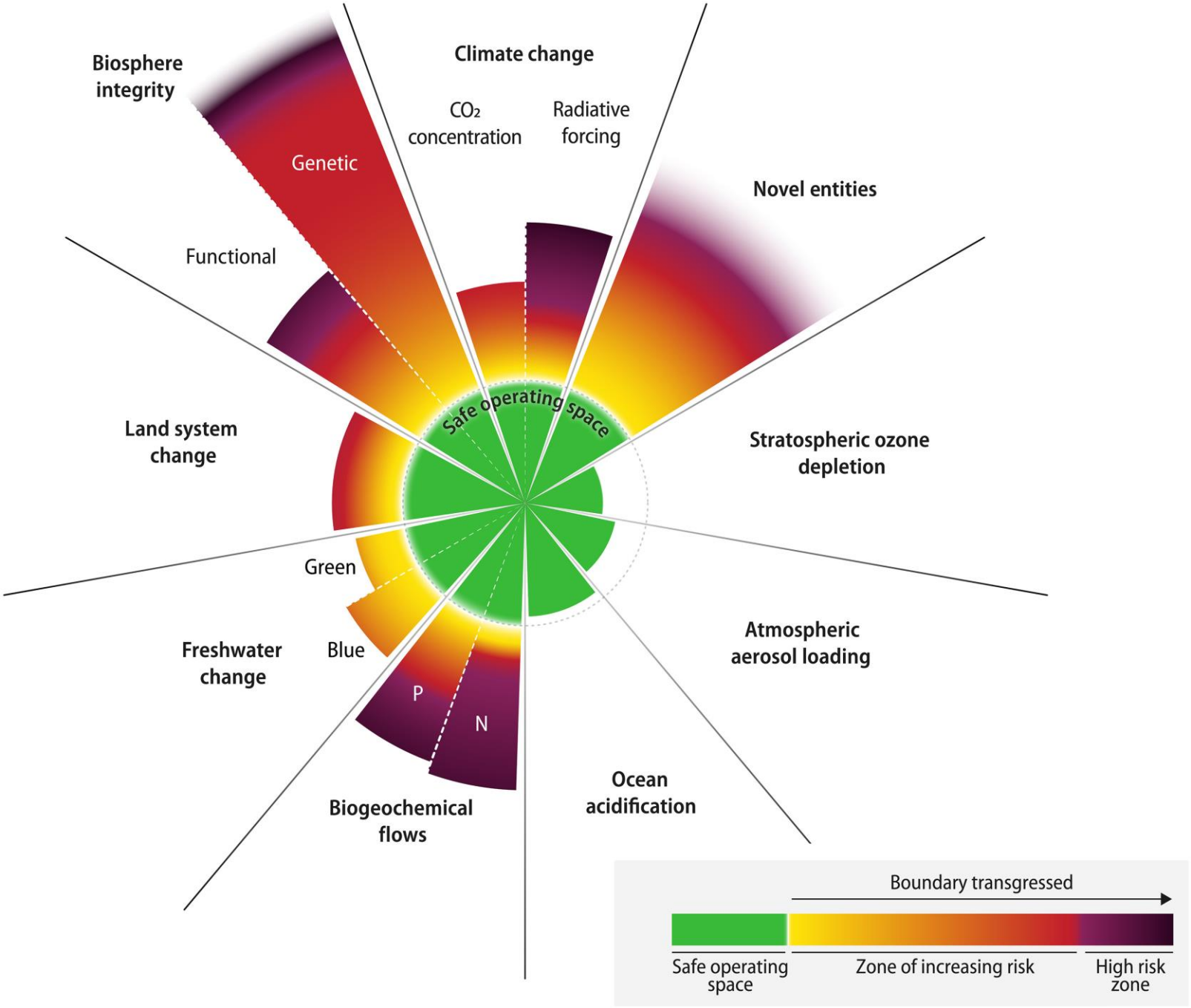
COSTA RICA
REGENERATIVA

Building a prosperous and abundant future through regeneration

Eduard Müller
Rector

UCI
Universidad para la Cooperación Internacional



Updated Planetary Boundaries

(Figure from Wang-Erlandsson et al, 2022)

Safe operating space for humanity

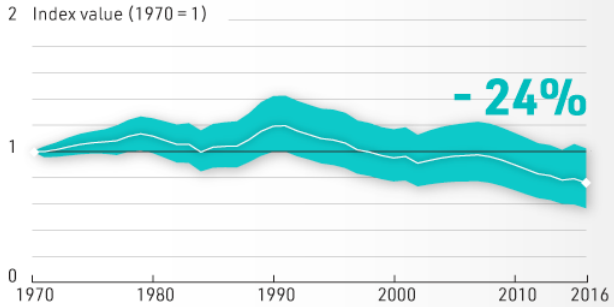
Anthropocene

VISUALIZING THE REGIONAL DECLINE OF EARTH'S BIODIVERSITY

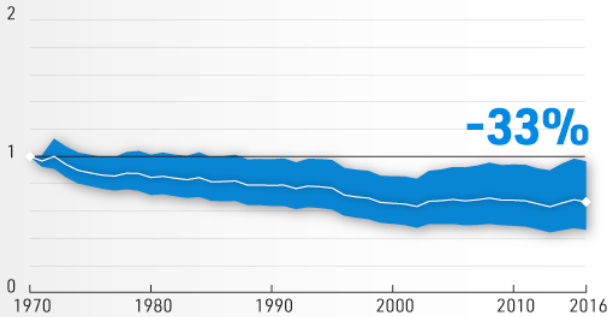
The Living Planet Index (LPI) tracks the abundance of mammals, birds, fish, reptiles, and amphibians across the globe.

Between 1970 and 2016, vertebrate population sizes dropped by **68%** on average worldwide. However, this rate of this loss varies from region to region.

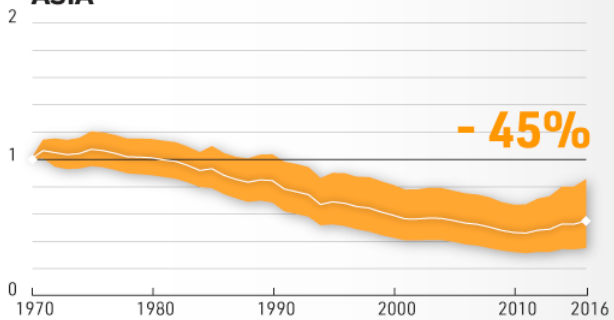
EUROPE



NORTH AMERICA

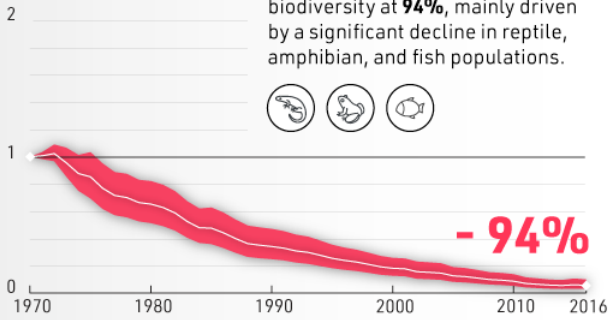


ASIA

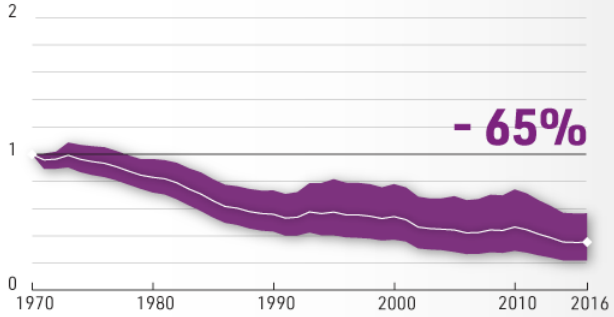


LATIN AMERICA & CARIBBEAN

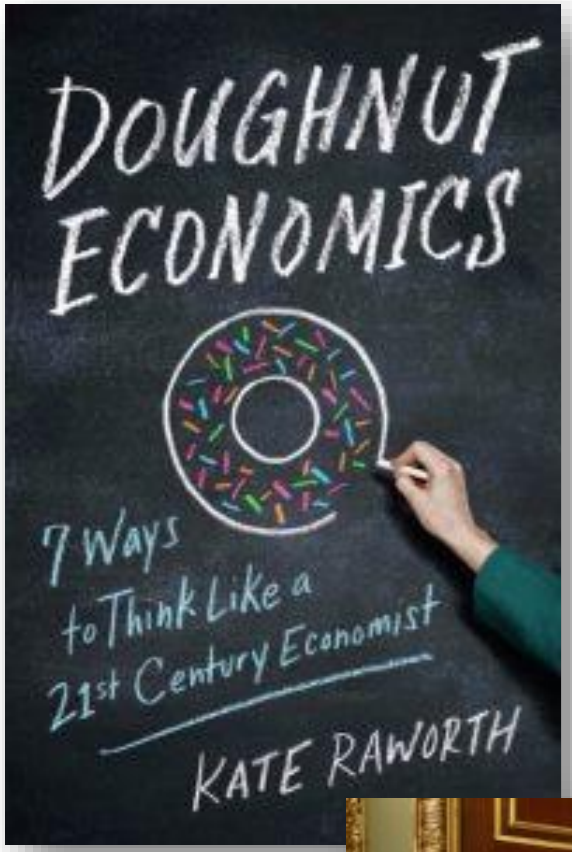
Latin America & Caribbean has seen the largest drop in biodiversity at **94%**, mainly driven by a significant decline in reptile, amphibian, and fish populations.

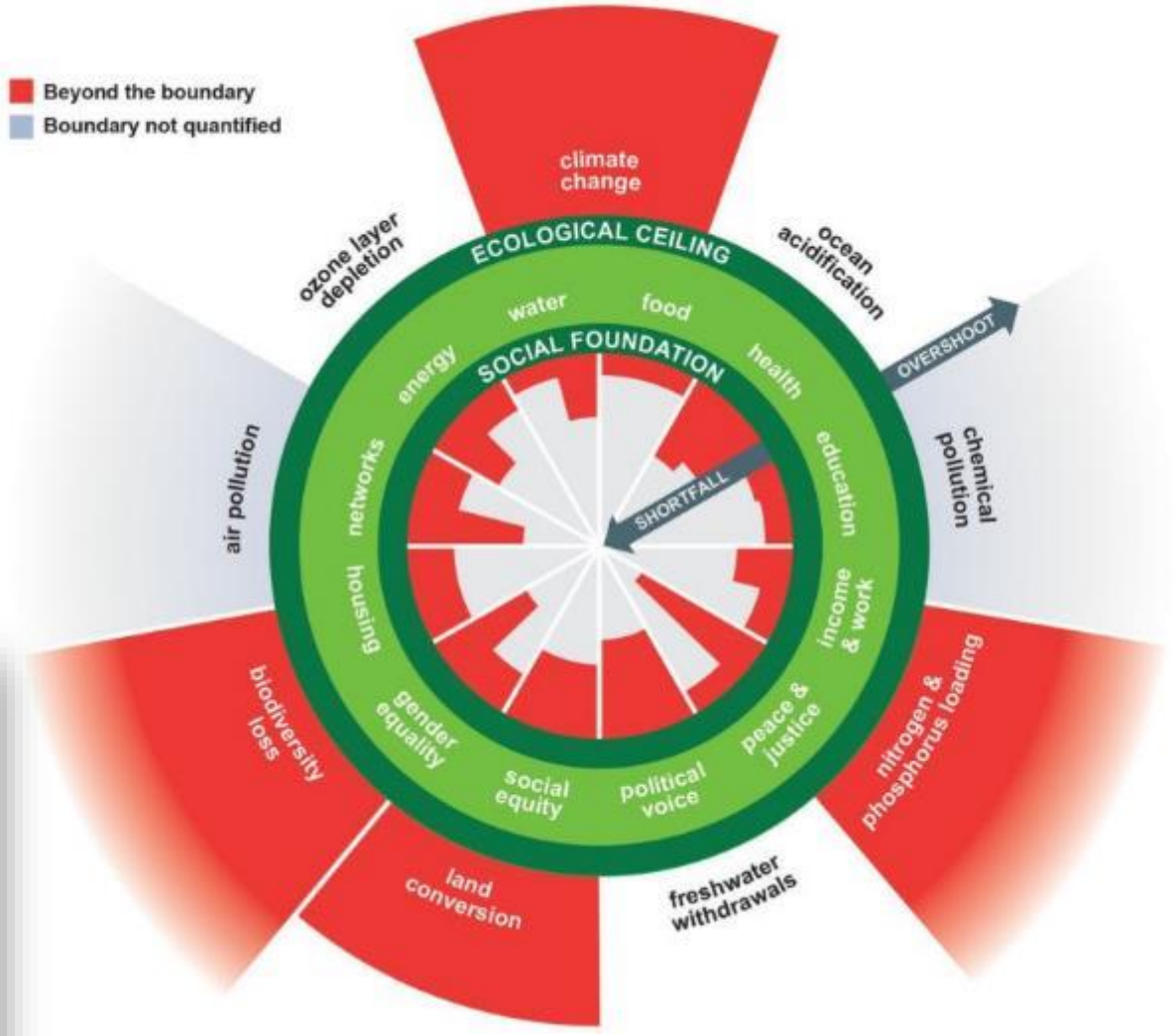


AFRICA



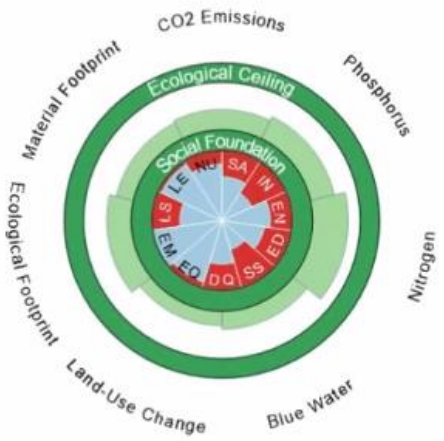
Source: Living Planet Report 2020


DOUGHNUT ECONOMICS
7 Ways to Think Like a 21st Century Economist
KATE RAWORTH


Beyond the boundary
Boundary not quantified
climate change
ozone layer depletion
ocean acidification
chemical pollution
air pollution
biodiversity loss
land conversion
freshwater withdrawals
nitrogen & phosphorus loading
ECOLOGICAL CEILING
SOCIAL FOUNDATION
OVERSHOOT
SHORTFALL
water
food
health
education
income & work
peace & justice
political voice
social equity
gender equality
housing
networks
energy

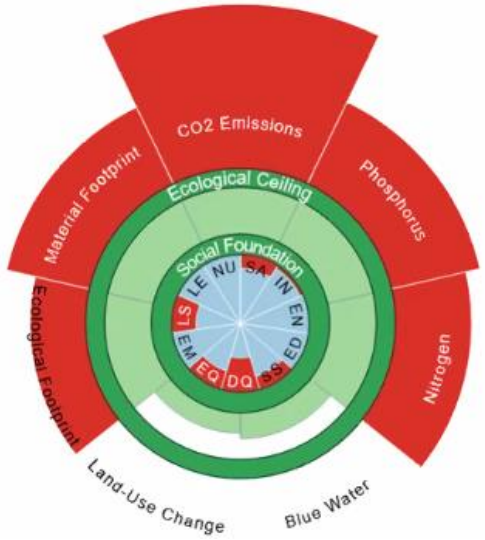
A Good Life For All Within Planetary Boundaries

Bangladesh



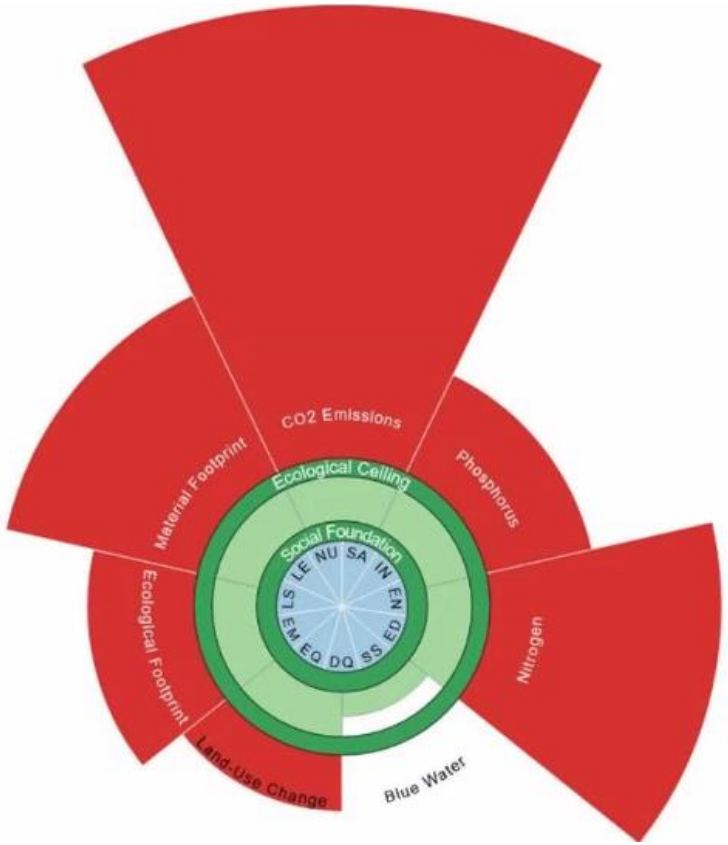
$5,100 pc

China



$17,200 pc

Norway



$44,300 pc

Best scientifically documented planetary extinction…

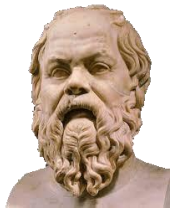
Data ➡ Information ➡ Knowledge ➡ **Wisdom?**

In 2017 we produced the same amount of data as what was produced up to 2016.

Challenge #1: Humans and Nature or Humans are Nature?

Challenge #2

The reductionist approach of Western science and education!



399 BC

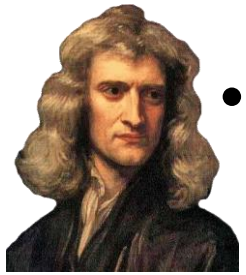
- Socrates – Plato: Hypothesis, and one answer.

322 BC

- Aristotle - Logic: True or false.

1650

- Descartes: material and spiritual realms are disconnected.



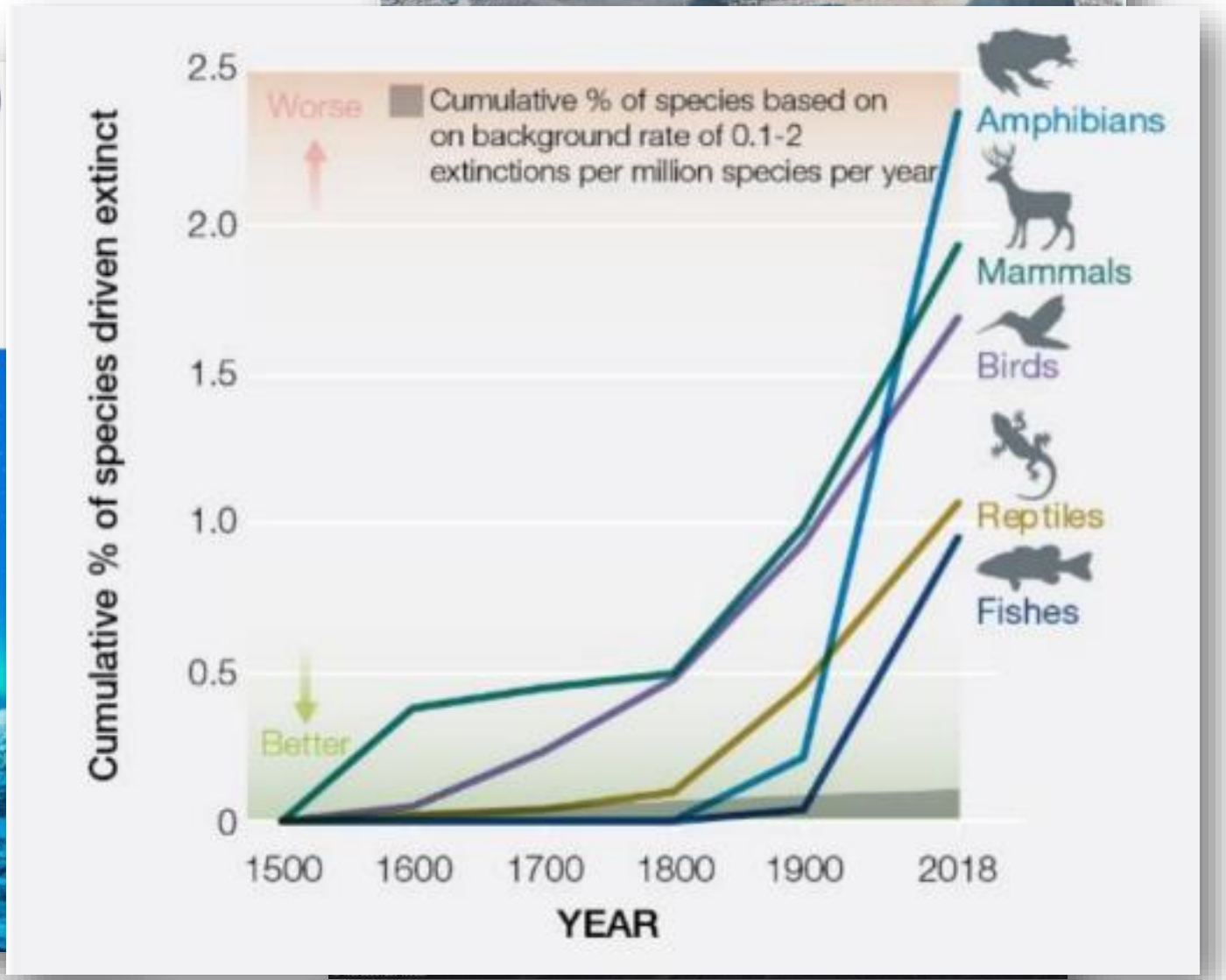
1727

- Isaac Newton: interactions are limited to forces exerted between the bodies.

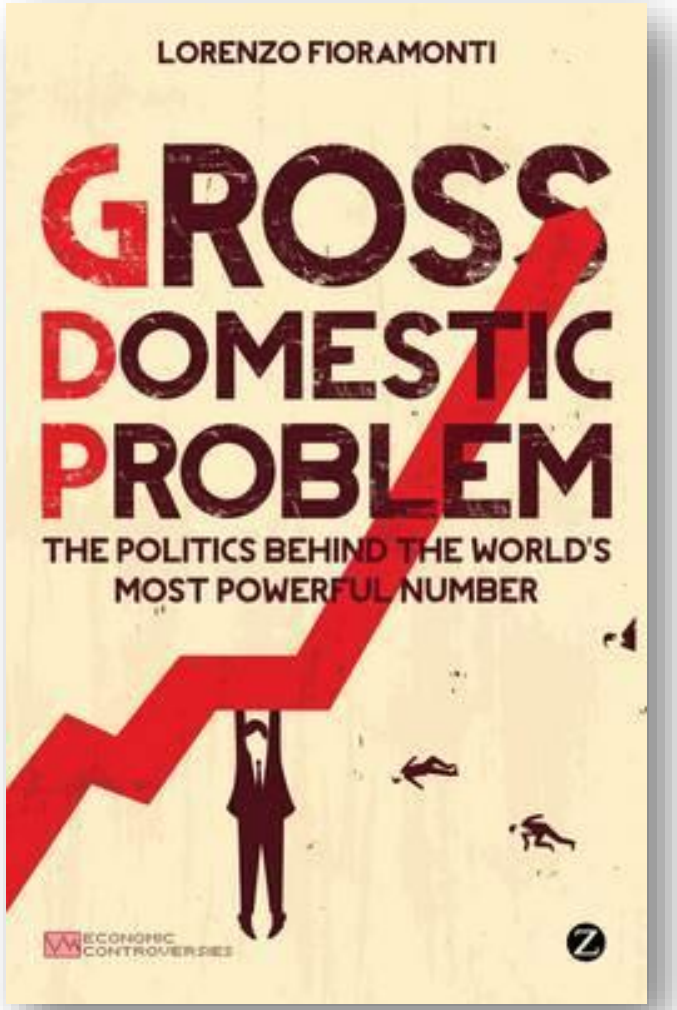
Challenge #3: Exponential changes

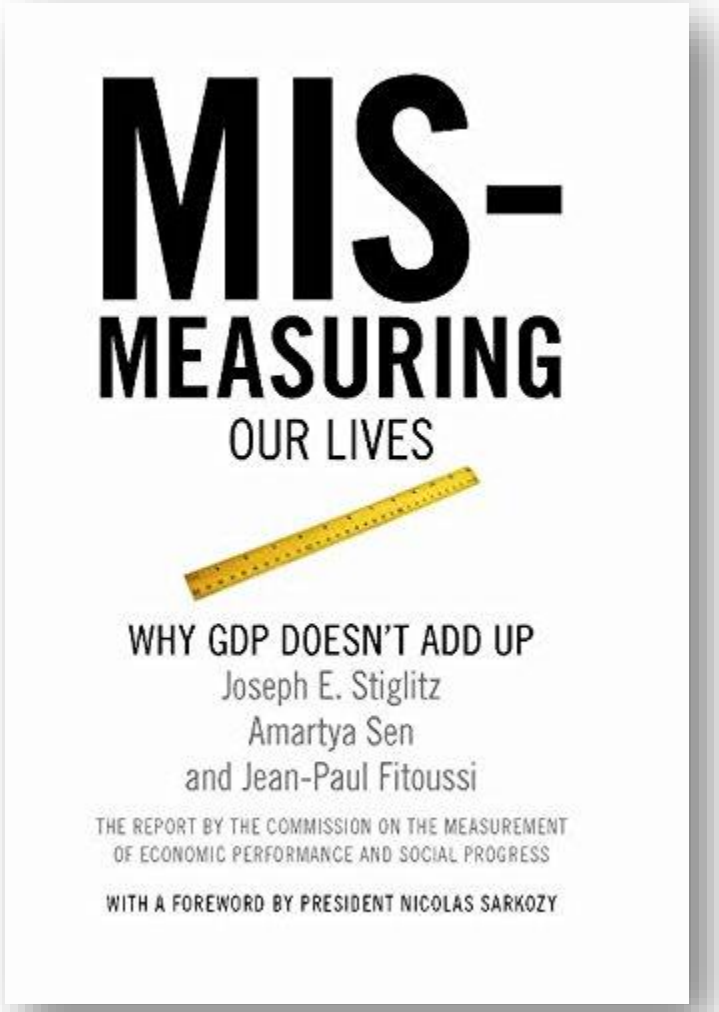
Hot poles: Antarctica, Arctic 40 and 30 degrees Celsius above normal

by Seth Borenstein



Challenge #4: Wide acceptance of wrong methods





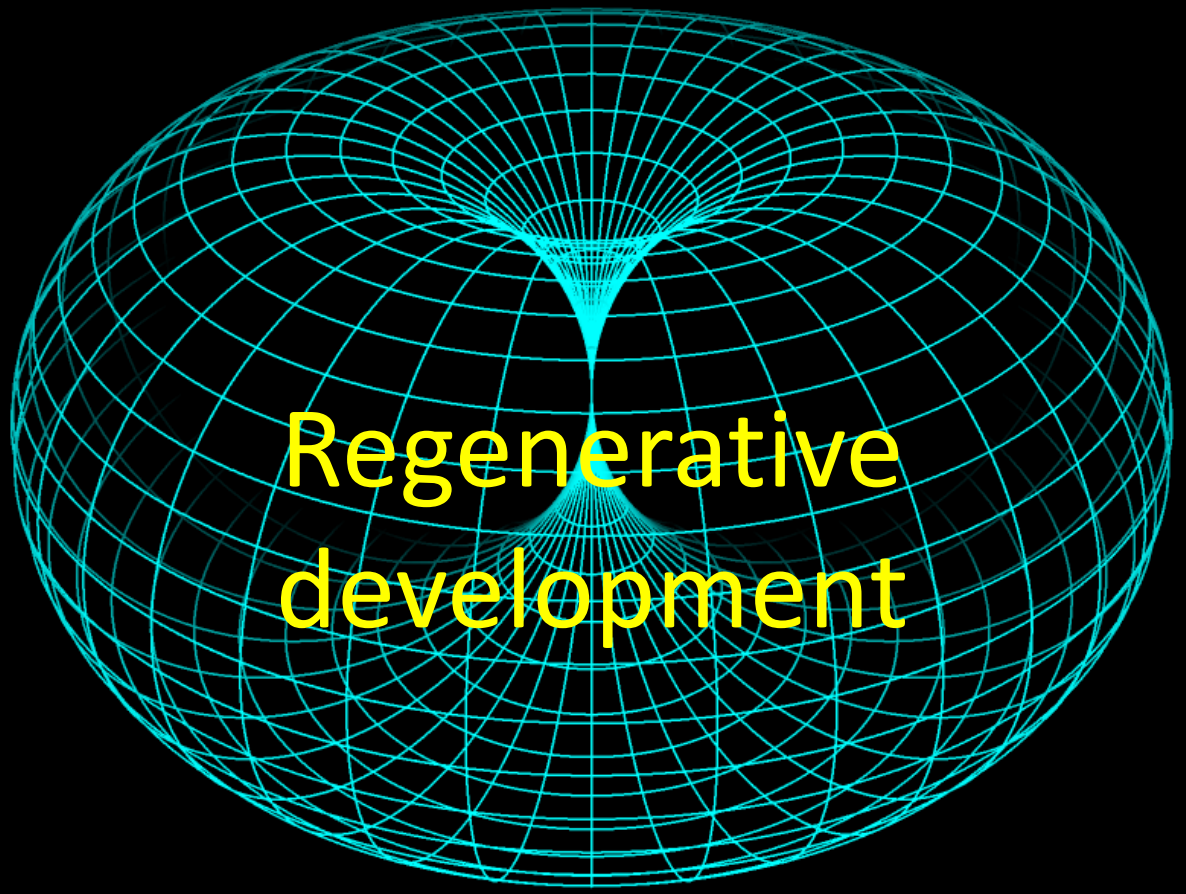
Challenge #5: Unlearning

Conceptual framework
E. Müller 2008 - 2016

Spirituality
ethics, values, compassion, mindfulness

Politics
Youth, young women, transparency, good for all

Economy
Regenerative, wellbeing, inclusion, for all life forms



Culture
Identity, feminine principle, equality

Society
Self determination, active participation

Mother Earth
Ecosystems – biodiversity
Functional landscapes and seascapes

Toroid: Wolfgang W. Daeumler


Mother Nature's Wisdom
We are nature
Functional biomimicry

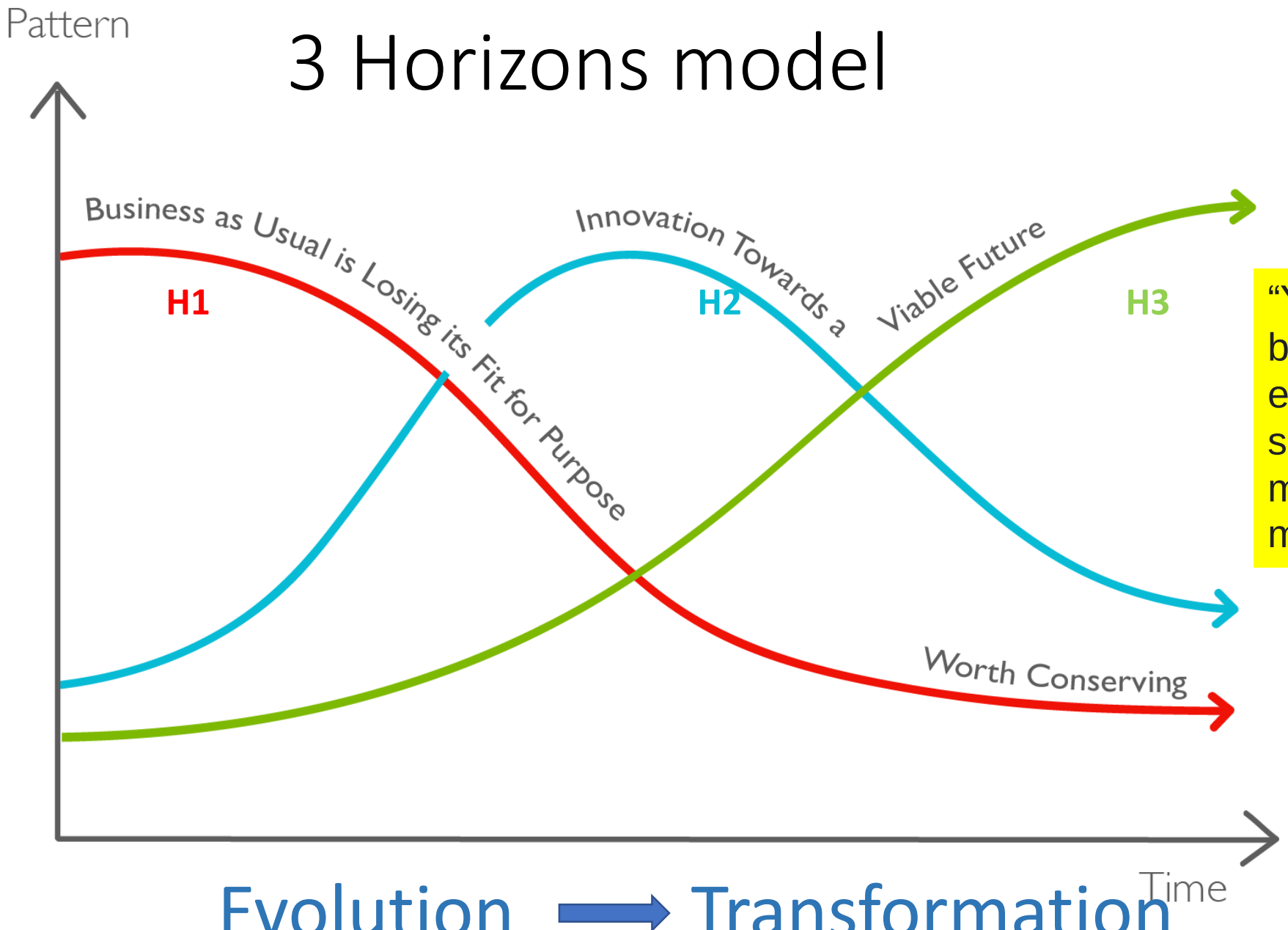
We build the future we want!

Regenerate Costa Rica

UCI
University for International Cooperation

COSTA RICA REGENERATIVA

3 Horizons model



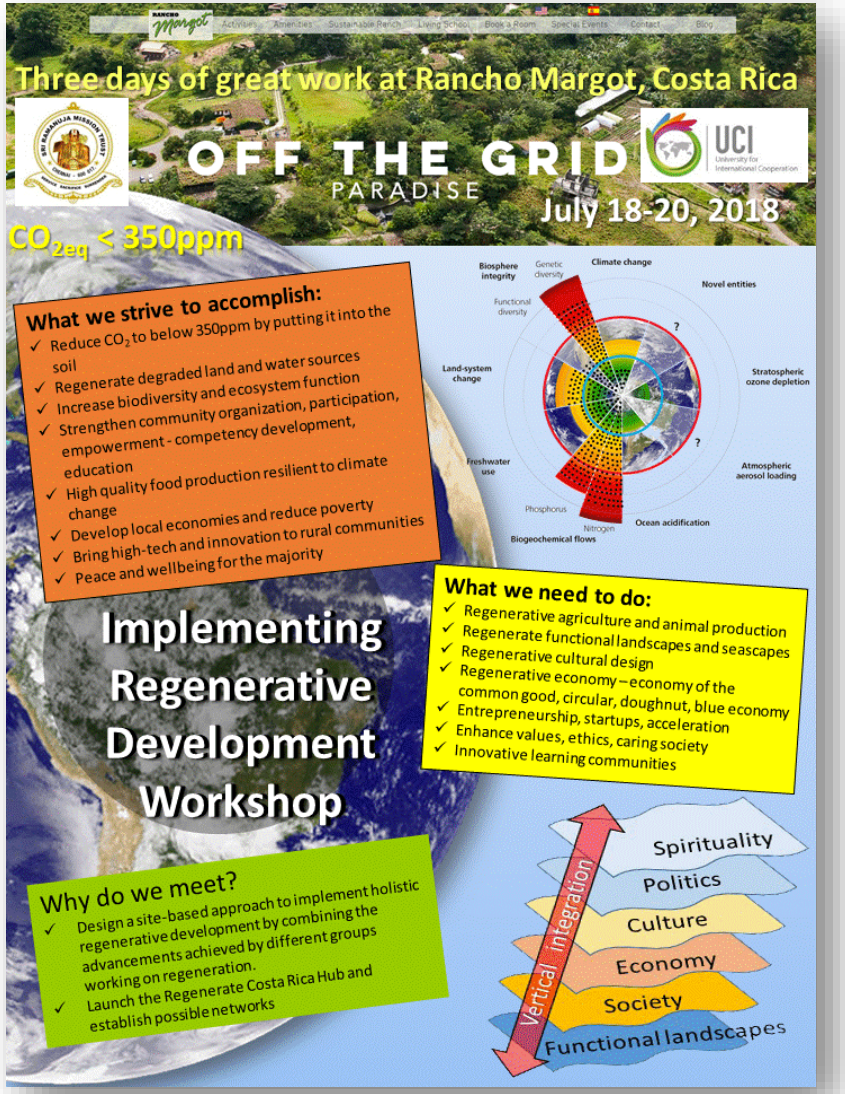
Regeneration

"You never change things by **fighting** against the existing reality. To change something, build a new model that makes the old model **obsolete**." B. Fuller

Evolution ⟶ Transformation

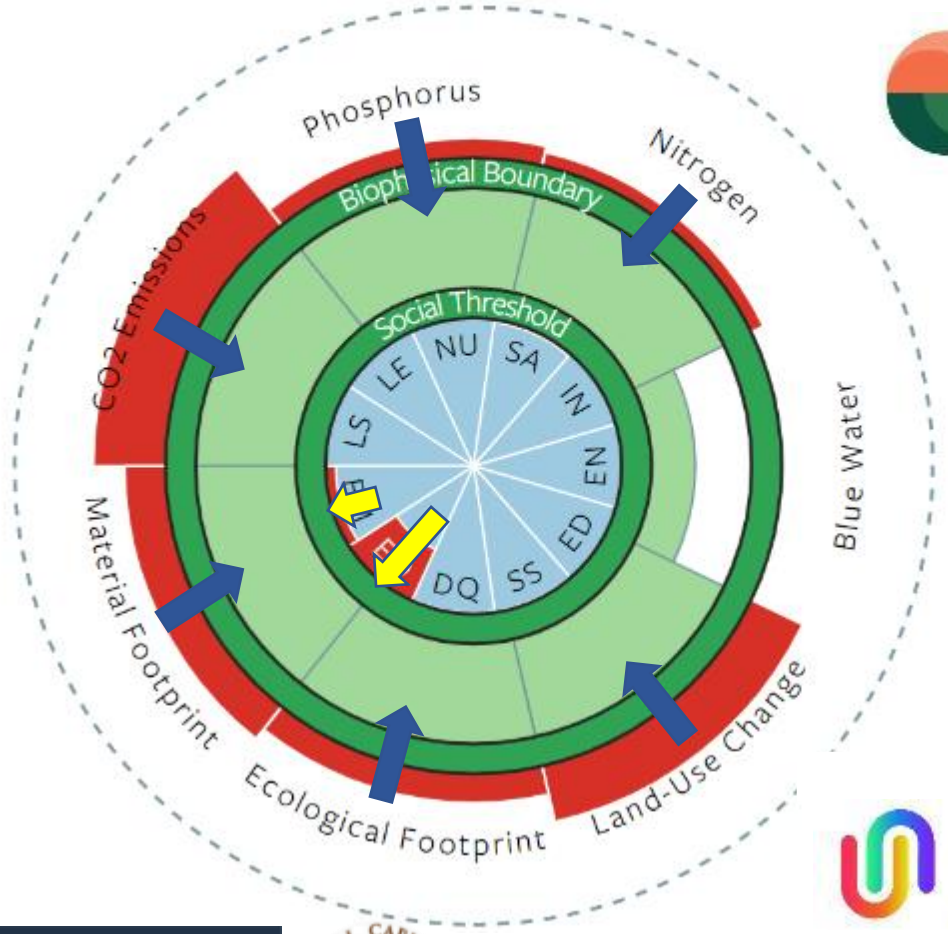
H3Uni.org

From theory to action!



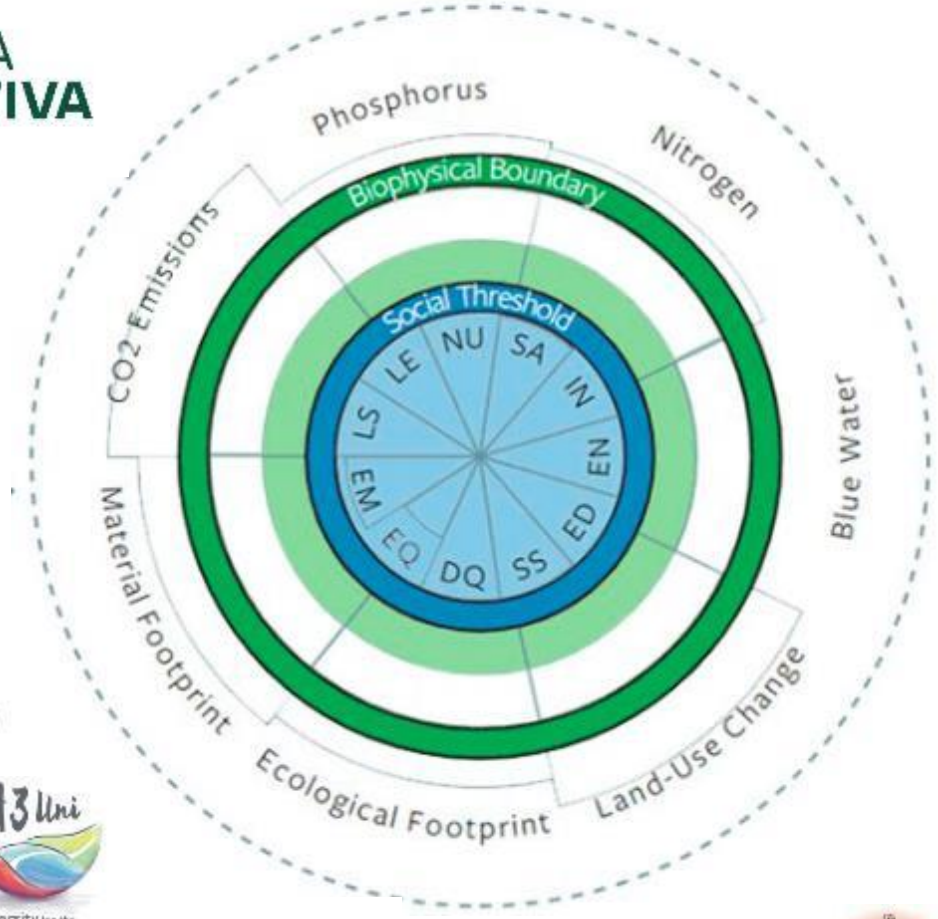
COSTA RICA REGENERATIVA

Costa Rica



COSTA RICA REGENERATIVA

Ideal doughnut



UCI Universidad para la Cooperación Internacional

UBIQUITY UNIVERSITY

H3 Uni a university for the third horizon

REGENERATIVE COMMUNITIES NETWORK

NATURAL CAPITALISM SOLUTIONS

Savory

WELLBEING ECONOMY ALLIANCE

THE CARBON UNDERGROUND

SEEDS

Earth Charter Initiative

NATURAL PACT

COMMON EARTH

BRAVE EARTH

BLUE MARBLE EVALUATION

REGENERATIVE EARTH

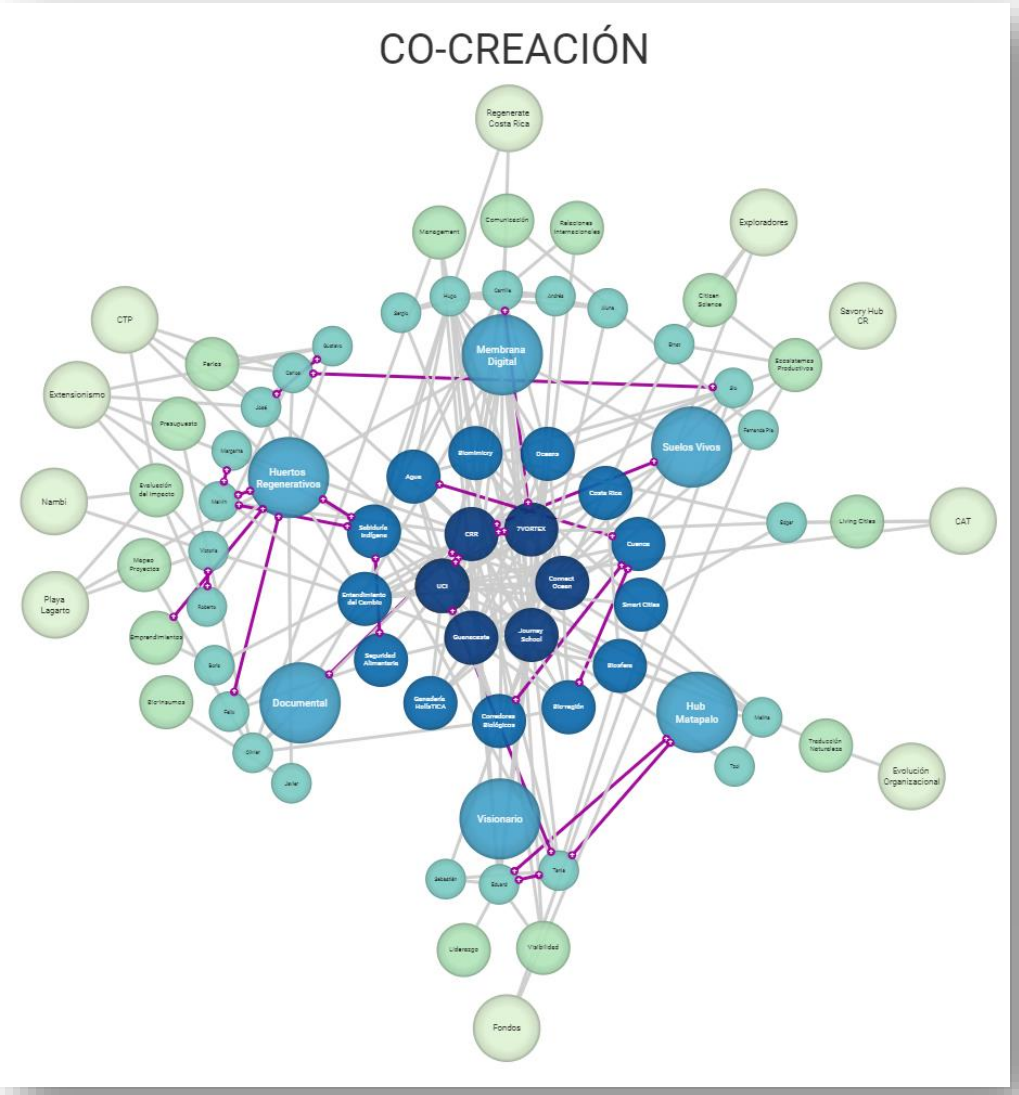
CAPITAL INSTITUTE

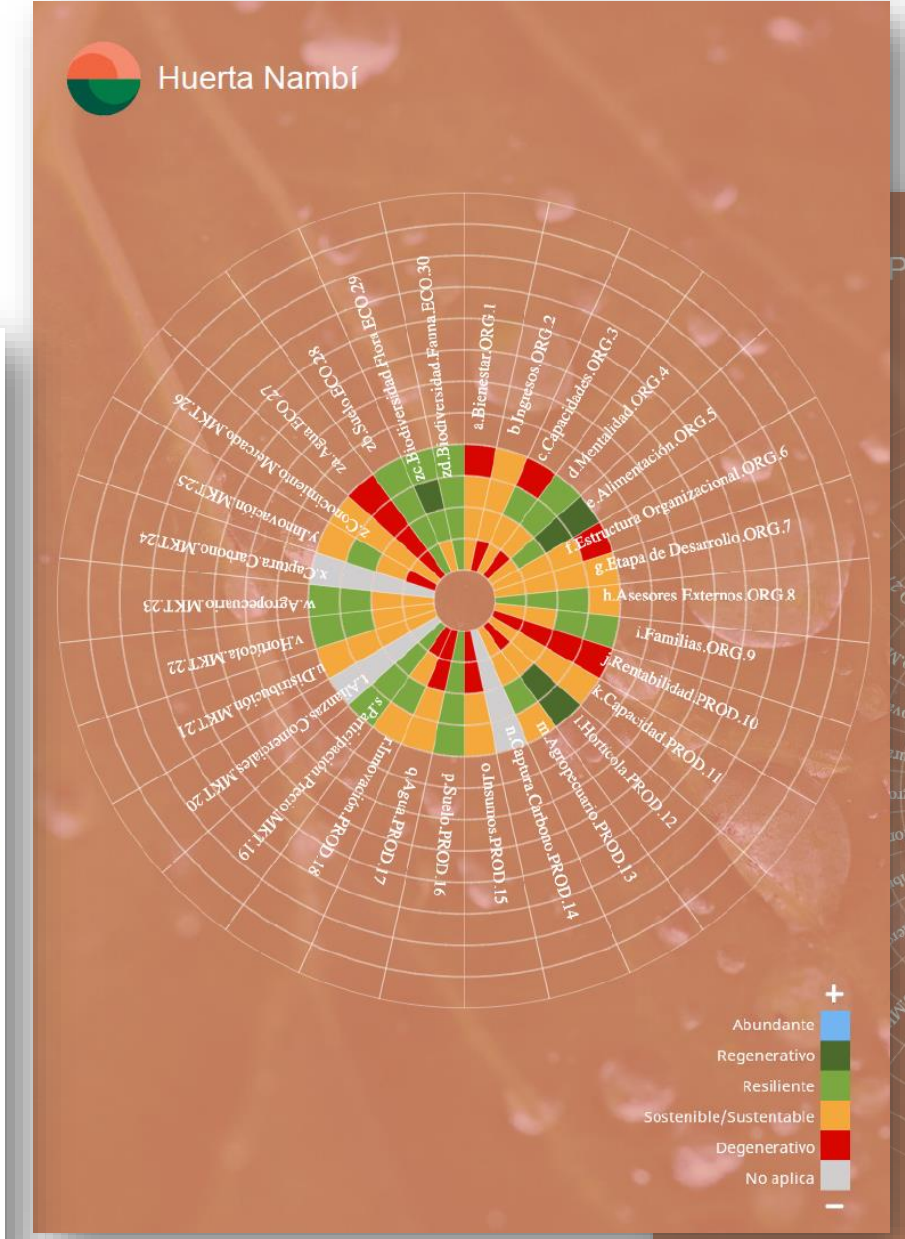
cambiatus

RANCHO Margot

SOIL 4 CLIMATE

7Vortex.com


CO-CREACIÓN
Regenerate Costa Rica
Management
Comunicación
Relaciones Internacionales
Exploradores
CTP
Membrana Digital
Citizen Science
Savory Hub CR
Extensionismo
Ecosistemas Productivos
Presupuesto
Huertos Regenerativos
Suelos Vivos
Nambí
Evaluación del Impacto
Biomimicry
Oceans
Agua
Costa Rica
Living Cities
CAT
Playa Lagarto
Mapeo Proyectos
Emprendimientos
CRR
TVORTEX
Cuenca
UCI
Connect Ocean
Entendimiento del Cambio
Seguridad Alimentaria
Guanacaste
Journey School
Biosfera
Documental
Comunidad HeliaTICA
Corredores Biológicos
Bioregión
Hub Matapalo
Traducción Naturaleza
Evolución Organizacional
Visionario
Liderazgo
Viabilidad
Fondos


Huerta Nambí
a.Bienestar.ORG.1
b.Ingresos.ORG.2
c.Capacidades.ORG.3
d.Mentalidad.ORG.4
e.Alimentación.ORG.5
f.Estructura Organizacional.ORG.6
g.Etapa de Desarrollo.ORG.7
h.Asesores Externos.ORG.8
i.Familias.ORG.9
j.Rentabilidad.PROD.10
k.Capacidad.PROD.11
l.Horticola.PROD.12
m.Agrosilvopastoril.PROD.13
n.Captura Carbono.PROD.14
o.Insumos.PROD.15
p.Suelo.PROD.16
q.Agua.PROD.17
r.Monitoreo.PROD.18
s.Practicas Pecuarias.PROD.19
t.Almanzas Comerciales.MKT.20
u.Distribución.MKT.21
v.Hortícola.MKT.22
w.Agropecuario.MKT.23
x.Captura Carbono.MKT.24
y.Innovación.MKT.25
z.Conocimiento Mercado.MKT.26
za.Agua.ECO.27
zb.Suelo.ECO.28
zc.Biodiversidad Flora.ECO.29
zd.Biodiversidad Fauna.ECO.30
+
Abundante
Regenerativo
Resiliente
Sostenible/Sustentable
Degenerativo
No aplica
−


Playa Lagarto
a.Bienestar.ORG.1
b.Ingresos.ORG.2
c.Capacidades.ORG.3
d.Mentalidad.ORG.4
e.Alimentación.ORG.5
f.Estructura Organizacional.ORG.6
g.Etapa de Desarrollo.ORG.7
h.Asesores Externos.ORG.8
i.Familias.ORG.9
j.Rentabilidad.PROD.10
k.Capacidad.PROD.11
l.Horticola.PROD.12
m.Agrosilvopastoril.PROD.13
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zd.Biodiversidad Fauna.ECO.30
+
Abundante
Regenerativo
Resiliente
Sostenible/Sustentable
Degenerativo
No aplica
−

Regenerative Guanacaste

- Regenerative agriculture and community farms
- Education
- Regenerative Tourism
  - Longer stays
  - Living experience – learning – sharing
  - Higher benefit for more
  - Local economies: local sourcing – local consumption
  - Biodiversity + connectivity
  - Marine biodiversity / fisheries
- Diverse and inclusive economy
- Local culture – traditions – food - agrobiodiversity
- Holistic cattle grazing (Savory)
- Public policy
- Local governments
- Local governance

Agriculture is biology, not chemistry

SOIL SCIENCE AND PLANT NUTRITION
2020, VOL. 66, NO. 1, 1–9
https://doi.org/10.1080/00380768.2020.1718548

JSSSPN 日本土壌肥料学会

Taylor & Francis
Taylor & Francis Group

REVIEW

Managing soils for negative feedback to climate change and positive impact on food and nutritional security

Rattan Lal

Carbon Management and Sequestration Center, The Ohio State Universi

-157ppm

ABSTRACT

The increase in atmospheric concentration of carbon
405 ppm in 2018, along with the enrichment of
mean temperature increase of 1°C. Among a
natural to agricultural eco-systems has an
organic carbon stock by historic lan
2-m depth, C stock is 2047 Pg fo
3605 Pg. Thus, even a small
CO_2 concentration. Soi
management practice which creates a positive soil/ecosystem C budget, is estimated at 178 Pg C for soil, 155 Pg C for biomass, and 333 Pg C for the terrestrial biosphere with a total CO_2 drawdown potential of 157 ppm. Important among techniques of soil organic C sequestration are adoption of a system-based conservation agriculture, agroforestry, biochar, and integration of crops with trees and livestock. There is growing interest among policymakers and the private sector regarding the importance of soil C sequestration for adaptation and mitigation of climate change, harnessing of numerous co-benefits, and strengthening of ecosystem services.

ARTICLE HISTORY
Received 5 November 2019
Accepted 16 January 2020

KEY WORDS
Soil carbon; anthropocene; historic carbon loss from soils; soil carbon sink; international initiatives on soil carbon sequestration


Landscapes, bioregions!

500 families producing their food!

Resilience + communtiy

8 – 10 T/month

Carbon, organic matter,
water, minerals, microbiome

Abundance + health

biomimika
Sin role

Regeneración
Evaluación
Personal
Mi perfil
Cambio
Bio-región
Red

UCI
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Costa Rica Regenerativa es una iniciativa de la Universidad para la Cooperación Internacional que reúne a una comunidad transdisciplinaria para reflexionar, planificar y activar proyectos que faciliten la transición hacia un paradigma regenerativo.

Cambio

biomimika
Sin role

2022
Hoy

a.Bienestar.ORG.1
b.Ingresos.ORG.2
c.Capacidades.ORG.3
d.Mentalidad.ORG.4
e.Alimentación.ORG.5
f.Estructura Organizacional.ORG.6
g.Etapa de Desarrollo.ORG.7
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k.Capacidad.PROD.11
l.Horticola.PROD.12
m.Agropecuario.PROD.13
n.Captura Carbono.PROD.14
o.Insumos.PROD.15
p.Suelo.PROD.16
q.Agua.PROD.17
r.Innovación.Precio.MKT.19
s.Planificación.Precio.MKT.20
t.Distribución.MKT.21
u.Hortícola.MKT.22
v.Agropecuario.MKT.23
x.Captura.Carbono.MKT.24
y.Innovación.MKT.25
z.Conocimiento.Mercado.MKT.26
za.Agua.ECO.27
zb.Suelo.ECO.28
zc.Biodiversidad.Flora.ECO.29
zd.Biodiversidad.Fauna.ECO.30

Huerta Nambí

Bio-región

biomimika
Sin role

2022
Hoy

Costa Rica

Earthstar Geographics
Powered by Esri

Indigenous Agroforestry Manual:

The Forest Garden

Second Edition

Author: Mel Landers
English Version
June 2020

2. The Origin of Agriculture

Ten thousand years ago the people of southern Mexico transitioned from hunting and gathering to the production of agricultural crops by reproducing the natural environments where they found the plants they ate. These farmers developed foods like maize, pumpkin, beans, cocoa, tomatoes and chilies, and cotton for the fibers. They grew fruit trees like avocado and mango, and cashew nuts; also plants for dyes, medicine and many others.

The knowledge and crops spread through the Americas through migration and trade. The Maya called the areas they cultivated, "Forest Gardens;" each one, an agroforestry system that mimics the original productive ecosystem found in the forest, maintained by nature itself.

In nature there is normally no bare soil, little soil disturbance and no pure stands of anything. Nature doesn't even produce compost. It produces mulch, which is all the soil microorganisms need to provide fertility and soil moisture holding capacity for lush growth.

The Indigenous American farmers grew hundreds of varieties of crops in their fields using beneficial plant associations in raised beds that were continually covered with an organic mulch that kept the soil soft, cool and moist. The soil was not plowed and crop wastes and weeds were used as mulch; protecting from loss due to drought, excessive rain, insects and diseases. It did not harm the environment while it produced nutrient rich soils and plentiful harvests.


Always advance to
agroforestry systems

Learning and empowerment

Technical schools local youth

Regeneration includes agro-biodiversity

7.000 especies of plants have been cultivated for over 12.000 years.

Today, 15 species of plants and 8 animal species produce 90% of food.

Study reveals nutritional benefits of regenerative agriculture crops

By Oliver Morrison
18-Mar-2022 - Last updated on 21-Mar-2022 at 09:36 GMT

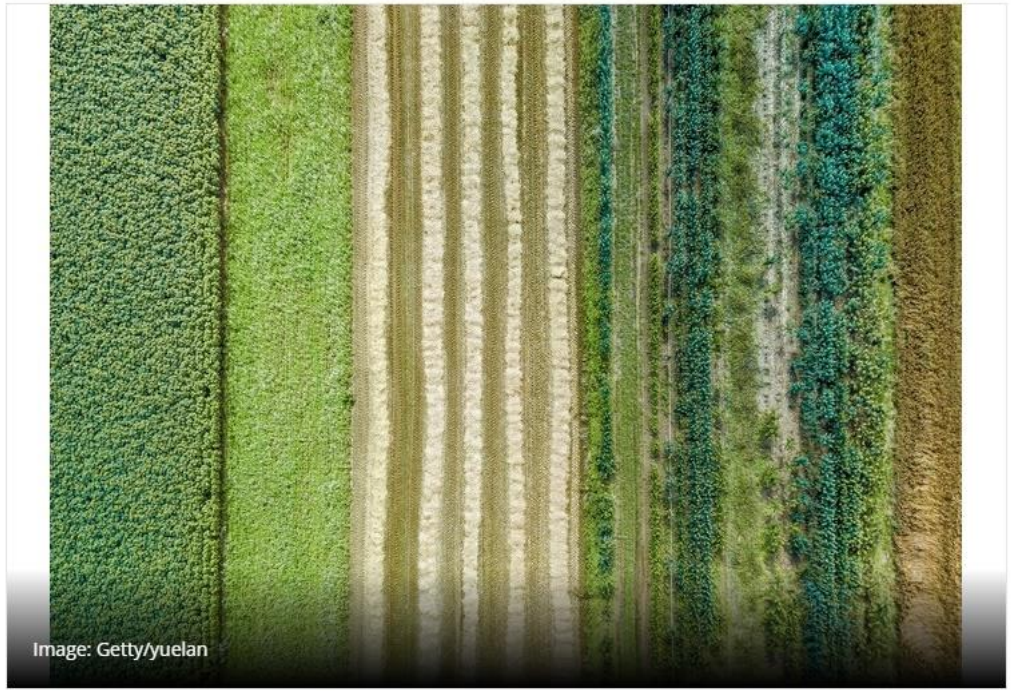


Image: Getty/yuelan

RELATED TAGS: regenerative ag

Regenerative farming practices such as soil-building techniques that minimize plowing, use cover crops, and plant diverse crops positively affect the nutritional content of the food, claims research.

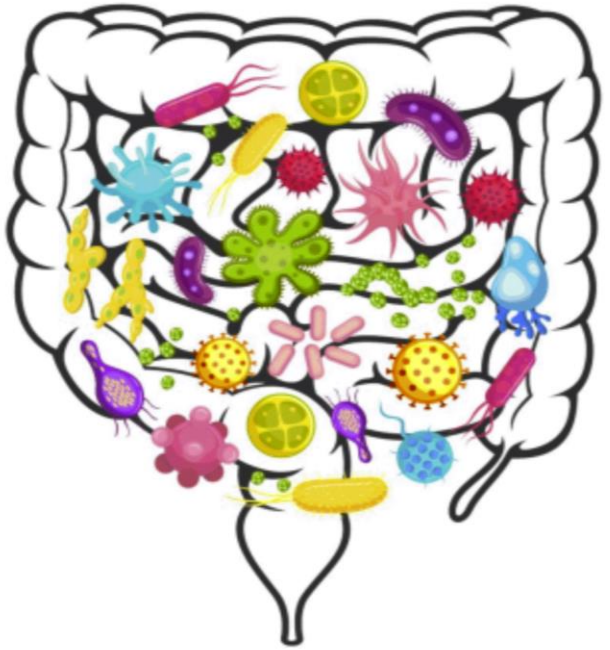
New Research Shows Regenerative Practices Increase Nutrient Density in Food

February 9, 2022 | Posted in Soil Health
Source: PeerJ

Reported declines in the nutrient density of crops are typically attributed to crop breeders having focused almost exclusively on increasing yields. However, studies demonstrating that fertilization regimes and soil life affect mineral uptake by crops suggest that conventional farming practices of intensive tillage, nitrogen fertilization, and synthetic pesticide applications may have contributed to declining nutrient density through disrupting crop symbioses with soil life. While a number of previous assessments compared differences in the nutritional quality of foods grown with conventional and organic production practices, few have considered directly the influence of soil health—as reflected in soil organic matter and soil life—on nutrient density.

Soil health will be the next big thing in reversing many of today's illnesses.

How to recover the human gut microbiome through healthy soil, plant and animal microbiomes.



Nina Vinot, Oct. 13, 2023

Healthy food blended with culture and traditions

CoopeRegenerativa

81 likes • 121 followers

Posts About Photos Videos ...

Savory Hub + Biodiversity

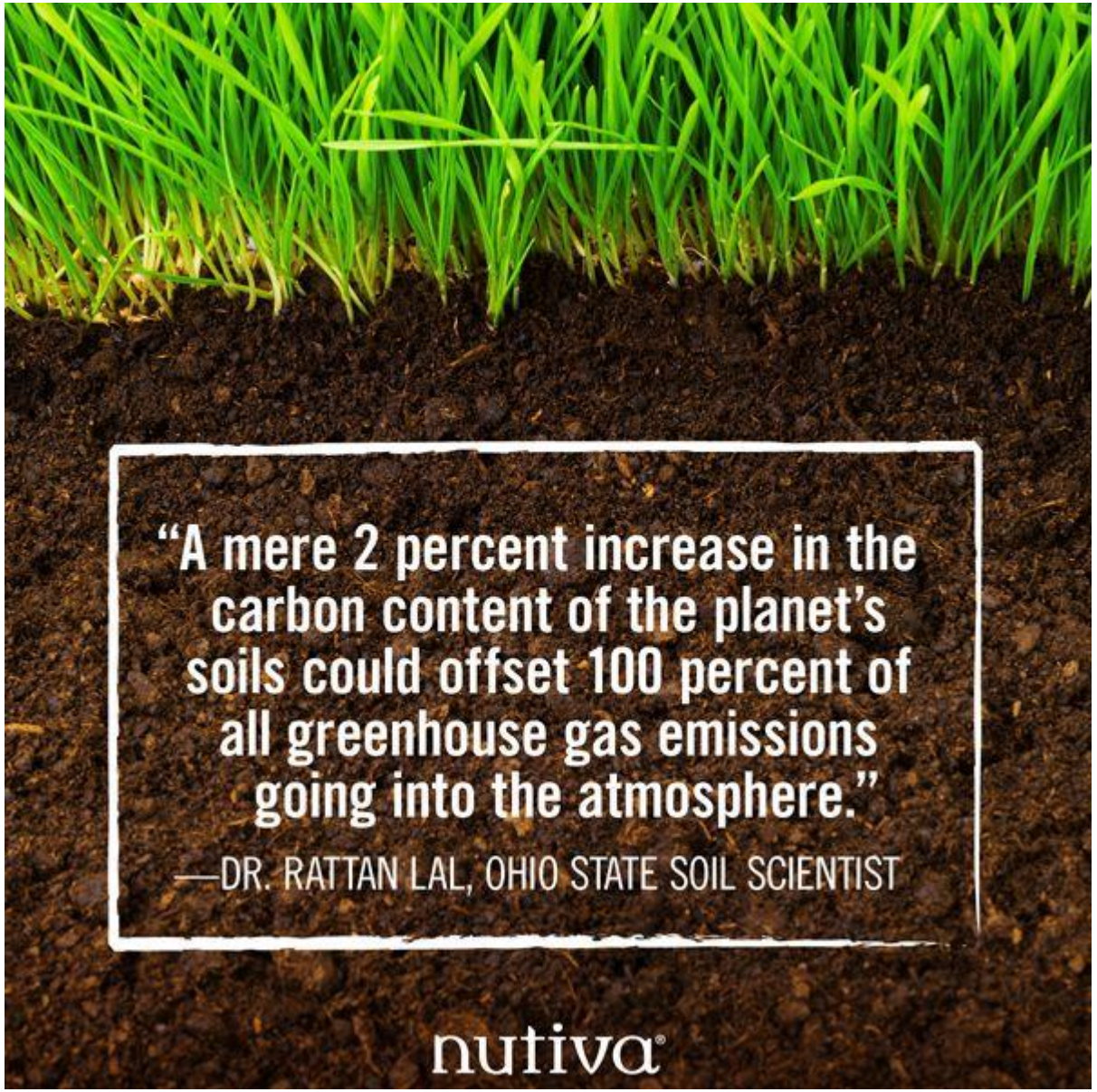
Suelos vivos – Savory Hub

- Living Soils business platform – carbon, biodiversity, markets
- MRV – Measuring, reporting and verification
- Training for holistic management, EOV, etc.
- Link with animal and human health - nutrition
- Linkage with production (milk, meat, etc.) – data management – One Health
- Biodiversity – pastures and biological corridors
- Water harvesting and erosion control

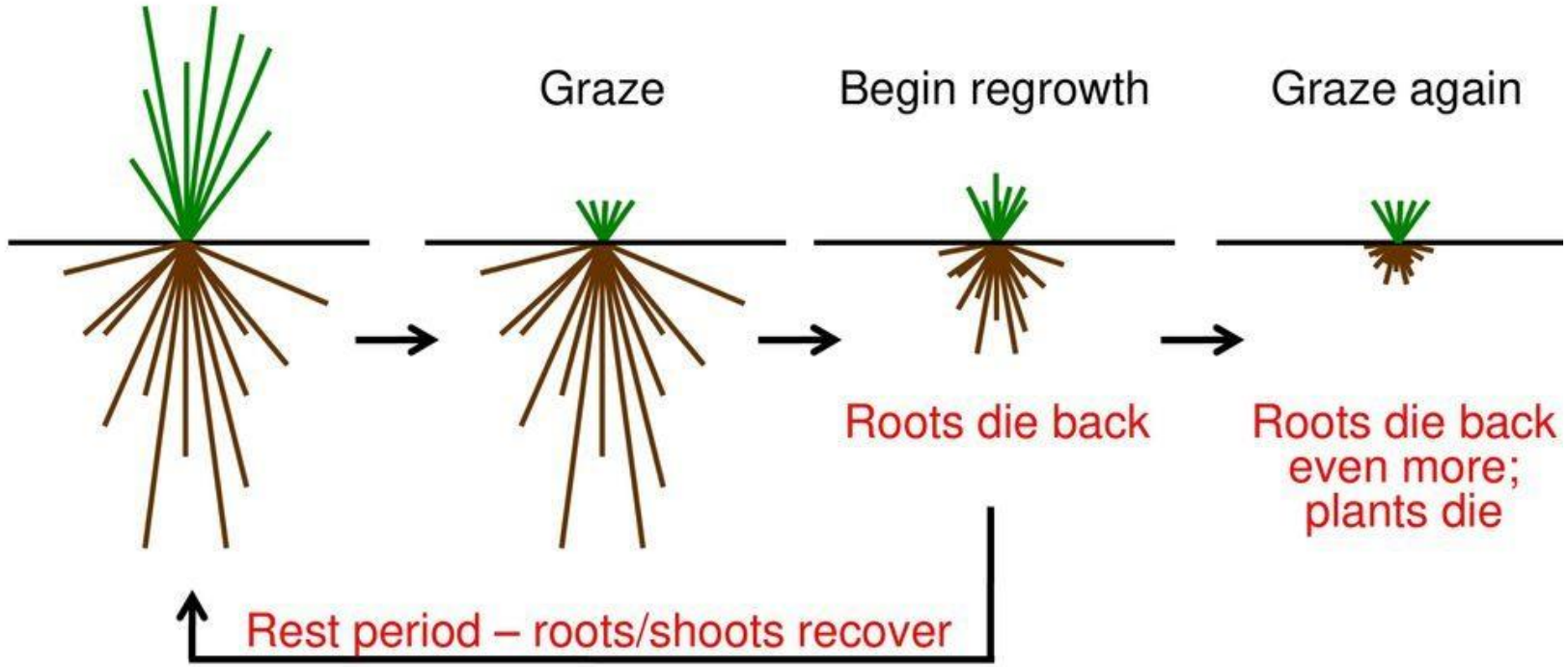
Savory hub in Costa Rica

We must reduce CO_2 levels to les tan 350 ppm

James Hansen



It's ALL about the grass

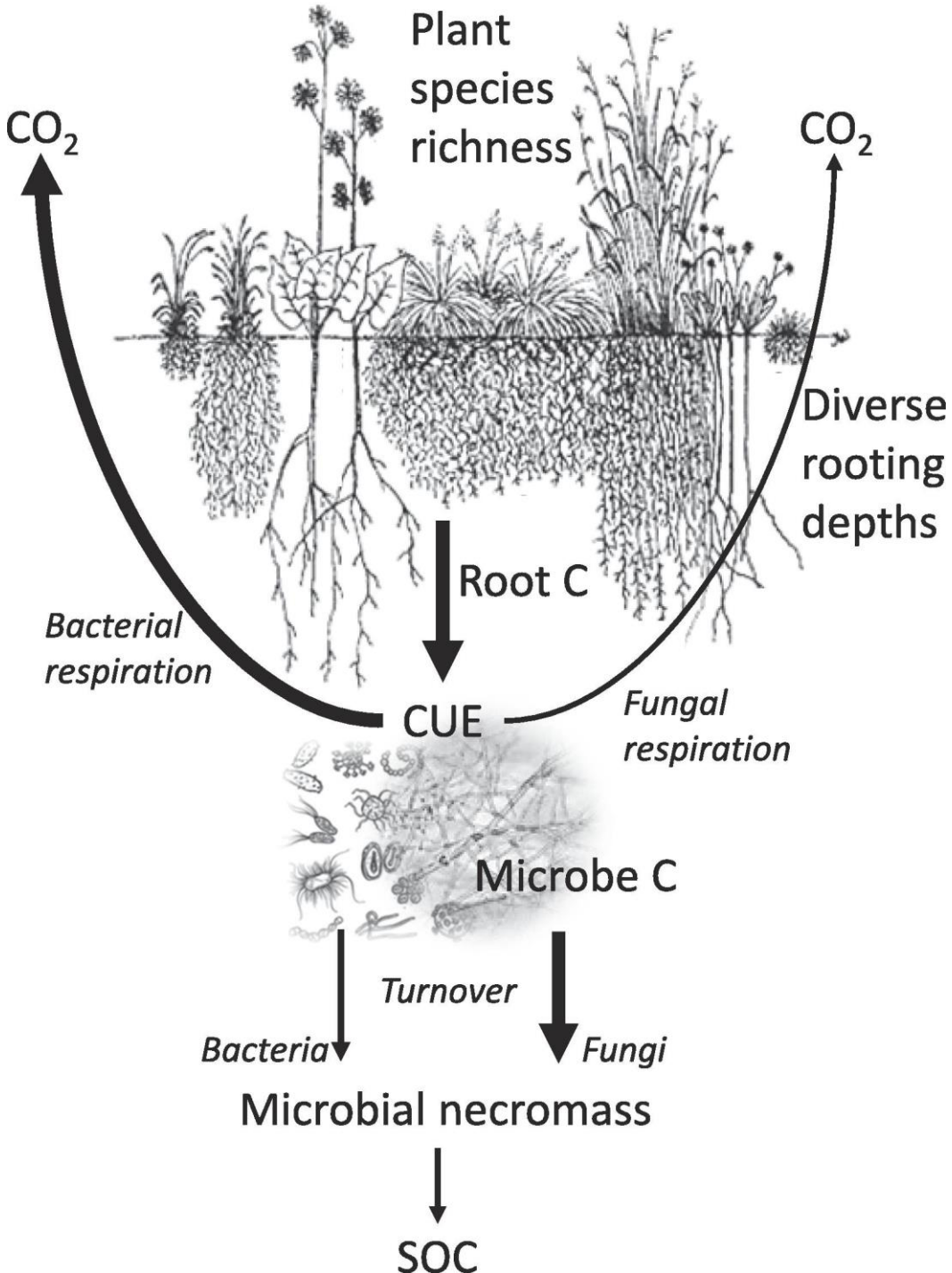


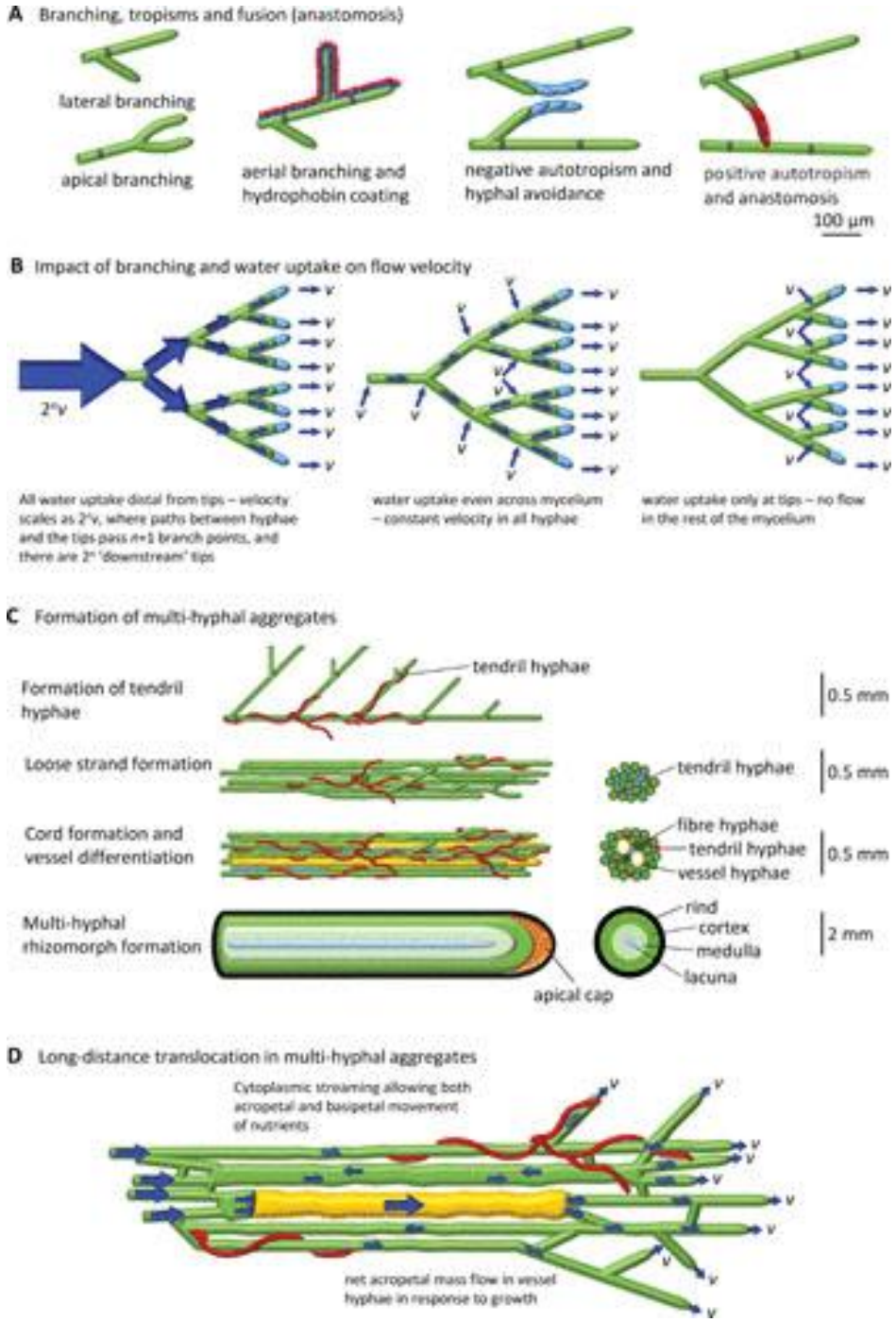
Rational Grazing = Rotational stocking

Increases forage productivity

Decreases drought impacts and weed encroachment

A man measures the root system of a vetiver plant after 2 seasons of growth. This plant has been dug out of a bank in Malaysia and the roots washed clean. In this case, the roots had reached 2 meters in red latosol soil.


Plant species richness
CO_2
CO_2
Diverse rooting depths
Root C
Bacterial respiration
CUE
Fungal respiration
Microbe C
Turnover
Bacteria
Fungi
Microbial necromass
SOC

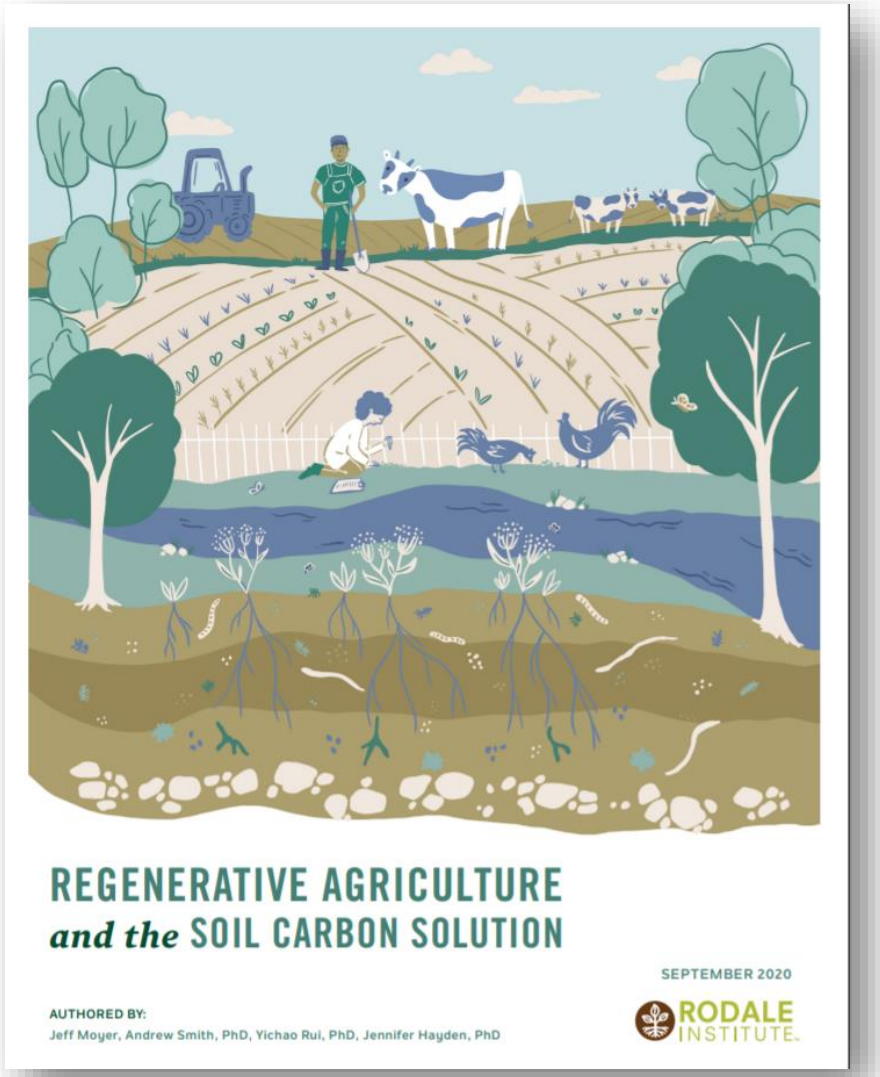

A Branching, tropisms and fusion (anastomosis)
lateral branching
apical branching
aerial branching and hydrophobin coating
negative autotropism and hyphal avoidance
positive autotropism and anastomosis
100 µm
B Impact of branching and water uptake on flow velocity
2^n v
All water uptake distal from tips – velocity scales as 2^n v, where paths between hyphae and the tips pass n+1 branch points, and there are 2^n 'downstream' tips
water uptake even across mycelium – constant velocity in all hyphae
water uptake only at tips – no flow in the rest of the mycelium
C Formation of multi-hyphal aggregates
Formation of tendril hyphae
tendril hyphae
0.5 mm
Loose strand formation
tendril hyphae
0.5 mm
Cord formation and vessel differentiation
fibre hyphae
tendril hyphae
vessel hyphae
0.5 mm
Multi-hyphal rhizomorph formation
rind
cortex
medulla
lacuna
2 mm
apical cap
D Long-distance translocation in multi-hyphal aggregates
Cytoplasmic streaming allowing both acropetal and basipetal movement of nutrients
net acropetal mass flow in vessel hyphae in response to growth

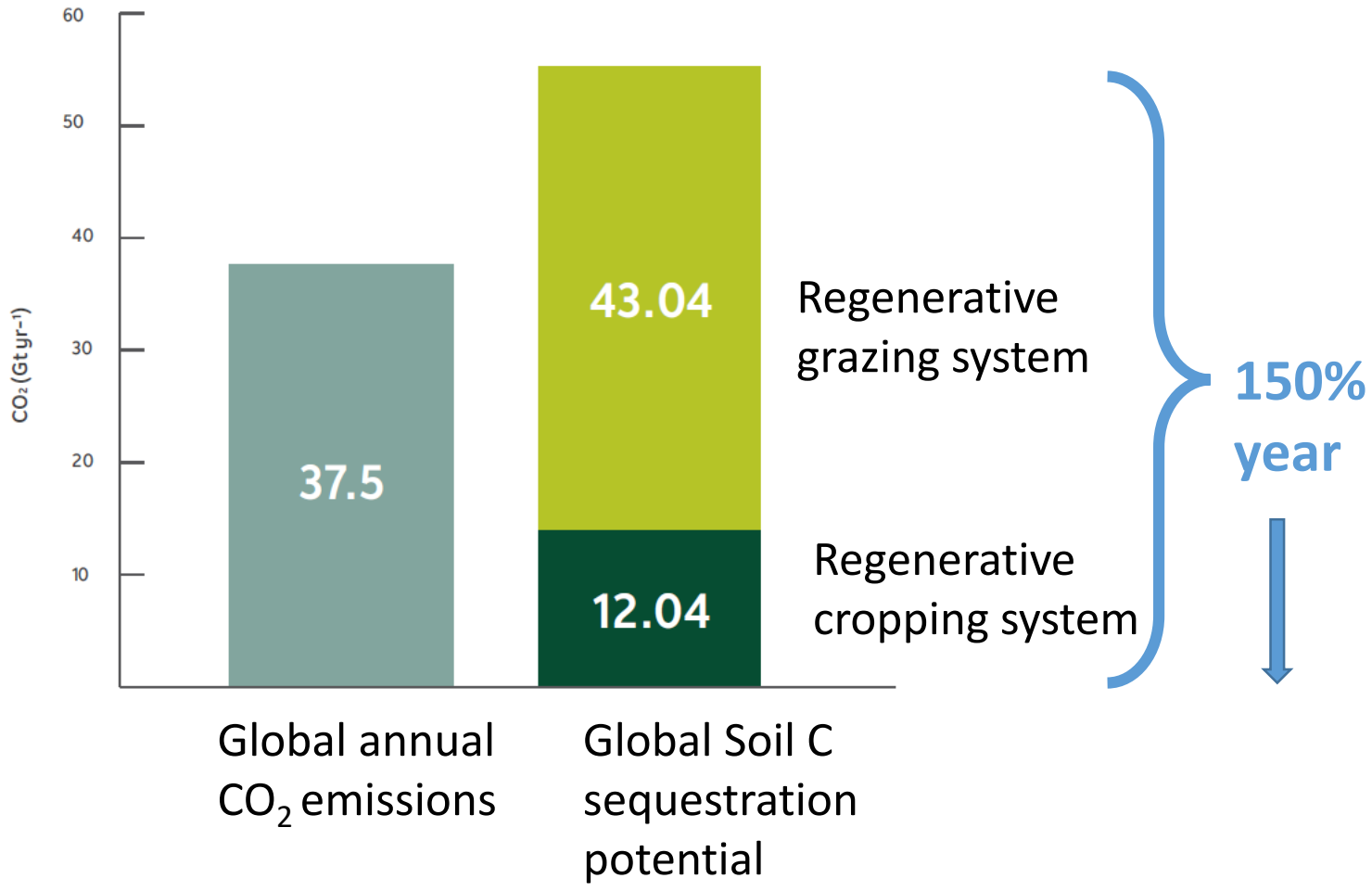
Regenerating the soil with Glomalin

(carbon tubes deposited by Mycorrhizal fungi)

Source: Mel Landers, March 2024

Carbon sequestration potential of global adoption of regenerative agriculture





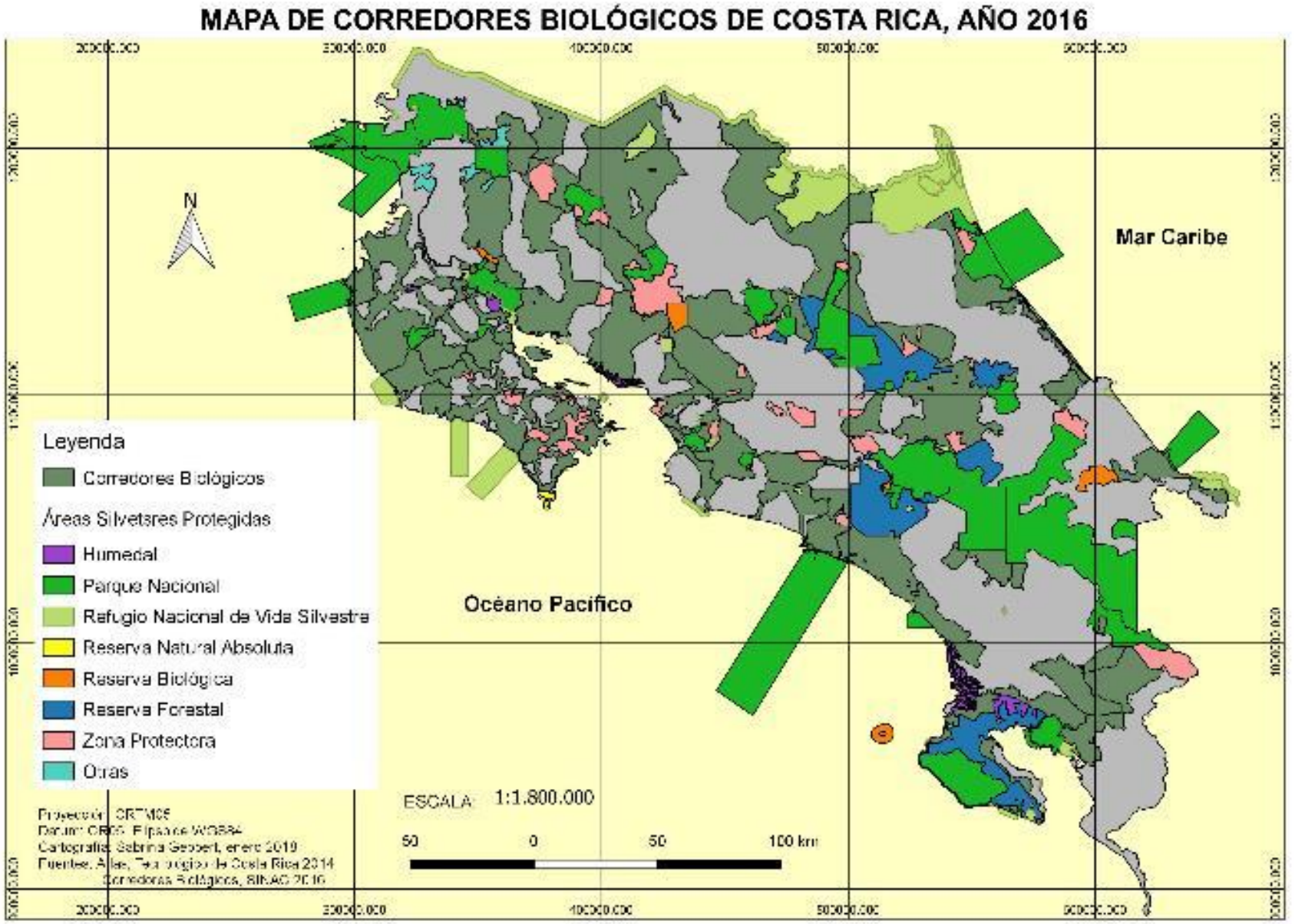
Holistic Grazing

3.500 million ha of grasslands could capture 88 - 210 GtC, would bring us down to 350 ppm CO_2 in 30 years.

2014, Seth J. Itzkan

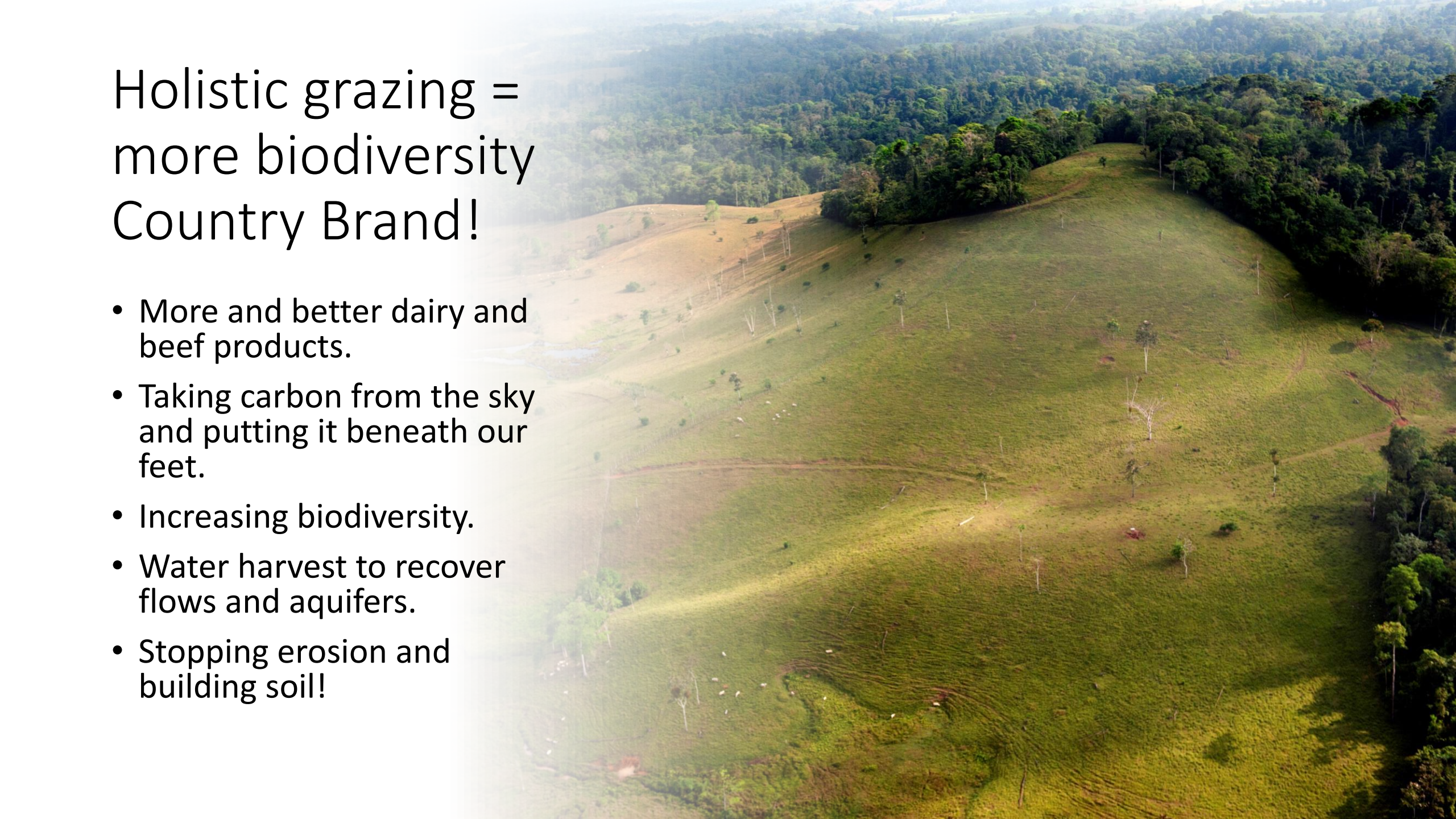
Biological corridors:

- Are key for regenerating biodiversity
- Increasing genetic diversity
- Migration due to climate change
- Governance is critical



Holistic grazing = more biodiversity Country Brand!

- More and better dairy and beef products.
- Taking carbon from the sky and putting it beneath our feet.
- Increasing biodiversity.
- Water harvest to recover flows and aquifers.
- Stopping erosion and building soil!



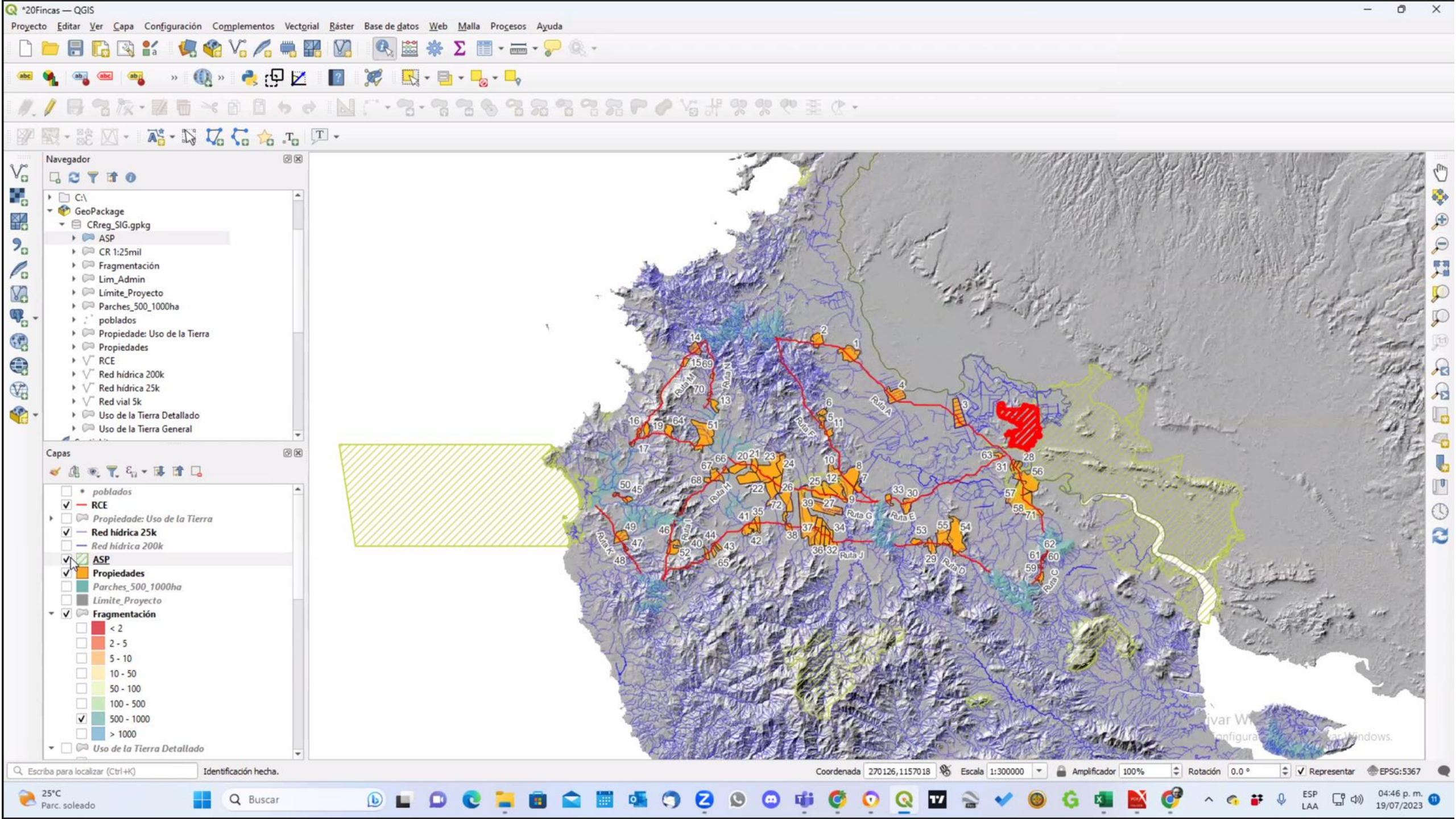
The current price of carbon: $40 to $80 per metric ton.

Current estimates for carbon accumulation with regenerative grazing are on average 2.73 tC/ha/year with a corresponding reduction of CO_{2e} of 10.02 tCO_{2e}/ha/year (Soil4Climate Inc., 2023).

Every 1000 ha: accumulation rate of 2730 tC/ha/year US$ 109,000 to US$ 218,000 per year of additional income, beyond the increase in livestock productivity, soil, biodiversity, and water.

The carbon market alone would allow farmers to recoup the investment within 2 to 5 years.

200,000 ha equals capturing 25% of Costa Rica's emissions.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poblados
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Propiedades
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Red hídrica 25k
Red vial 5k
Uso de la Tierra Detallado
Uso de la Tierra General
Capas
poblados
RCE
Propiedade: Uso de la Tierra
Red hídrica 25k
Red hídrica 200k
ASP
Propiedades
Parches_500_1000ha
Límite_Proyecto
Fragmentación
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Uso de la Tierra Detallado
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Ruta C
Ruta D
Ruta E
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Ruta I
Ruta J
Ruta K
Ruta L
Ruta M
Ruta N
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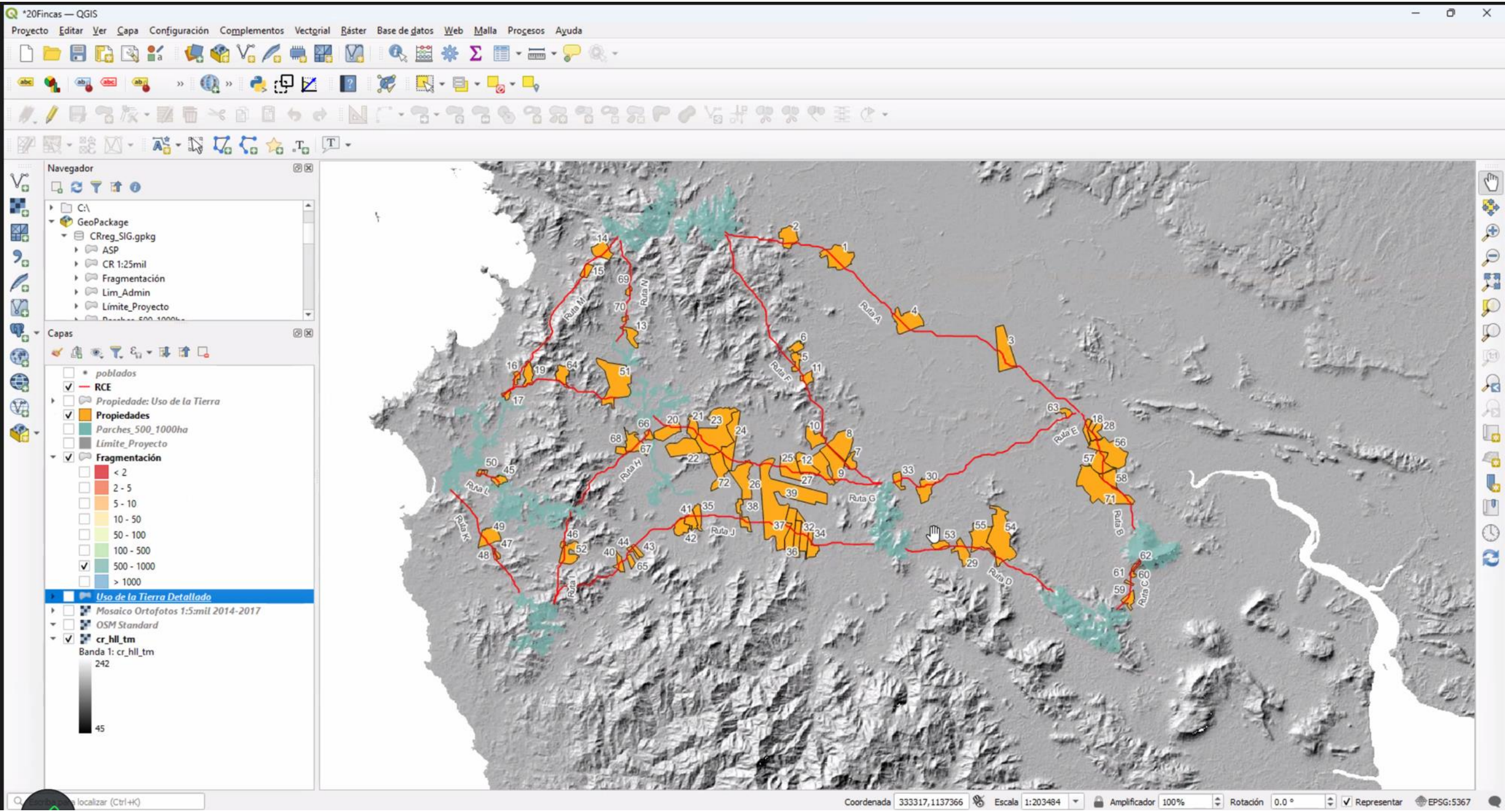
19/07/2023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Propiedade: Uso de la Tierra
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Uso de la Tierra Detallado
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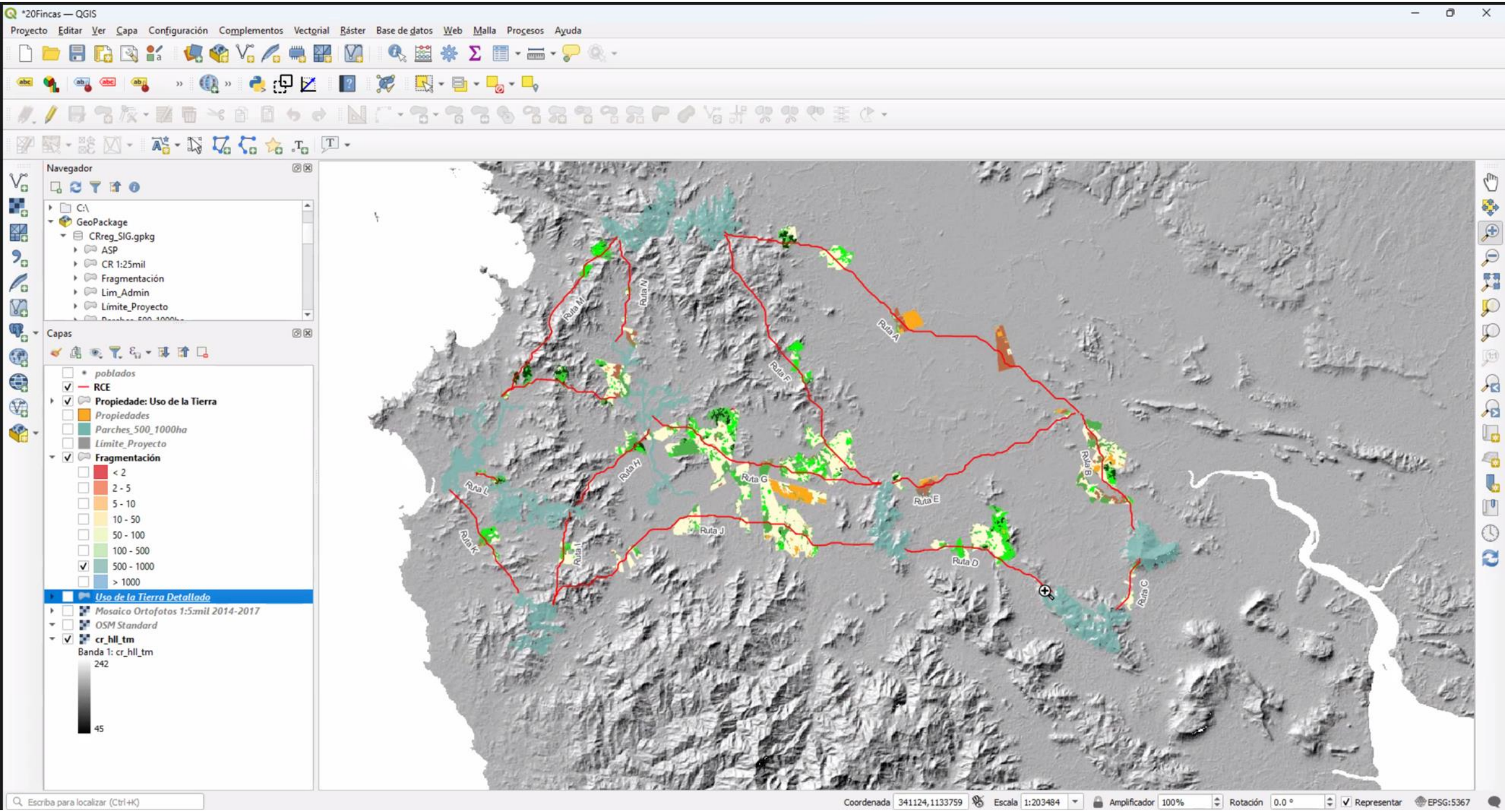
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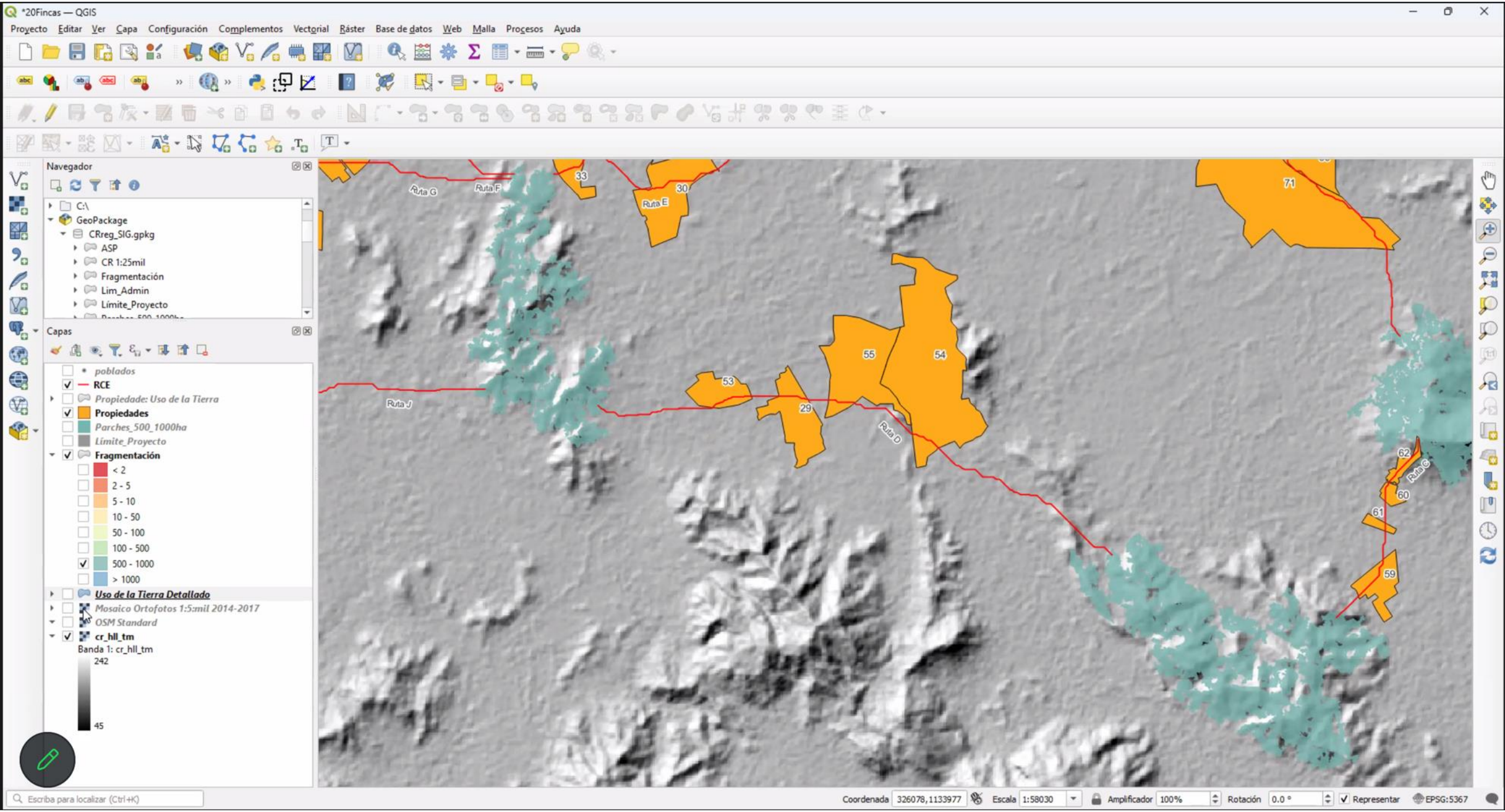
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Propiedade: Uso de la Tierra
Propiedades
Parches_500_1000ha
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Fragmentación
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Uso de la Tierra Detallado
Mosaico Ortofotos 1:5:mil 2014-2017
OSM Standard
cr_hll_tm
Banda 1: cr_hll_tm
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Ruta G
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Representar
EPSG:5367

*20Fincas — QGIS

Proyecto Editar Ver Capa Configuración Complementos Vectorial Ráster Base de datos Web Malla Procesos Ayuda

Navegador

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    - Parches_500_1000ha
    - poblados
    - Propiedade: Uso de la Tierra
    - Propiedades
    - RCE
    - Red hídrica 200k
    - Red hídrica 25k
    - Red vial 5k
    - Uso de la Tierra Detallado
    - Uso de la Tierra General
  - SpatiaLite
  - PostGIS
  - SAP HANA
  - MSSQL
  - Oracle
- WMS/WMTS
- Vector Tiles

Capas

- poblados
- RCE
- Propiedade: Uso de la Tierra
- Red hídrica 25k
- Red hídrica 200k
- Propiedades
- Parches_500_1000ha
- Límite_Proyecto
- Fragmentación
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  - 2 - 5
  - 5 - 10
  - 10 - 50
  - 50 - 100

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Ruta O
Ruta G
Ruta H
Ruta F
Ruta J

Coordenada 315702,1140815 Escala 1:60050 Amplificador 100% Rotación 0.0 ° Representar EPSG:5367

25°C Parc. soleado

Buscar

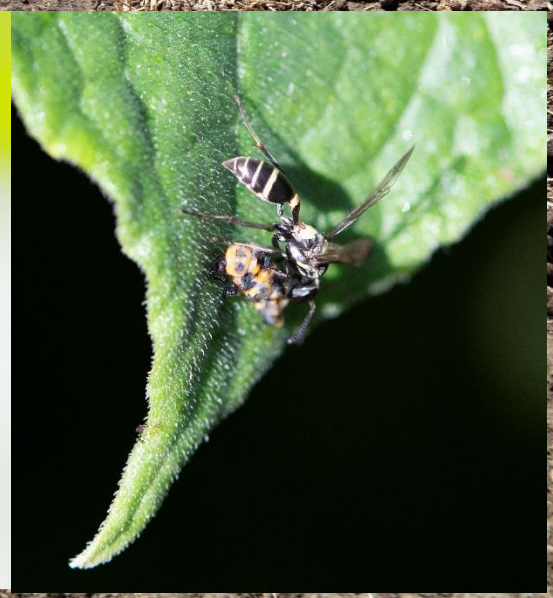
ESP LAA 04:42 p. m. 19/07/2023

Preliminary connectivity evaluation – Las Garzas

COSTA RICA REGENERATIVA

UCI

Orden	Familia	Orden	Familia
Coleoptera	Buprestidae	Hymenoptera	Apidae
	Chrysomelidae		Formicidae
	Coccinellidae		Ichneumonidae
Diptera	Drosophilidae		Mutillidae
	Muscidae		Vespidae
	Syrphidae	Lepidoptera	Crambidae
Hemíptera	Berytidae		Hesperiidae
	Cicadellidae		Papilionidae
	Coreidae		Pieridae
	Pentatomidae		Tortricidae
	Rediuviidae	Neuroptera	Chrysopidae
	Membracidae		Myrmeleontidae
	Miridae	Odonata	Anisoptera
Orthoptera	Acridoidea		Coenagrionidae
	Tetrigidae		
	Tettigonidae		



Large scale monitoring

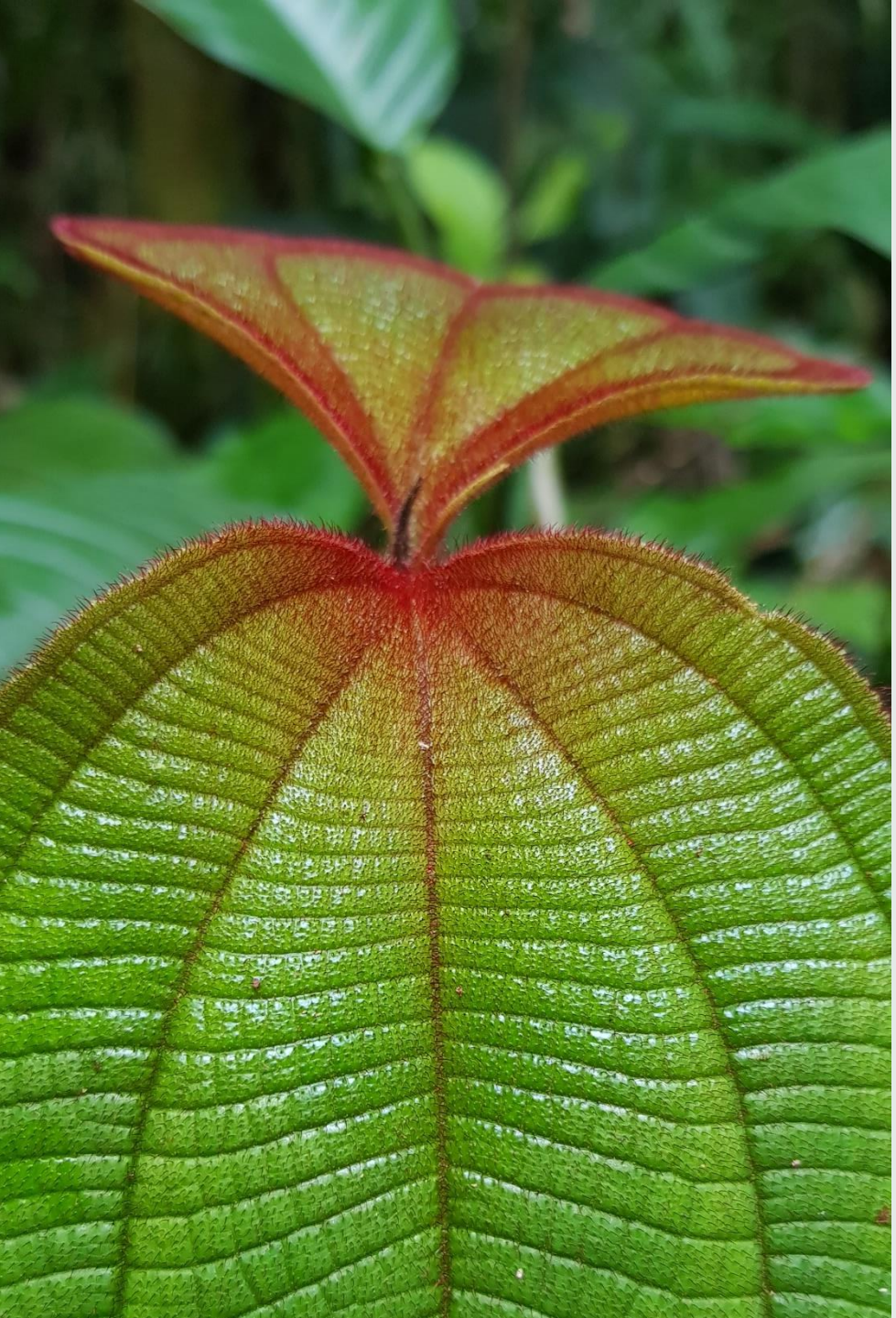
- GIS, Lidar, …
- Biodiversity baseline inventories
- Biodiversity monitoring
- Ecosystem services valuation
- Water cycle and harvesting
- Soil biodiversity
- Soil carbon
- Soil parameters
- Local production & consumption
- Well-being
- Community + local government planning

Biodiversity monitoring: bats

Marine Connect Ocean

- Participatory fisheries management
- Citizen science
- Responsible management areas
- Elimination of middlemen
- From the sea to the table
- Coral farms

http://connectoceancr.com/



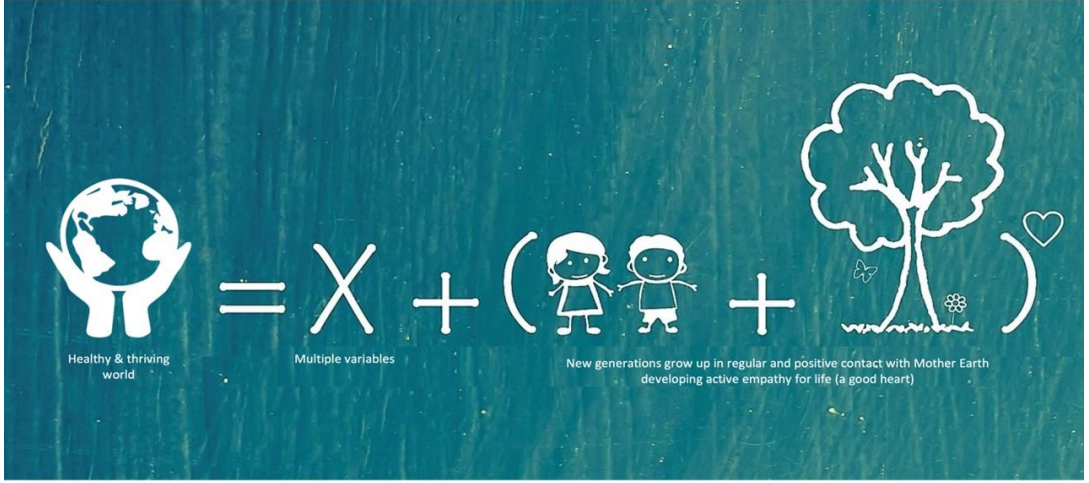
Cities

- Biophilic cities
- Biodiversity
- Agricultural production (urban gardens)
- Tree coverage
- Regenerative badges/awards
- Well-being of the population – young people and older adults
- Heat pockets
- Pollution

Urban landscapes

Biophylic cities program

- Capacity development: Mayor + 5
- Tax and Budget management
- Environmental management
- Cultural strengthening
- Social empowerment
- Education
- Greening the city
- Biological corridors



ania

Escalating "TiNi: Children's Land" methodology

An innovative methodology that catalyzes the regeneration of life with the new generations and Mother Earth as allies

Children's Land (TiNi)

It is a methodology that connects children and youngsters with Mother Earth and empowers them as agents of change for sustainable development. It consists in granting them a space of land, which can be from three pots, where they nurture life and biodiversity with love generating well-being for themselves, others and nature.

A Children's Land can be implemented at home, school, in the neighborhood or community, in urban and rural areas, and in various ecosystems. Children's land helps develop active empathy for life and is an indicator of the children's contribution to the sustainable development of their neighborhood.

✓ Recognized as a good practice in Education for Sustainable Development by **UNESCO (2012).**

✓ Recognized by the **Ministry of the Environment of Peru** as a good practice of Education for Sustainable Development (2013).

✓ Institutionalized by the **Ministry of Education of Peru** as EsVi - Spaces of Life, currently in +5900 schools. (2015).

✓ Institutionalized by the **Ministry of Education of Ecuador** as Children's Land for Good Living, present in +6000 schools (2017).

✓ Recognized as one of the best 7 innovative initiatives in Latin America for social impact by **VIVA (2020)**.

✓ Present in Peru, Ecuador (+ Galapagos), Colombia, Brazil, Chile (+ Rapa Nui), El Salvador, Canada, Japan and India.


Kosmos Farm

What we need, urgently!

- Cooperation and not competition
- Narratives
- Scalability – we need a global movement
- Holistic approaches using different sources of knowledge (science, indigenous, local)
- Flexible pathways: principles, not recipes
- Research that allows for immediate action – storytelling beyond publication
- Business models
- Actions conducive to life - regeneration
- Local well-being above corporate and trade
- Massive (re)education – First responders for regeneration®
- Give HOPE and guidance


Will we make it
on time?