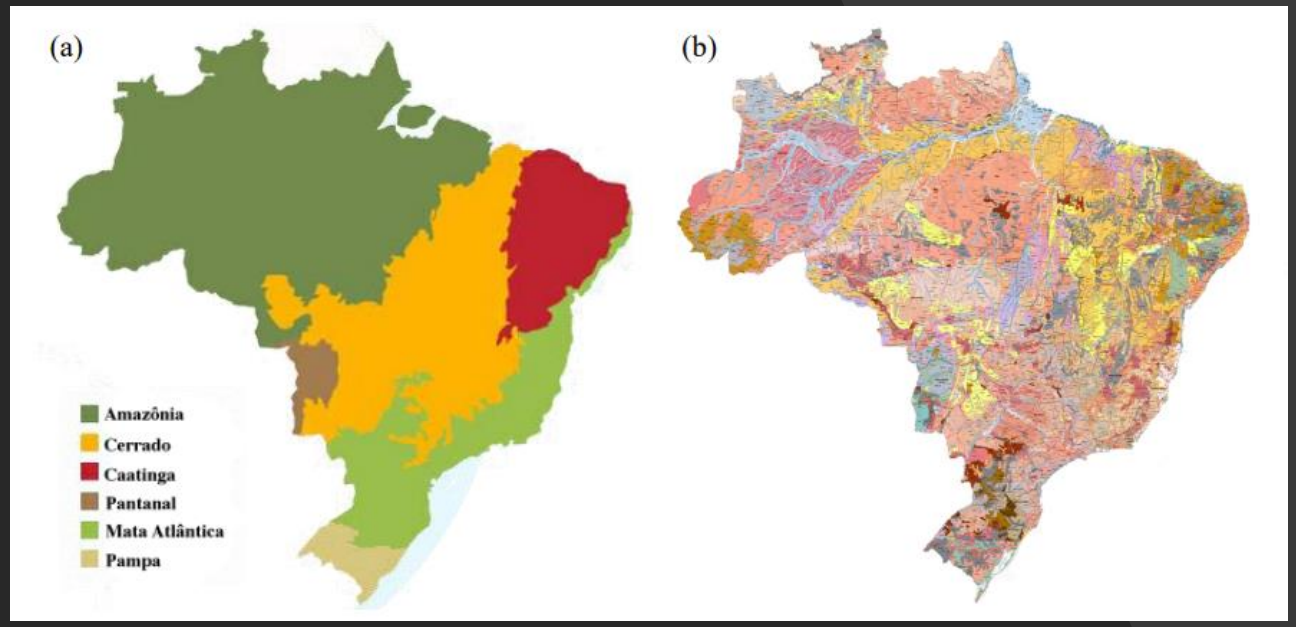


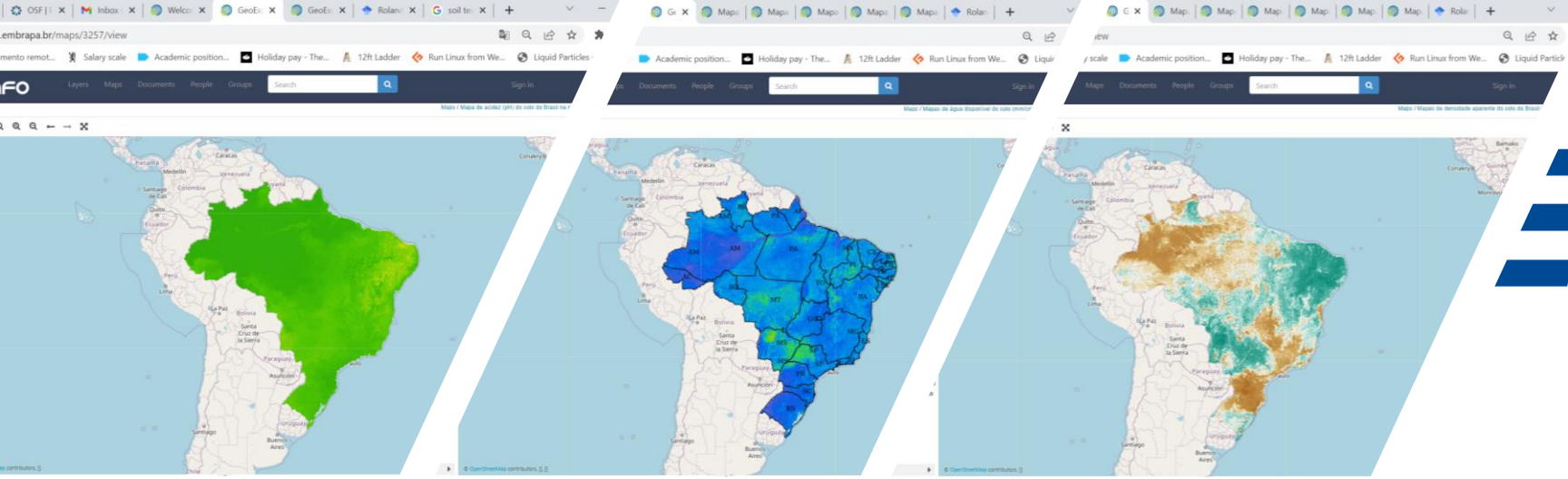
In England any person fond of natural history enjoys in his walks a great advantage, by always having something to attract his attention; but in these fertile lands teeming with life, the attractions are so numerous, that he is scarcely able to walk at all.

Charles R. Darwin, 19 Apr. 1839,
after leaving Brazil on board of HMS Beagle.

Unique climatic and geologic conditions

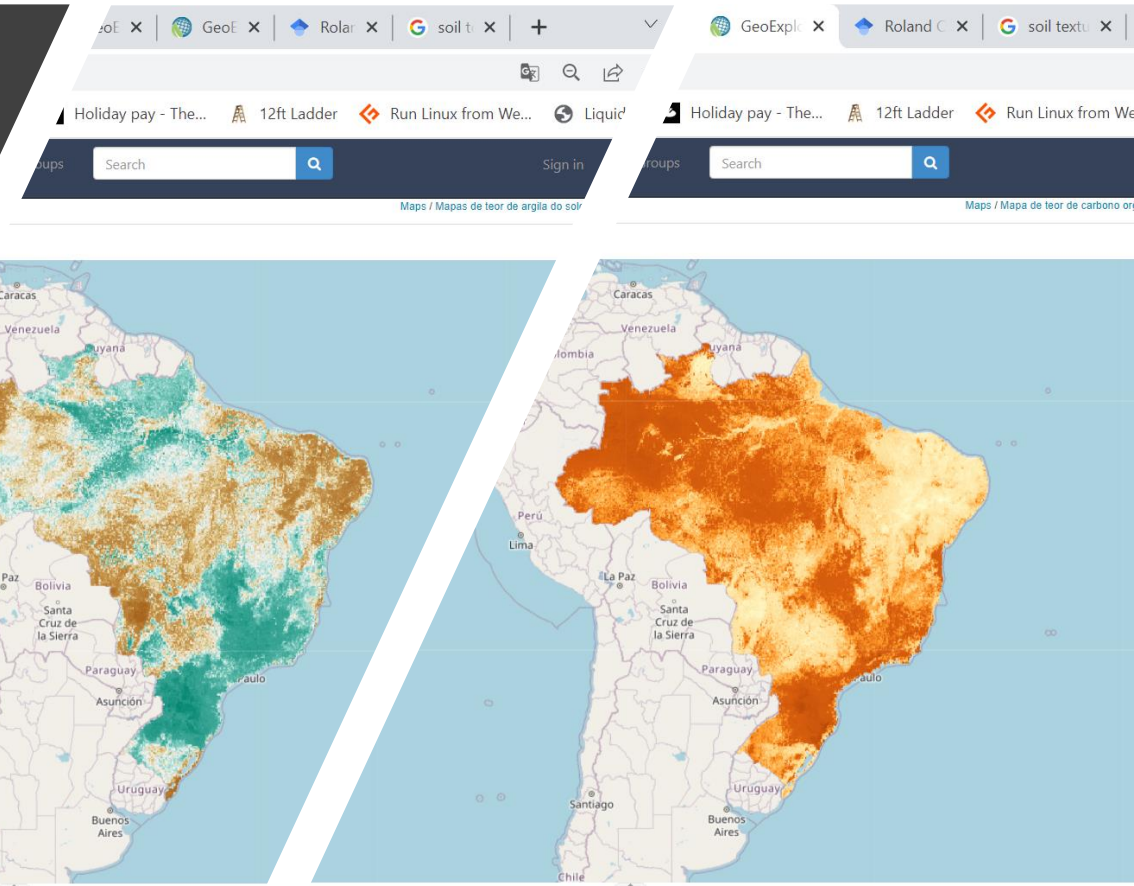
- Latossol is the most prevalent soil in Brazil
  - Highly weathered soils
  - Distrofic
  - Acidic
  - Low fertility
- We have a desert in formation right now in Brazil
- Until the 60’s the Brazilian Savanas were considered impossible to grow crops and nowadays is where most of Brazilian agricultural production is concentrated
- High precipitation and mean annual temperature favour the weathering processes
- We are rapidly losing our natural environments due to improper or ilegal agricultural practices





- Soil Bulk Density
- Soil Water Availability
- Soil Texture
- Soil Acidity
- Soil Organic Carbon Stocks

http://geoinfo.cnps.embrapa.br/

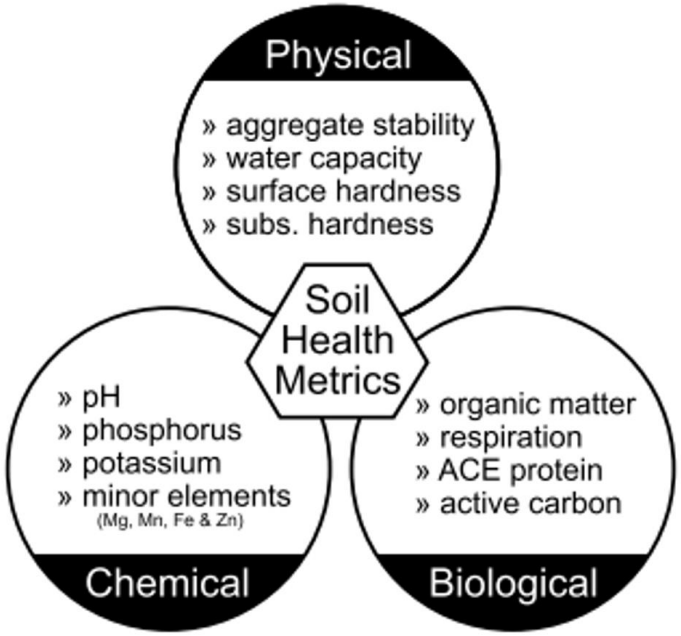


Trends in Food Science & Technology
Volume 107, January 2021, Pages 195-200

Artificially intelligent soil quality and health indices for 'next generation' food production systems.

Vinícius Henrique Gomes Zuppa de Andrade [a], Marc Redmile-Gordon [b], Bruno Henrique Groenner Barbosa [c], Fernando Dini Andreote [d], Luiz Fernando Wurdig Roesch [e], Victor Satler Pylro [a, f, g]

Prediction of Soil Health



Contents lists available at ScienceDirect

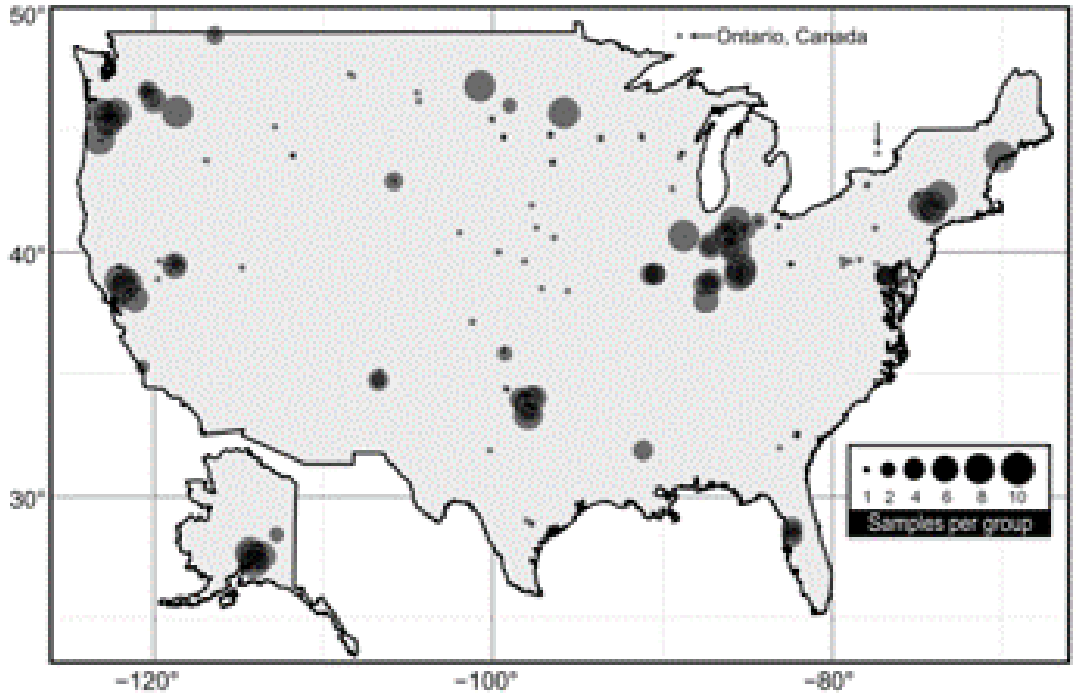
Soil Biology and Biochemistry

journal homepage: www.elsevier.com/locate/soilbio

Predicting measures of soil health using the microbiome and supervised machine learning

Roland C. Wilhelm, Harold M. van Es, Daniel H. Buckley *

School of Integrative Plant Science, Bradfield Hall, Cornell University, Ithaca, NY, 14853, USA



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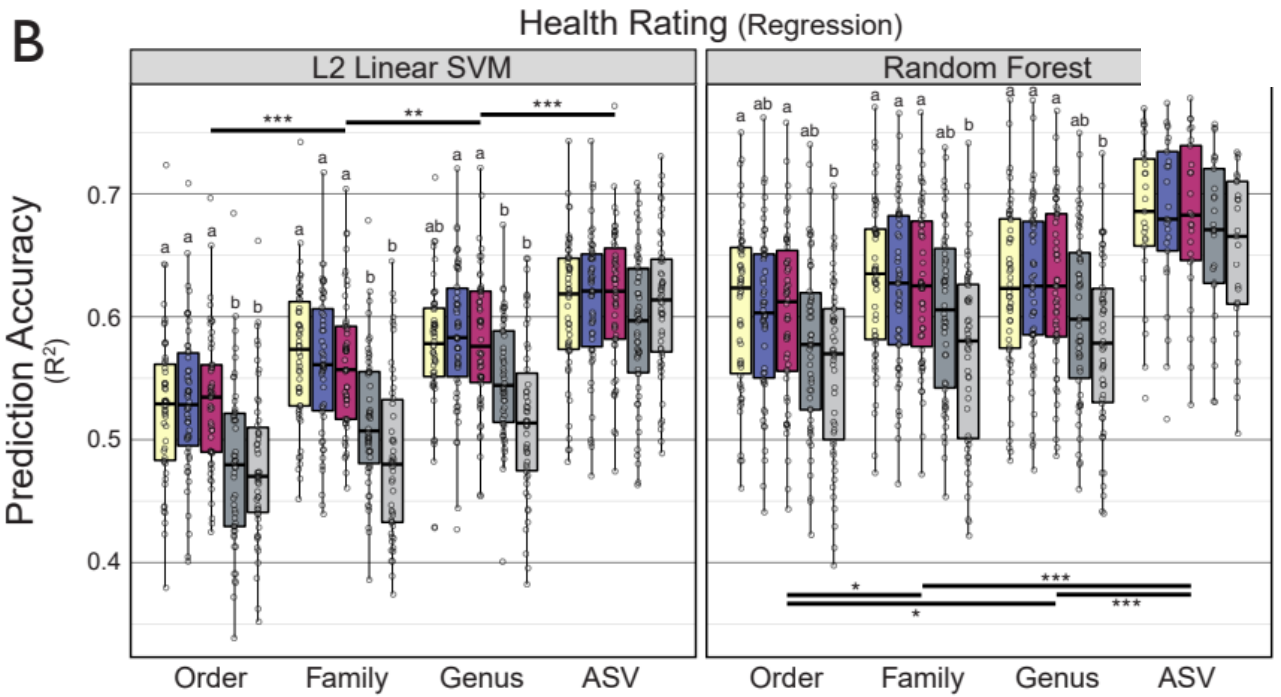

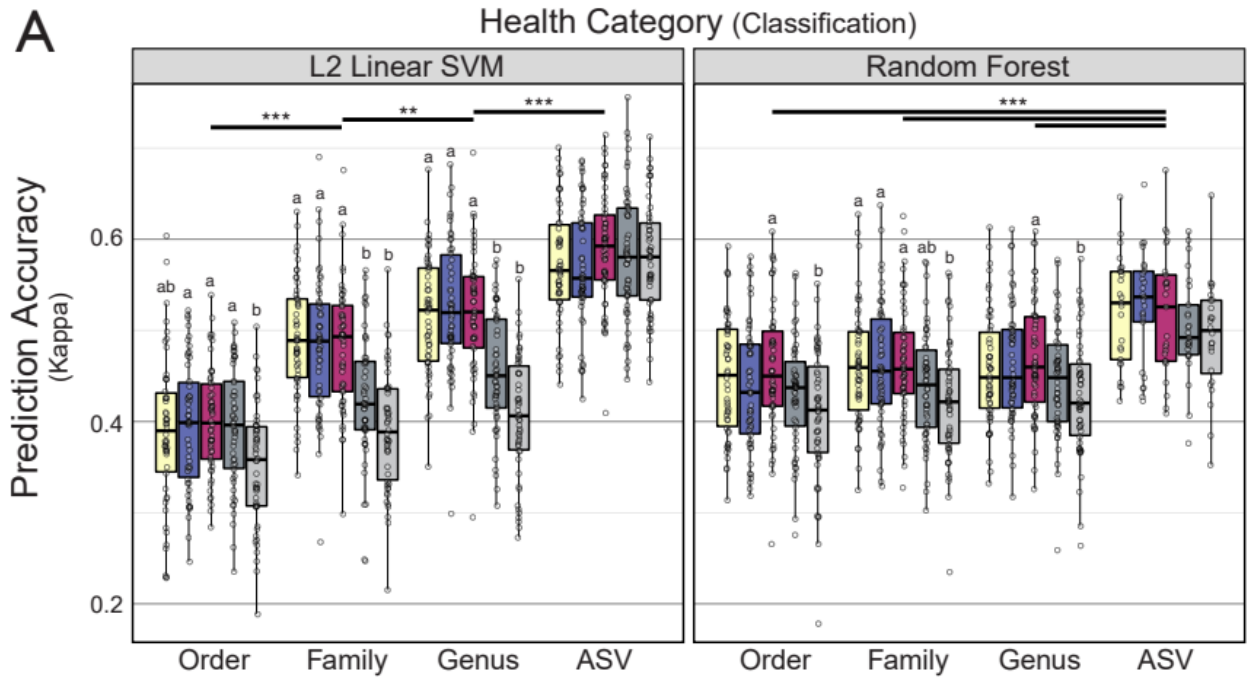

Global trend

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CONSUMER TRENDS

Regenerative Agriculture To Expand Across North Dakota and Beyond

Words by Mary Riddle

DEC 05, 2022

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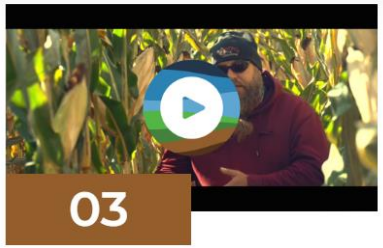
Register

Foundations of Soil Health

This module provides the basics of soil health principles and how you can use them in your business.

Protecting the Soil

CCAs discuss how to reduce erosion, manage residue, and improve soil structure.



Building the Soil

CCAs share their experience on managing rotations, incorporating cover crops, and increasing diversity.

Looking Ahead

CCAs show real world examples and get creative with implementing soil health practices.

Global Trend

Healthy Soil: Why And How To Invest In This Sustainable Opportunity

Walter Schindler Forbes Councils Member
Forbes Business Council COUNCIL POST | Membership (Fee-Based)

Oct 23, 2020, 09:40am EDT

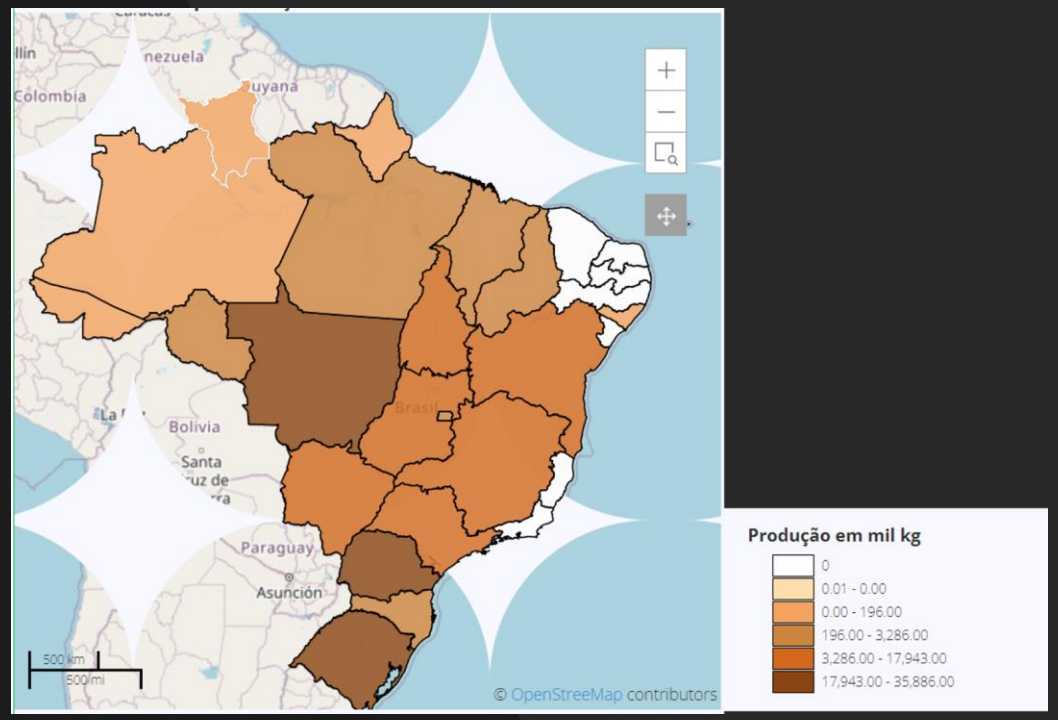
Good Soil Is Gold For Businesses

To best support healthy soil, the implementation of holistic and integrated agricultural practices requires an estimated $700 billion net capital expenditure over the next 30 years. However, some predict that this investment in climate-smart agriculture could generate about $10 trillion in net financial return.

Microbiome of Brazilian soils

- To map the soil microbiological diversity
- Understand how anthropic activity degrade soil quality (conversion forest x crop)
- Create a new soil quality index
- Identify alteration patterns in the main Brazilian Biomes

Collection of samples and creation of a predictive database



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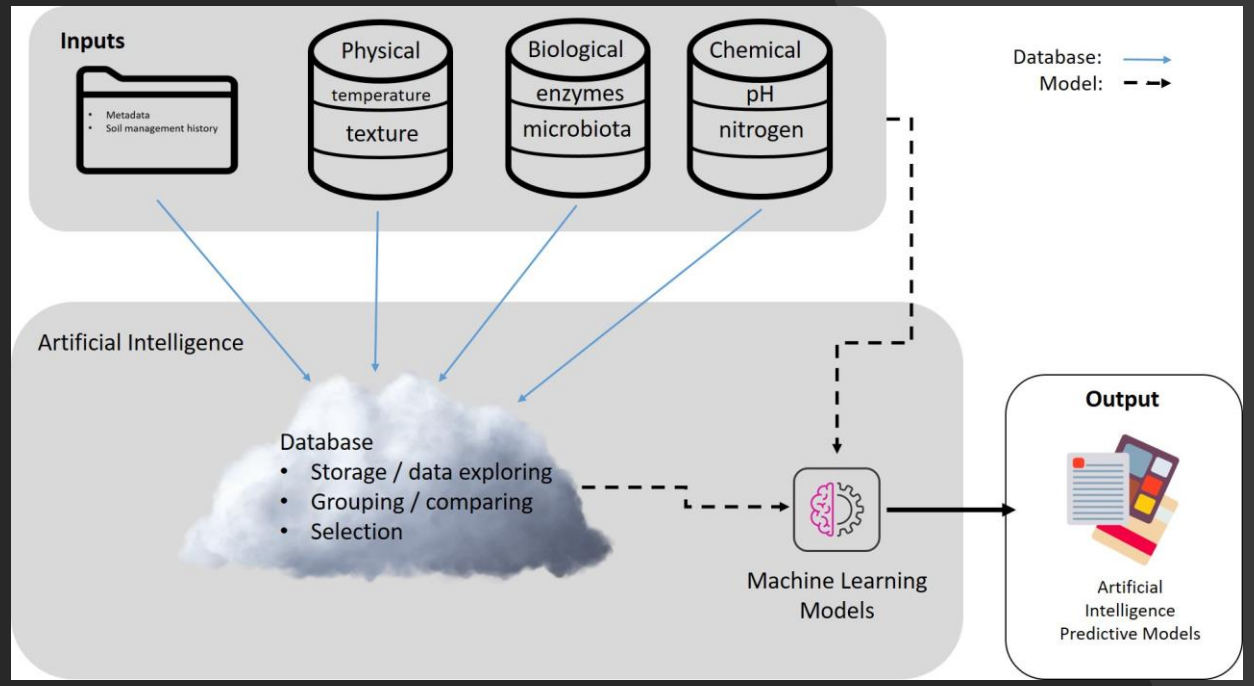

Lets Dig Neotropical Soil Treasures!

Team

Dr. Ricardo Harakava
Brazil

Dr. Victor Pylro
Brazil

Dr. Iñaki Odriozola
Basque Country

Dr. Fernando Andreote
Brazil

Dr. Marc Redmile-Gordon
United Kingdom

Dr. Alessandra Kosovits
Brazil

Dr. Luiz Roesch
United States

Dr. Tomáš Větrovský

Dr. Petr Baldrian
Czech Republic