Remote Sensing and GeoData

A bird's eye view on our planet

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Rabobank

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What you can expect:

- What is Remote sensing and how do we use it
- Two specific use cases with clear impact
- What we can do with this technology
- Time for questions

Source

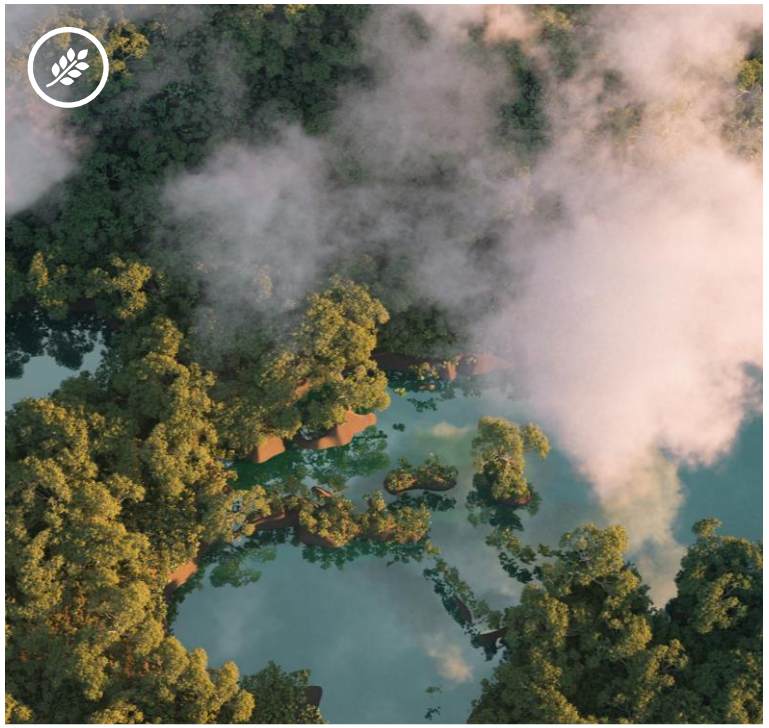
Remote sensing enables the detection and monitoring of physical characteristics of an area

Remote sensing enables cloud tracking and weather prediction…

- Assisting farmers in determining the irrigation methods, which fertilizer to use, controlling pests and assess the field workability

… monitoring the growth of cities …

- Supporting local and regional governments and stakeholders on their processes of monitoring and evaluating urban challenges, trends and public policies in cities



… and identifying changes in farmlands over several years or decades

- Enabling to include multiple indicators into the valuation processes of farmland relevant to banks and other financial institutes

Can you guess how many satellites are in orbit today?

7,389!

It was Sputnik, launched in 1957, the first to see the Earth from outside the atmosphere.

Until the 2010s, annual satellite launches were between 10 and 60.

However, in the last decade, the number has skyrocketed, with steady over ~1000 per year since 2020.

Source

First photo of the earth

(Apollo 17 in 1972)

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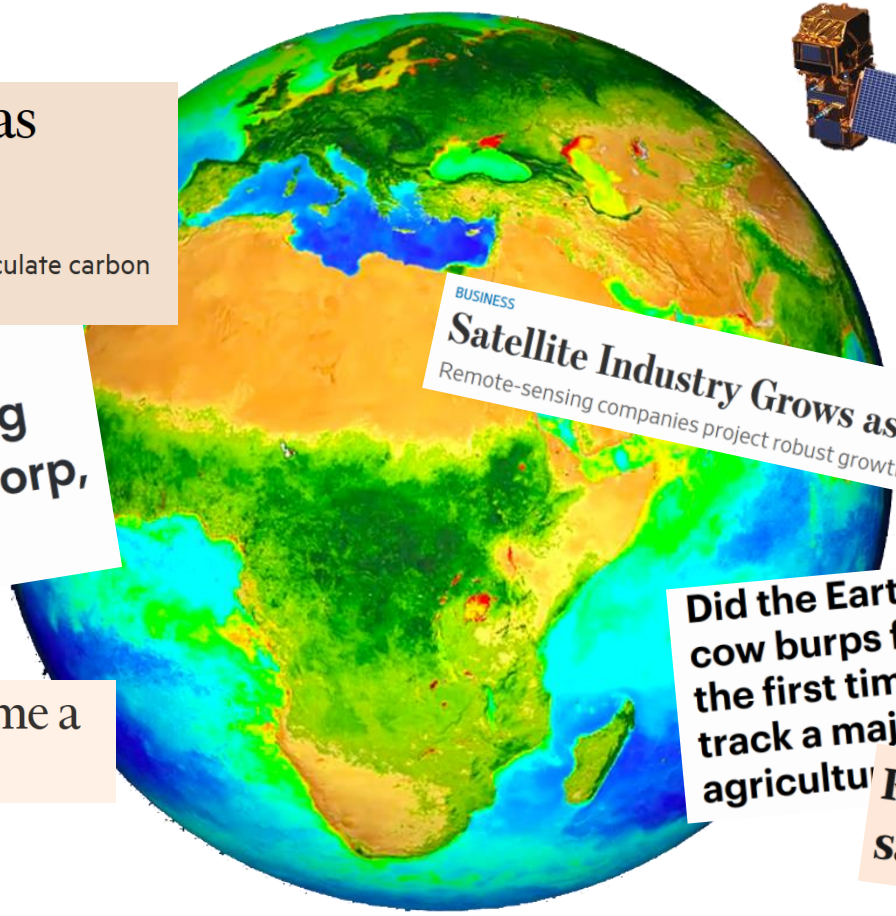
Remote sensing innovation: progressing sustainability goals and expanding insurability

Tree-tracking start-ups surge as climate pledges take root

Remote tracking tools using AI and drones attempt to calculate carbon stored in forests



Remote Sensing Services: Market 2022 is Set To Fly High in Upcoming Years | Antrix, Satellite Imaging Corp, Spectir, Cyber Swift

BUSINESS

Satellite Industry Grows as Investors Bet Billions on Sp... e-Derived Data

Remote-sensing companies project robust growth; some executives anticipate cons...

Did the Earth moo-ve? Satellites detect cow burps from a herd in California for the first time, providing a new way to track a major source of methane from agricultu...

"How satellite monitoring became a surprise ESG opportunity"

Klimaatcrisis bestrijden met satellietdata

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Increasing the use and incorporation of data within Rabobank's businesses provides an opportunity to drive new growth and efficiency goals

Global data trends[1]

- A **data-driven business model** – where decisions are made based on what is known - is core to the wave of a digital transformation
- The use of data provides opportunities to better **understand customers**, developing better **products and services** and streamline the internal operation to **reduce costs and waste**

Opportunity to enable new business models …

Understanding our customers food, energy, climate needs and develop products and services customized to their wishes. Enabling the bank to "Grow a better world together"

… ensure compliancy …

Quantify and qualify our own and our clients' sustainability efforts in order to track progress on the Paris climate goals and Environmental Social and Governance (ESG) targets

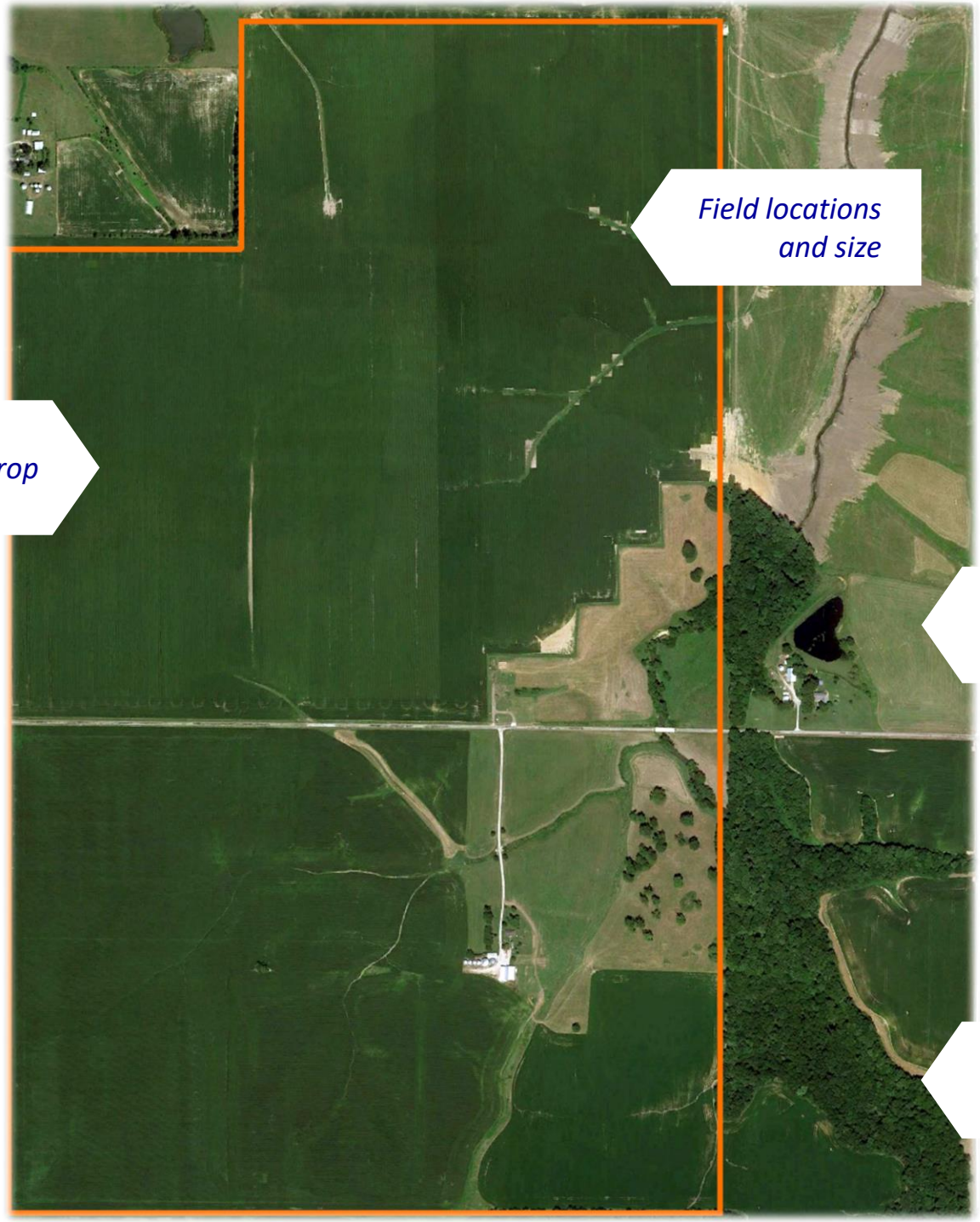
… decrease risks within the bank …

Incorporating climate indicators into our risk modelling results in a more efficient model that allows us to better assesses the financing possibilities and capital reserves needed to be maintained

… and reduce costs

The increasing demand and use of data reporting requires collection processes and methods that enable effortless collection of relevant data, require no to limited manual work and ensure high quality standards

[1]Gartner (2022)



Field locations and size

Accurate weather data, climate development, crop surveillance.

Access to water

Biodiversity impact of forest area

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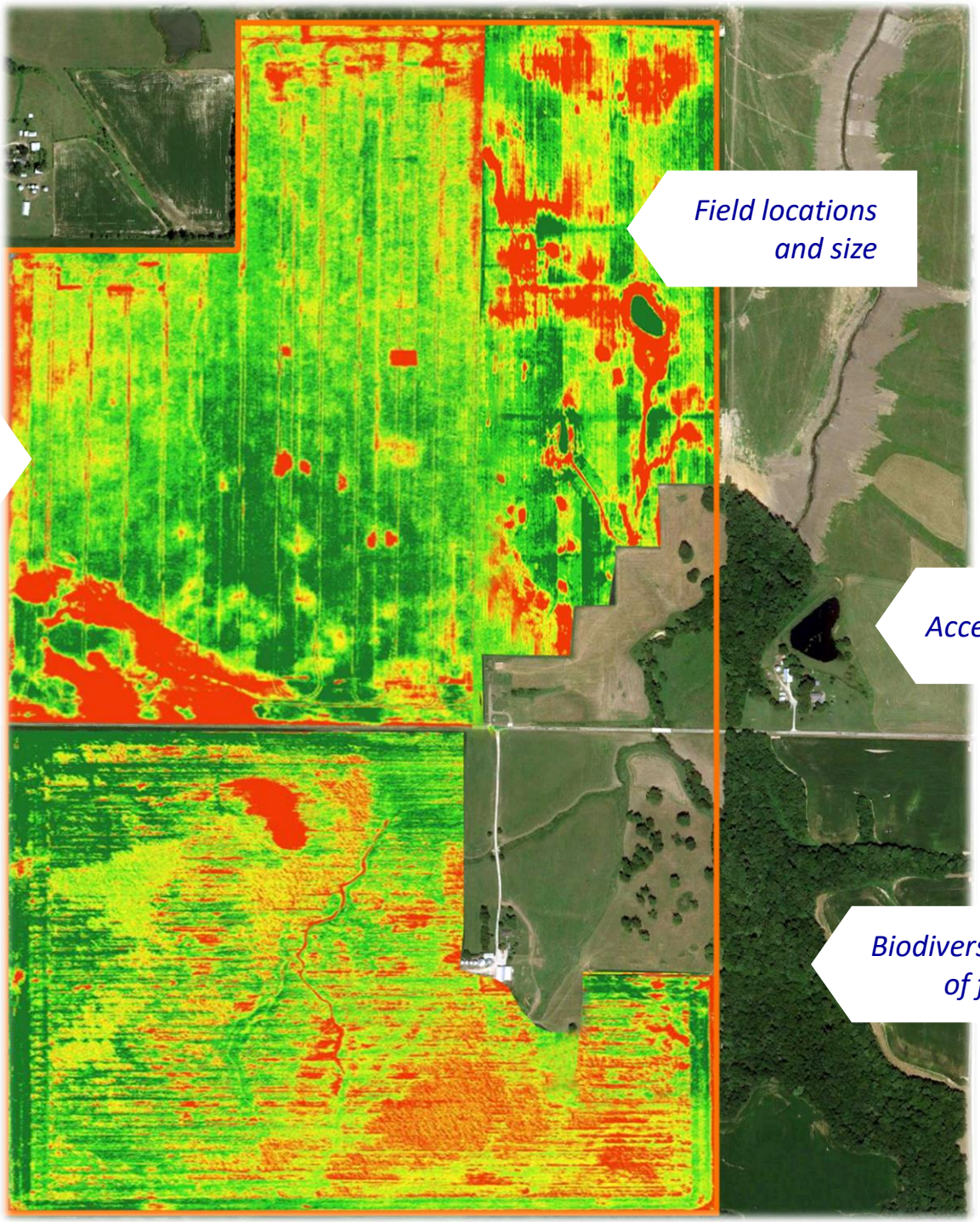
Accurate weather data, climate development, crop surveillance.



Field locations and size

Access to water

Biodiversity impact of forest area

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How do we choose?

- Resolution

0.5m-1m-10m-30m

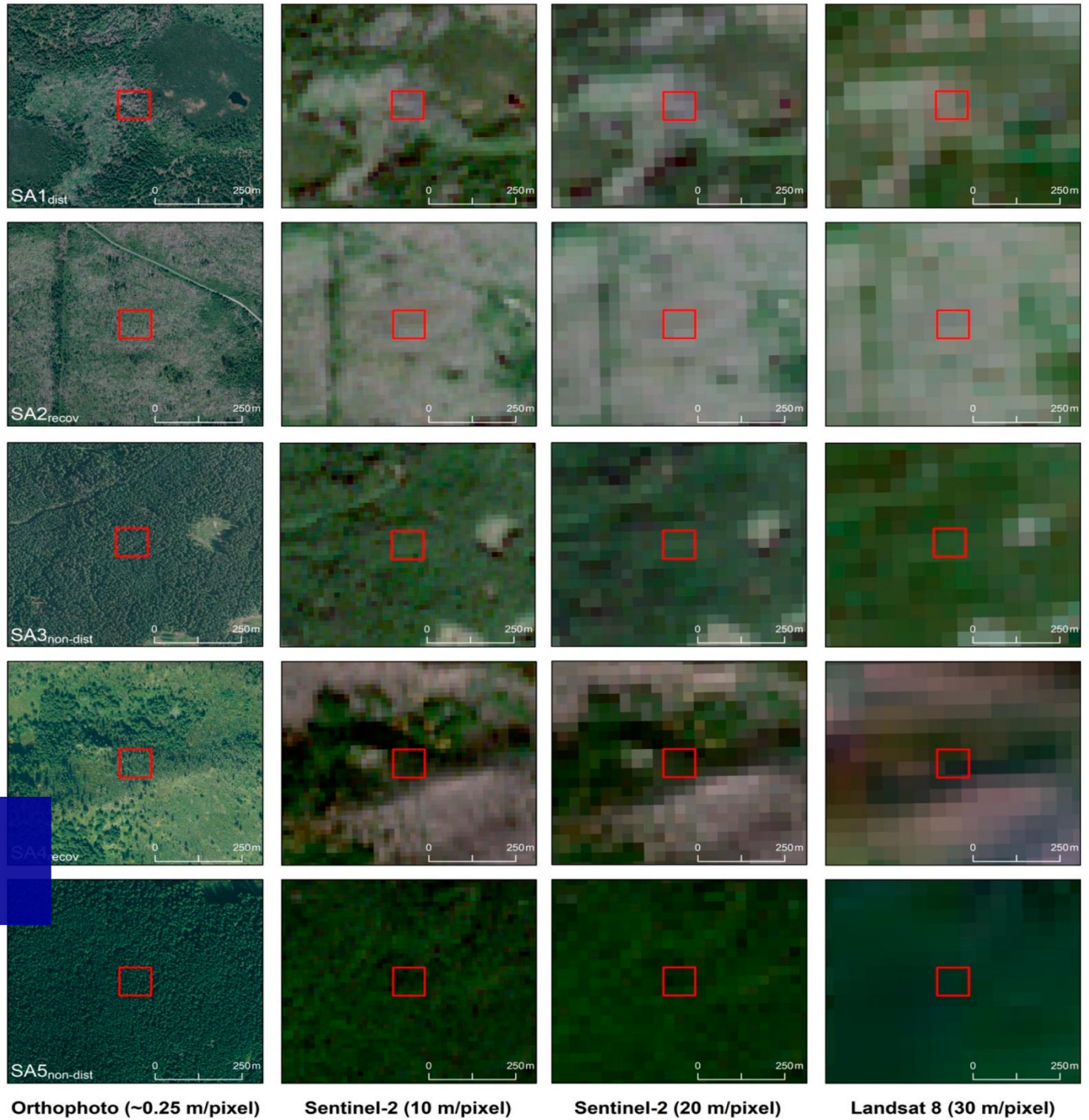
2bands-3bands-120bands

5hours-1day-3days-10days

Spatial Resolution

Spectral resolution

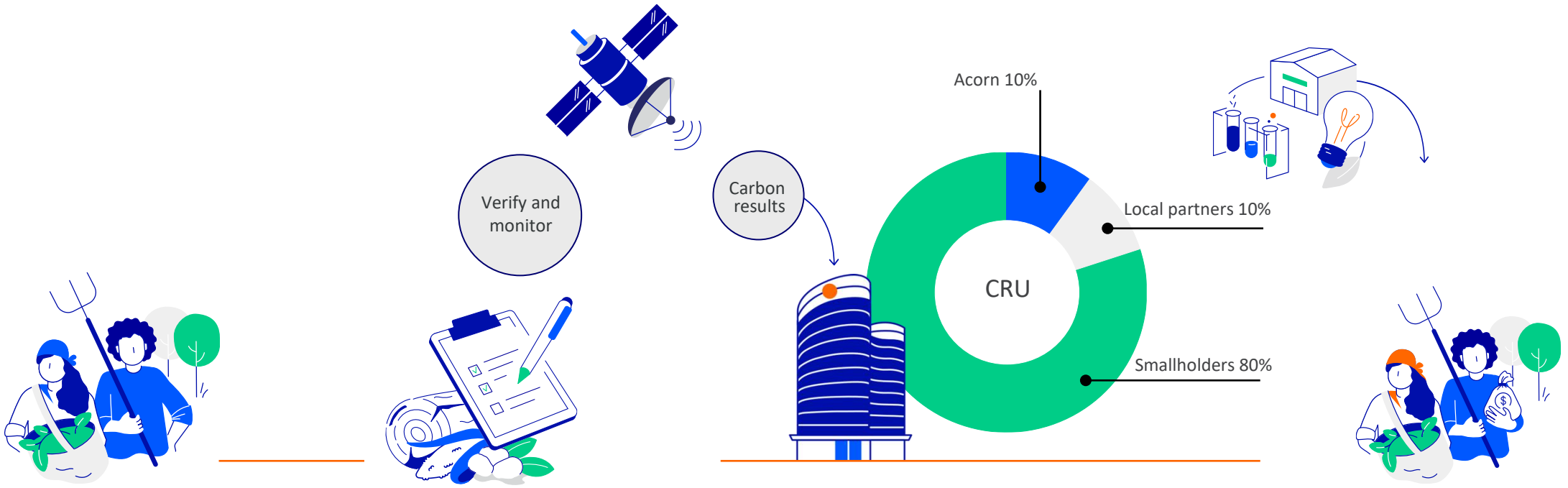
Temporal resolution



Source


Acorn
Plant a better future

Acorn sequesters CO2 from the air by helping smallholder farmers transition from monoculture to agroforestry



Assist smallholder farmers in their transition to agroforestry

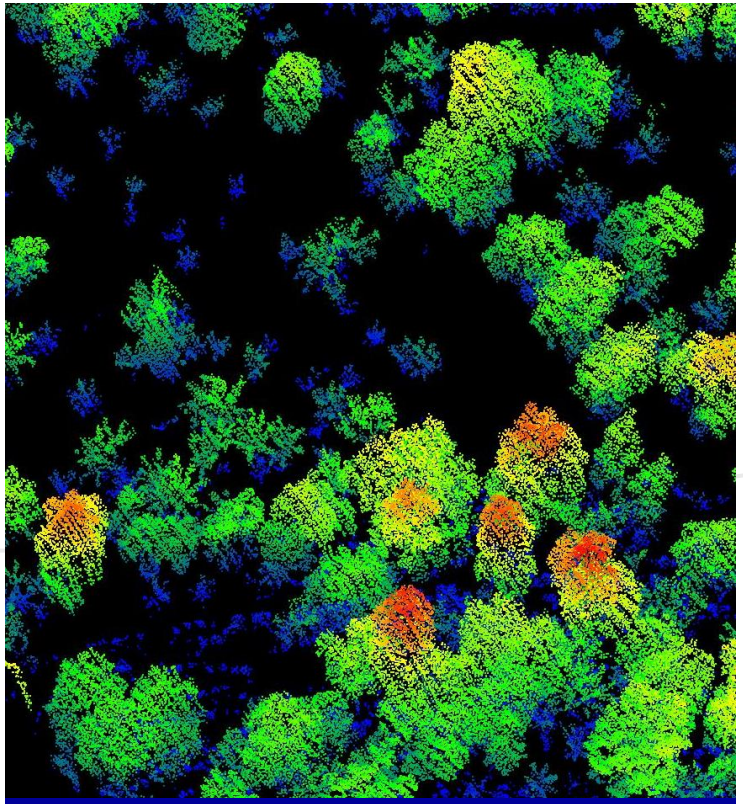
Measure and certifies biomass growth and makes CRUs

Facilitates access to local partners and buyers of CRUs through Rabobank's network

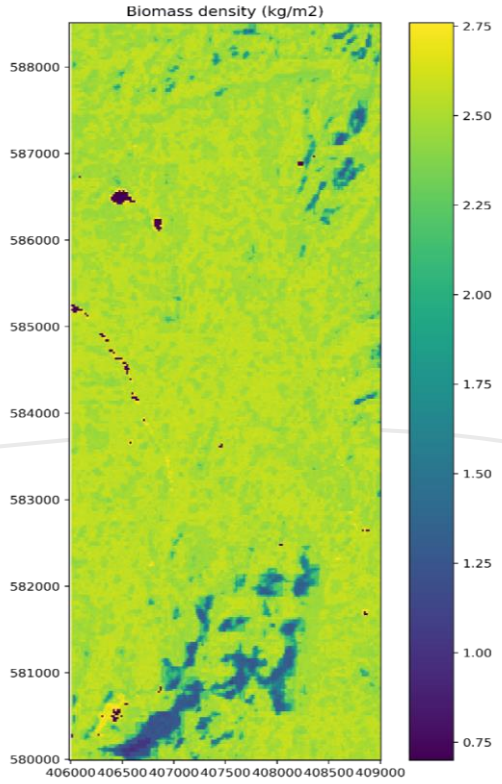
Ensures a fair share of income for smallholder farmers

We collect ground truth data, validated by LiDAR, to train, validate and perform scalable models

Sample based collection of ground truth data



LiDAR data to validate ground truth measurements



Together with satellite images we calculate biomass

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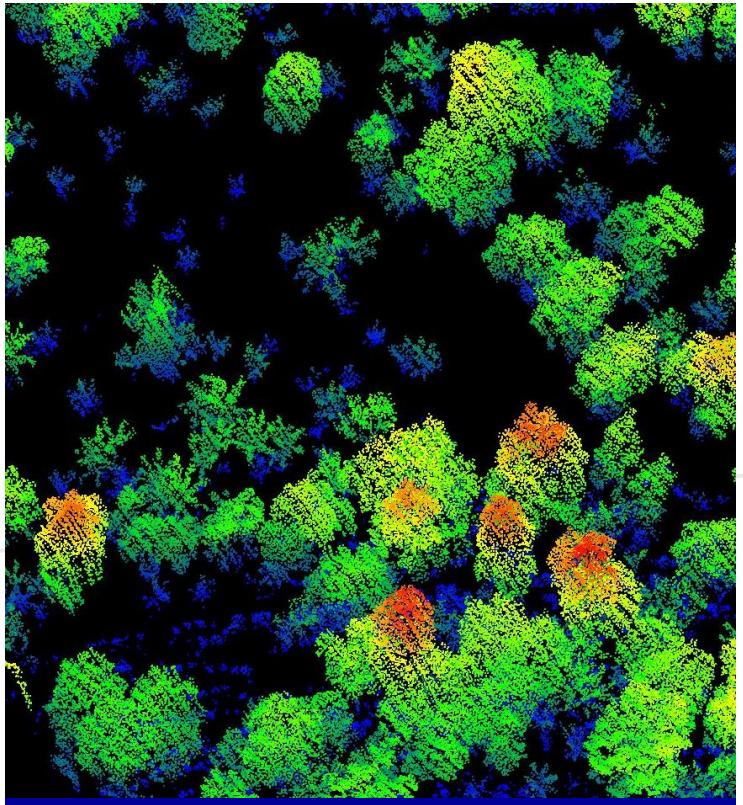

LiDAR data to validate ground truth measurements

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Transparency and traceability of every CRU

- Every issued Acorn CRU can be found on the Acorn website

…till the level of each individual plot of land.

- Showing detailed information of where specifically the carbon of the CRU is captured

Back to all projects

ID# CRU-18732

CRU courtesy of Wilfredo Andrés

Wilfredo Andrés, a farmer in Colombia, is adapting to a sustainable method of planting various native trees and other crops on farmland. This system is called agroforestry. As those native trees and crops grow, they directly sequester carbon: the basis of this carbon removal unit. In addition to sequestering carbon, agroforestry helps smallholder farmers like Wilfredo Andrés to be more resilient to climate change and have more diversified crops to sell. In total, 80% of the revenue from this credit will flow back to Wilfredo Andrés, improving farmer livelihoods and investing in farmers' communities, while taking carbon out of the air as well. A win-win!

CRU Details

Type	**Naturebased**
CO2kg per CRU	**1000**
Buyer	**Microsoft Corporation**
Issuance date	**23.03.2022**
Farmer	**Wilfredo Andrés**
Certifier	**Plan Vivo**

Risaralda, Colombia

Solidaridad Latin America Colombia

7,372 t CO_2 captured

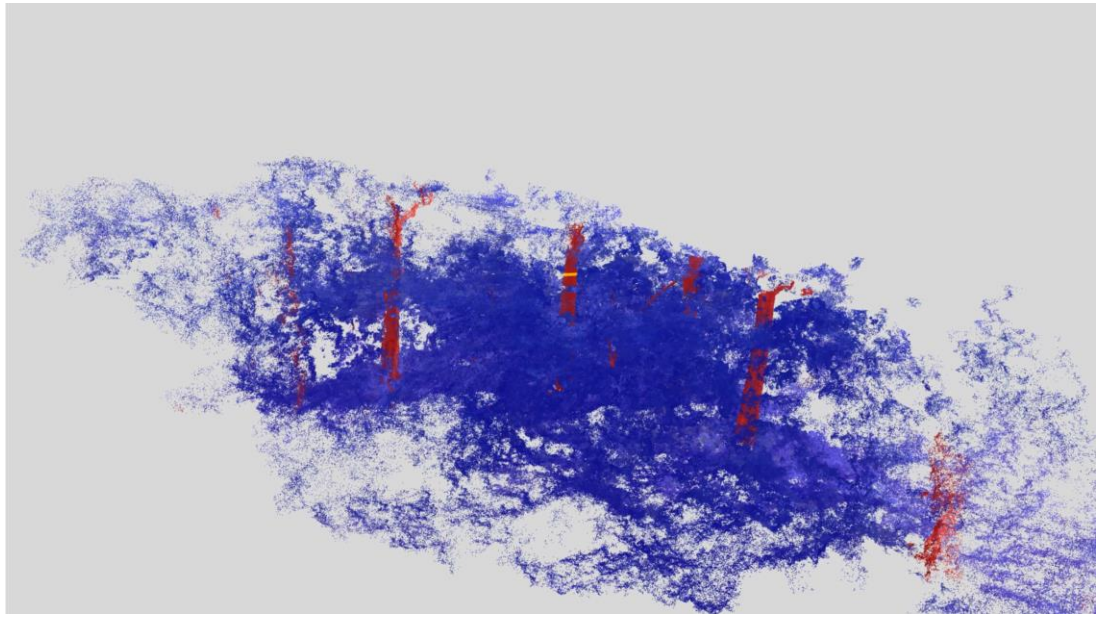
View project

SDGs

We're testing emerging technologies in automated measurements, digital twins and virtual reality.

Subplot in Embu, Kenya

Trees identified and measured

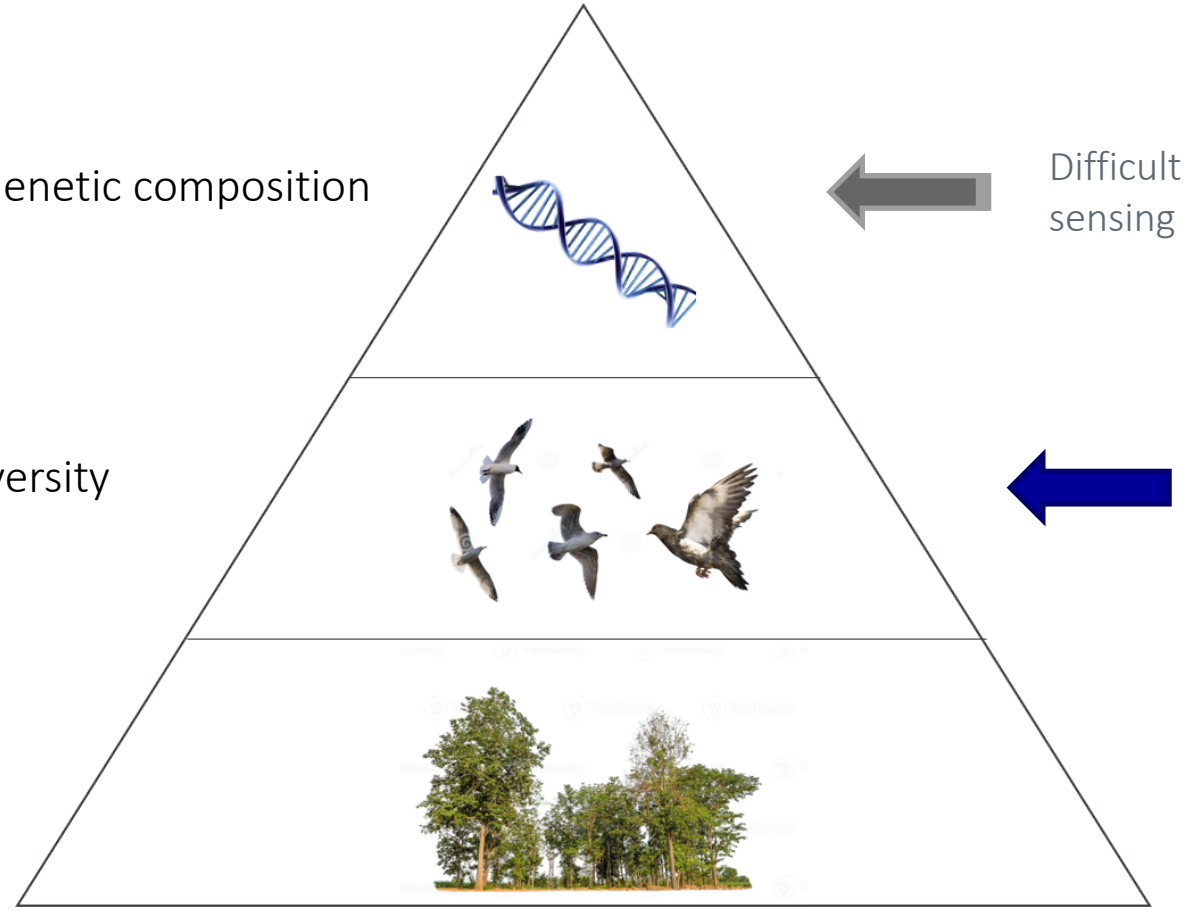


Source: Agerpoint

Biodiversity

Monitoring and measuring biodiversity through RS

Biodiversity is the sum of all biotic variation from the level of genes to ecosystems in space and time



Genetic composition

Difficult to measure with remote sensing

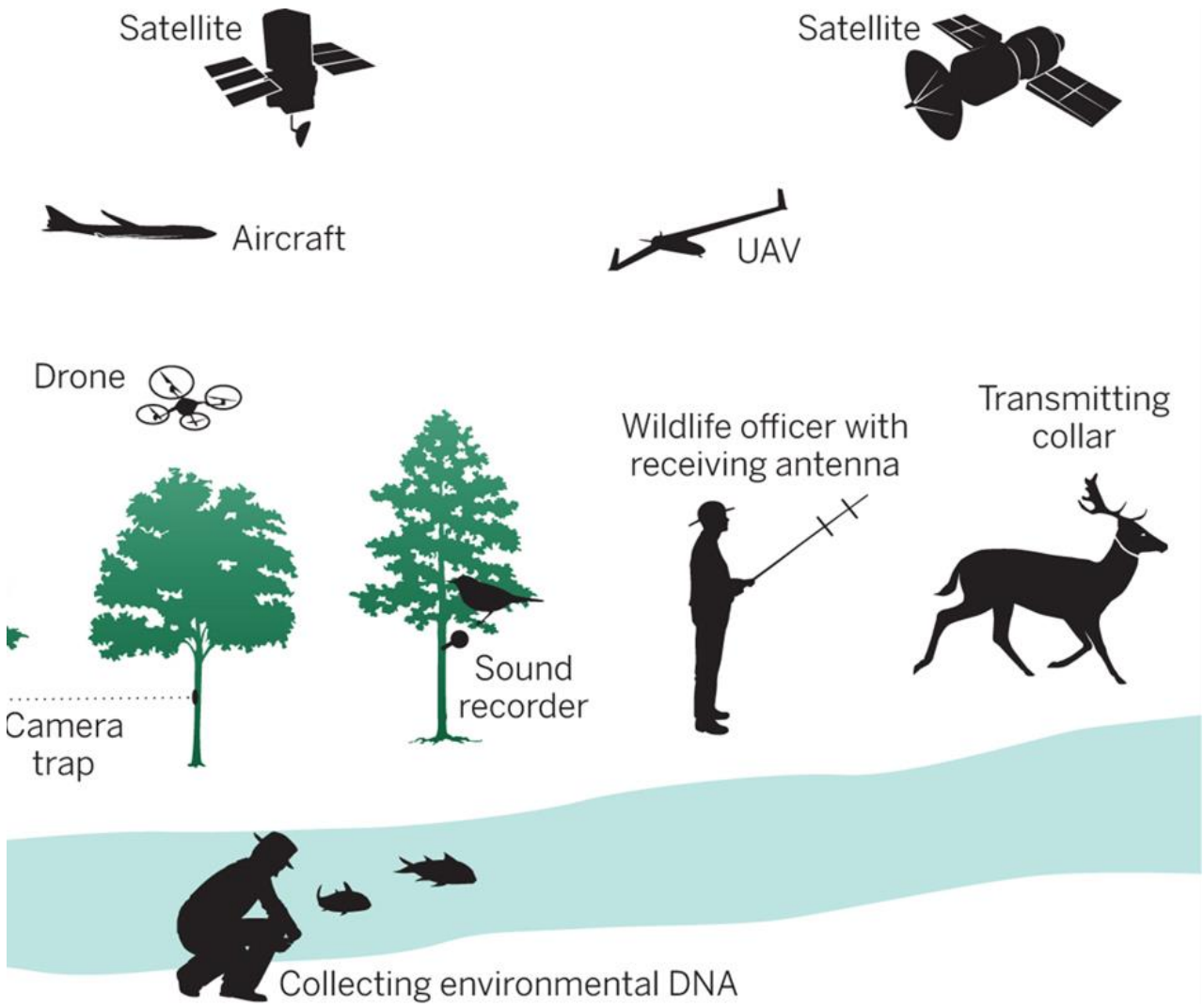
Species diversity

Feasible

Ecosystem diversity

Feasible

Remote sensing can sense biodiversity at different spatial scales

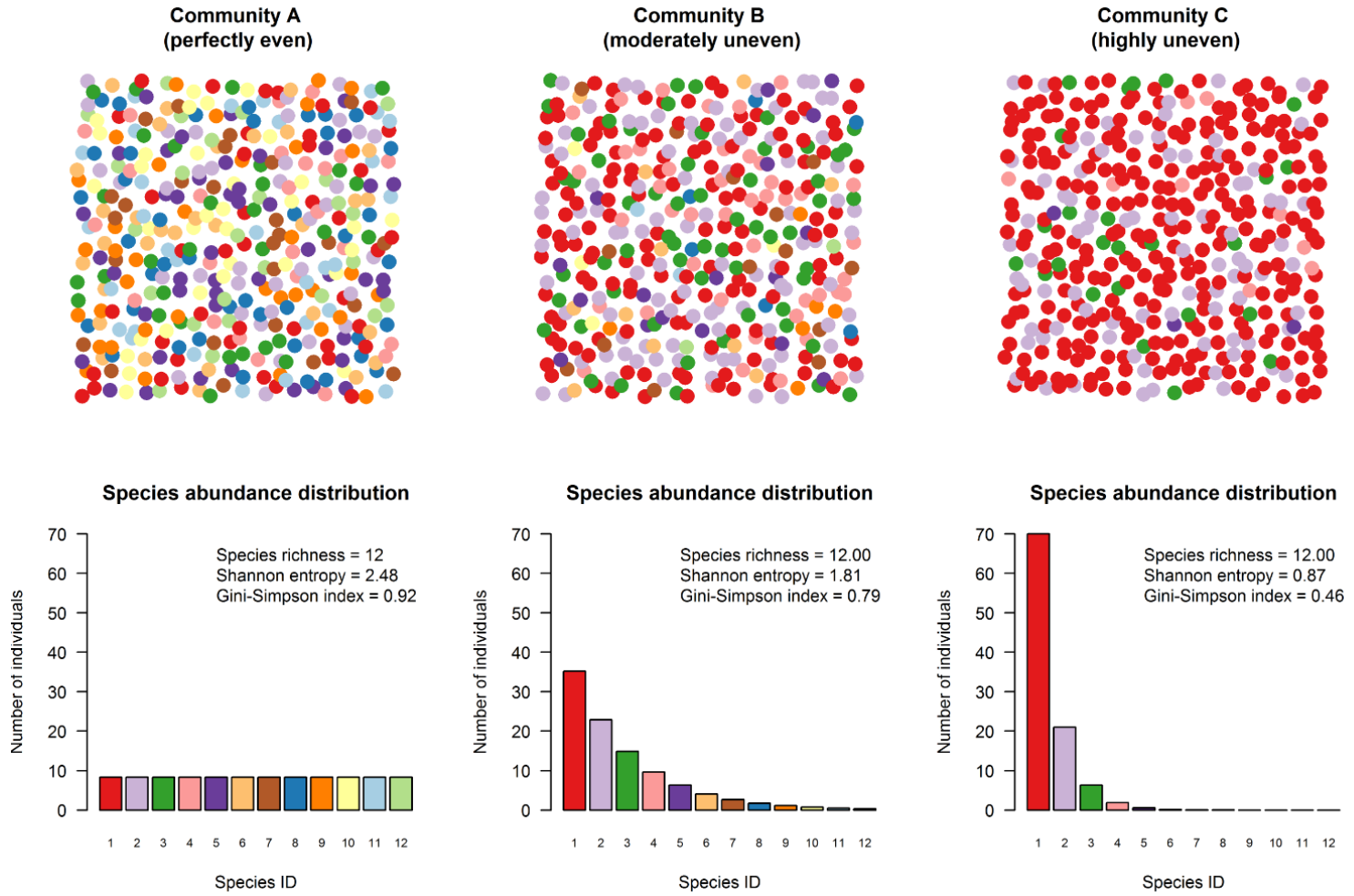


Global-regional coverage

Regional-local coverage

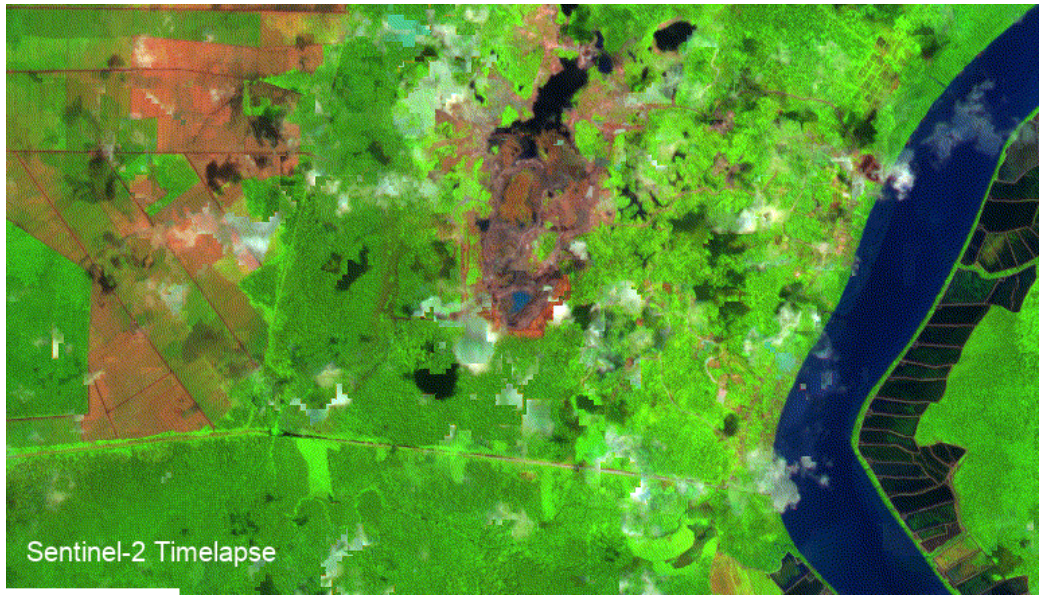
Number of species is not the whole story for biodiversity

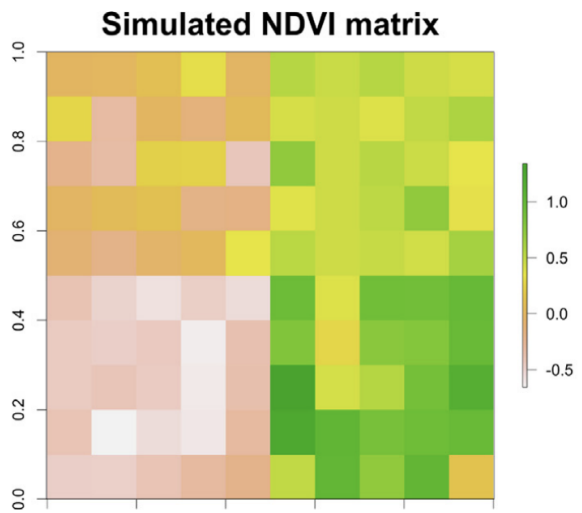
- **Species richness**: number of species
- **Shannon index (0 - 3.5)**: higher more even
  - considers both species richness and evenness

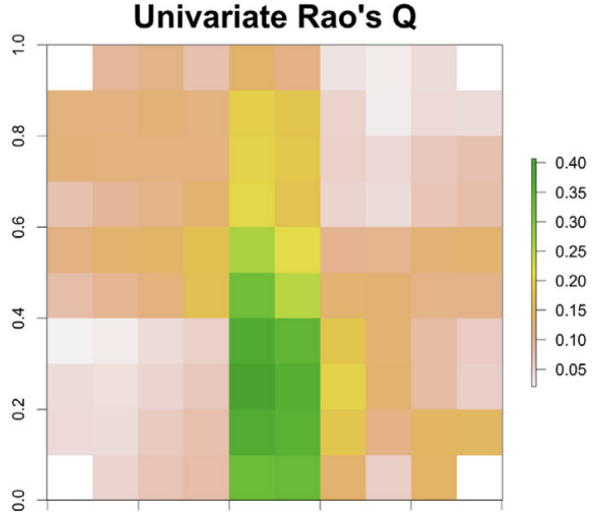


Remote sensed temporal and spatial variation is the key to measuring biodiversity

- Sentinel 2 time series: temporal variation
  - 10 m resolution
  - Images of different time
- NDVI: spatial variation
  - Spatial variability in the reflectance of vegetation relates to species biodiversity

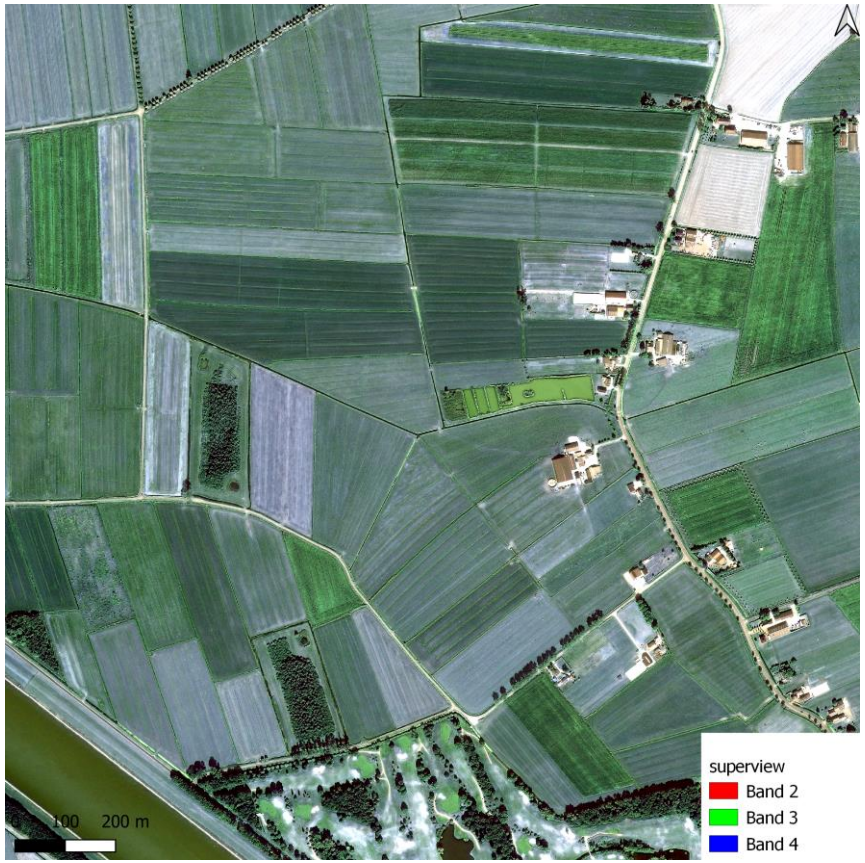




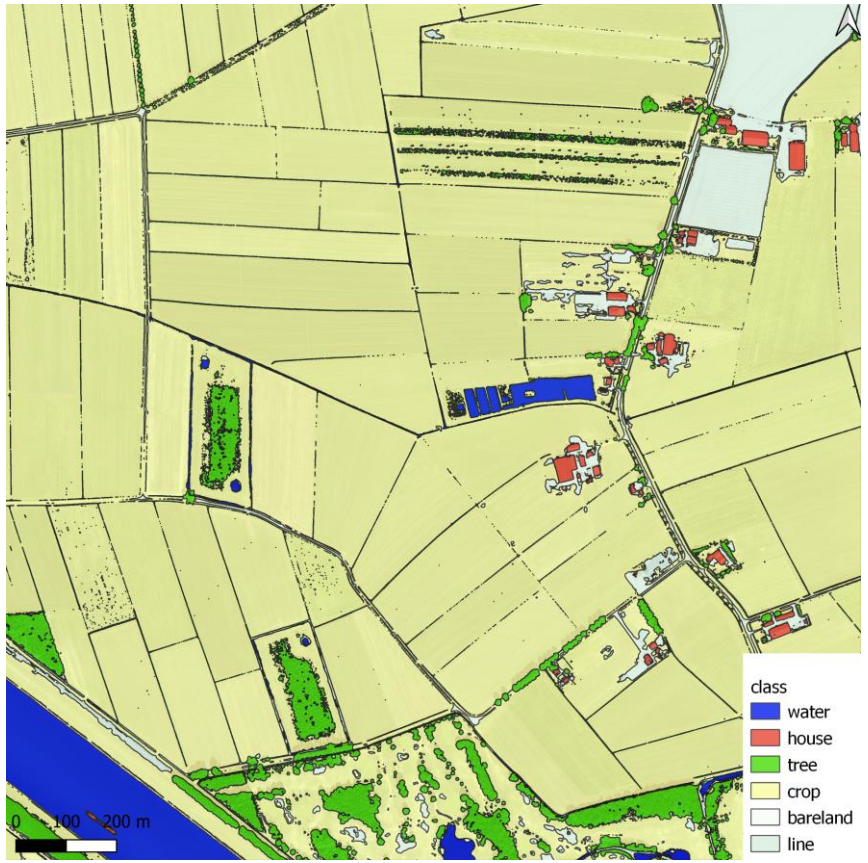


Rocchini, Duccio, Matteo Marcantonio, and Carlo Ricotta. "Measuring Rao's Q diversity index from remote sensing: An open source solution." *Ecological indicators* 72 (2017): 234-238.

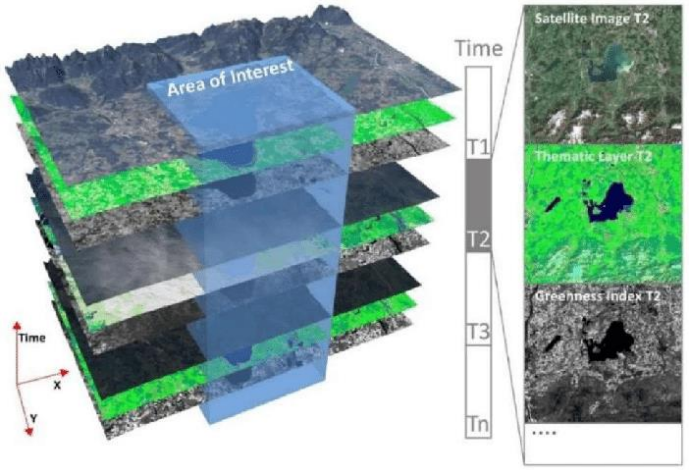
Through remote sensing we can identify different land cover types



U-net



Biodiversity indices can be predicted with remote sensing data

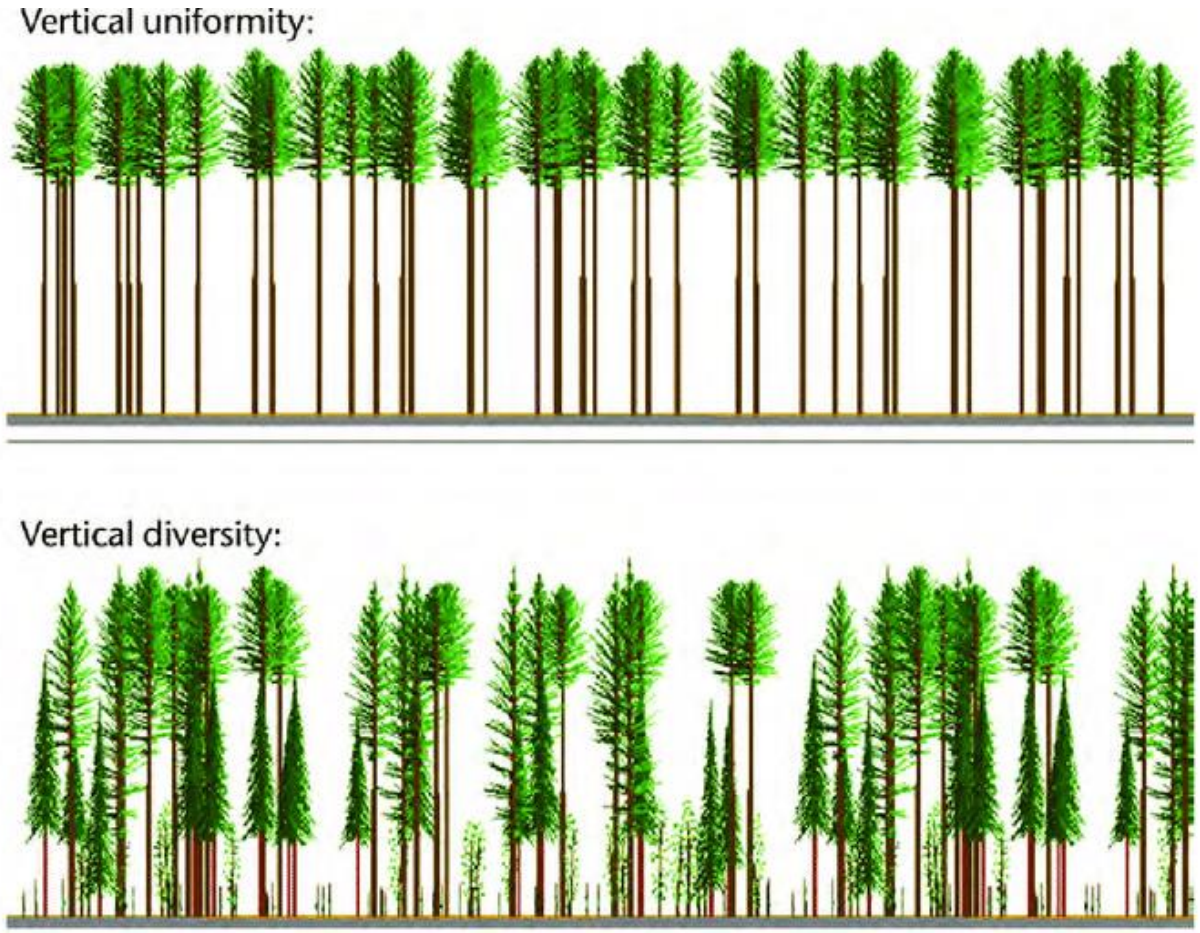


Richness

Shannon index

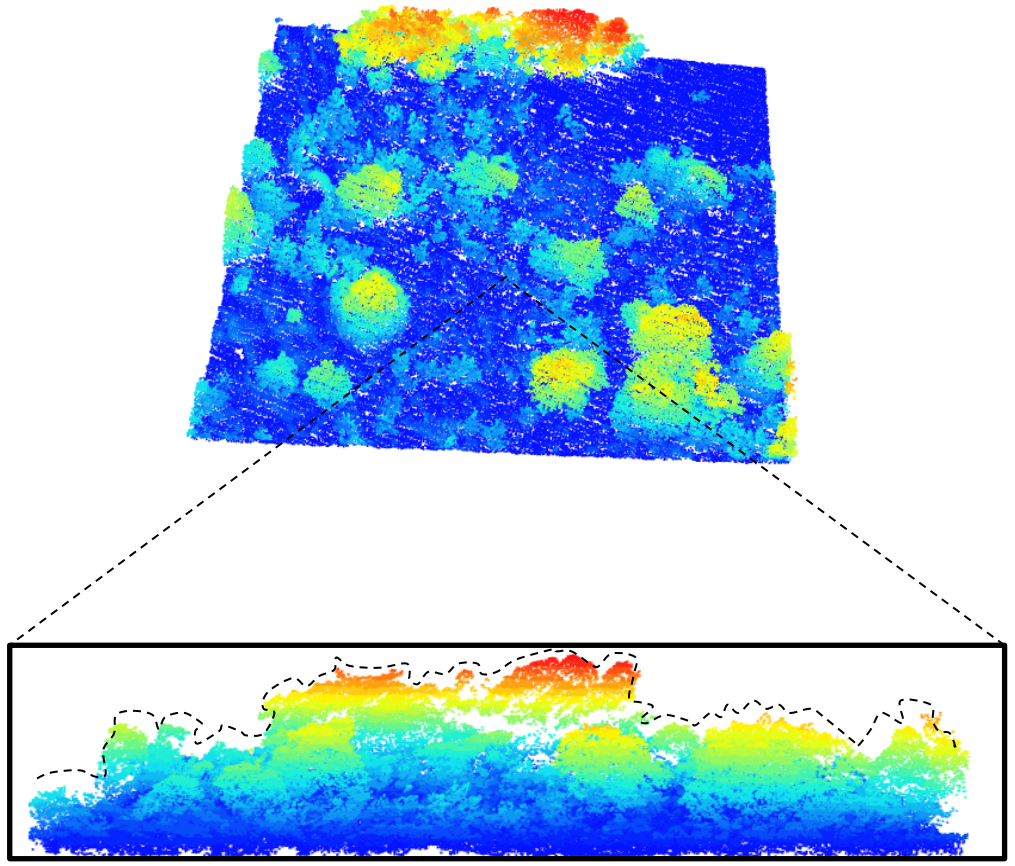
Biodiversity is not only species diversity, but also structure diversity

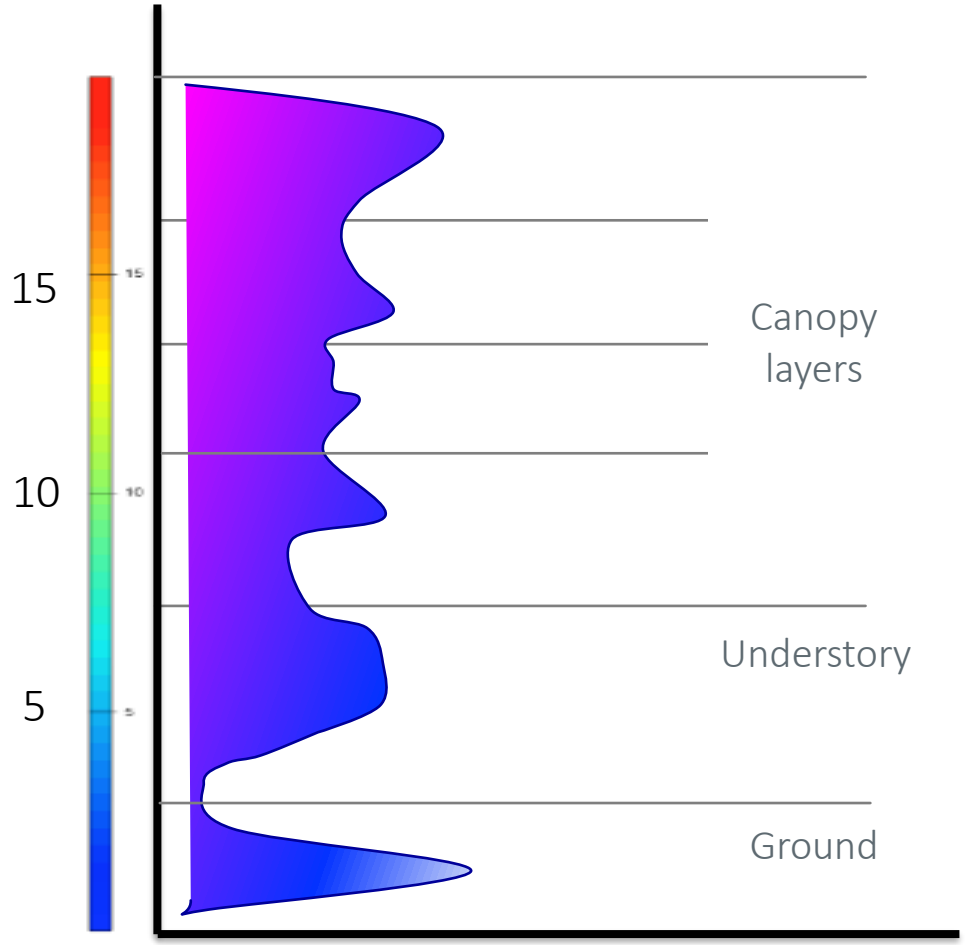
A diverse stand structure is likely to have more niches, which would host more species and contribute to a more eifficient use of available resources



Zobrist, Kevin W., and Thomas M. Hinckley. "Diversifying forest structure to promote wildlife biodiversity in western Washington forests." (2013).

LiDAR estimates plant vertical profile, and height heterogeneity (layer)





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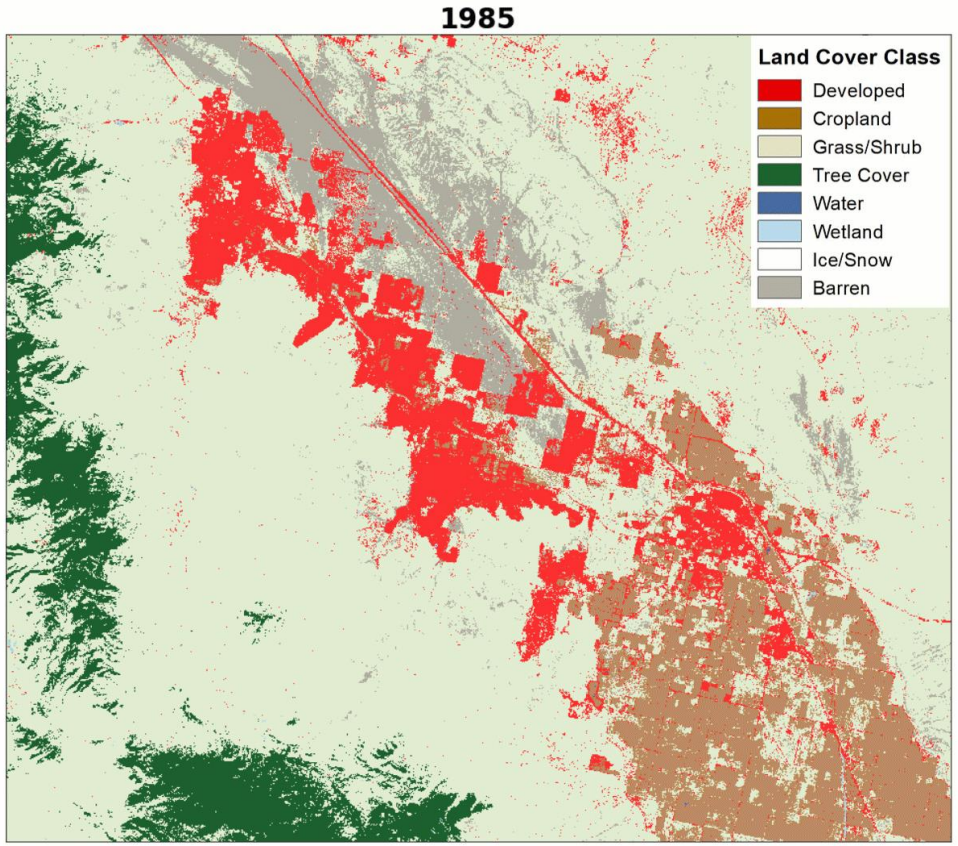
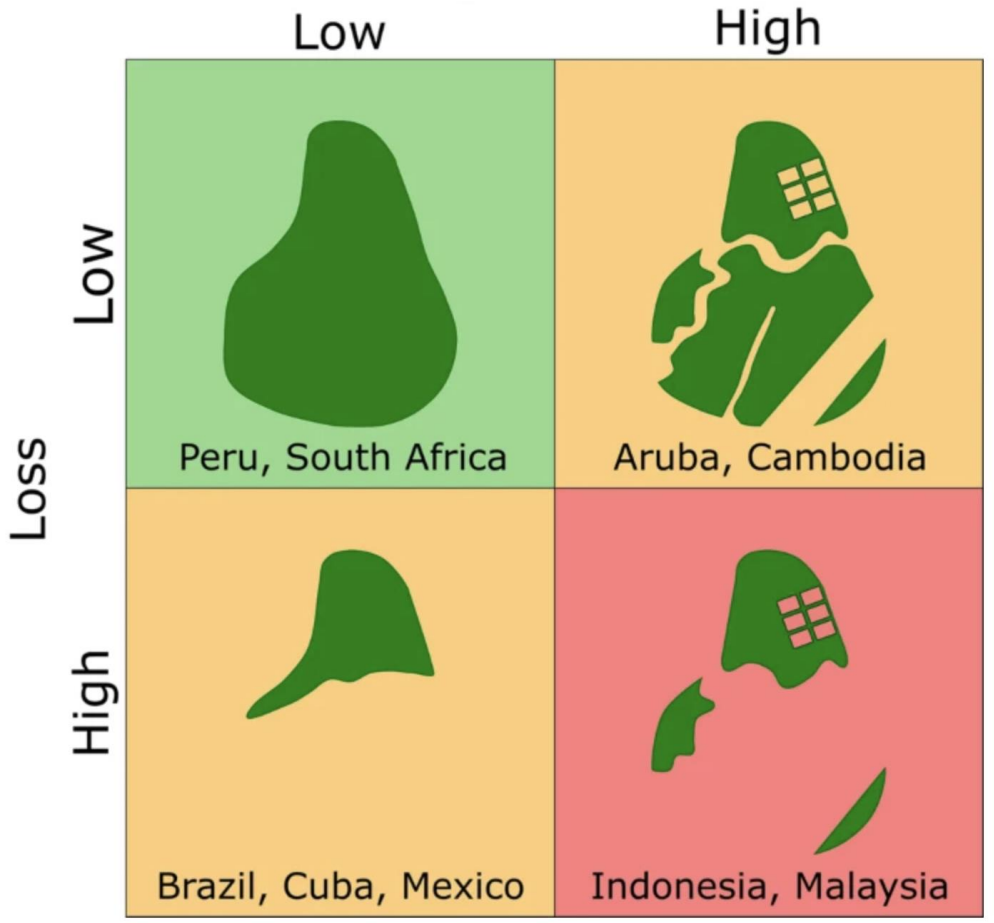
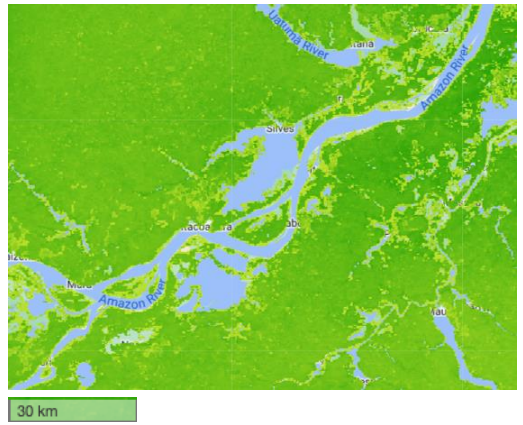
Land use is the prime cause of the loss or fragmentation of natural habitats and their species





Bryan-Brown, Dale N., et al. "Global trends in mangrove forest fragmentation." *Scientific reports* 10.1 (2020): 1-8.

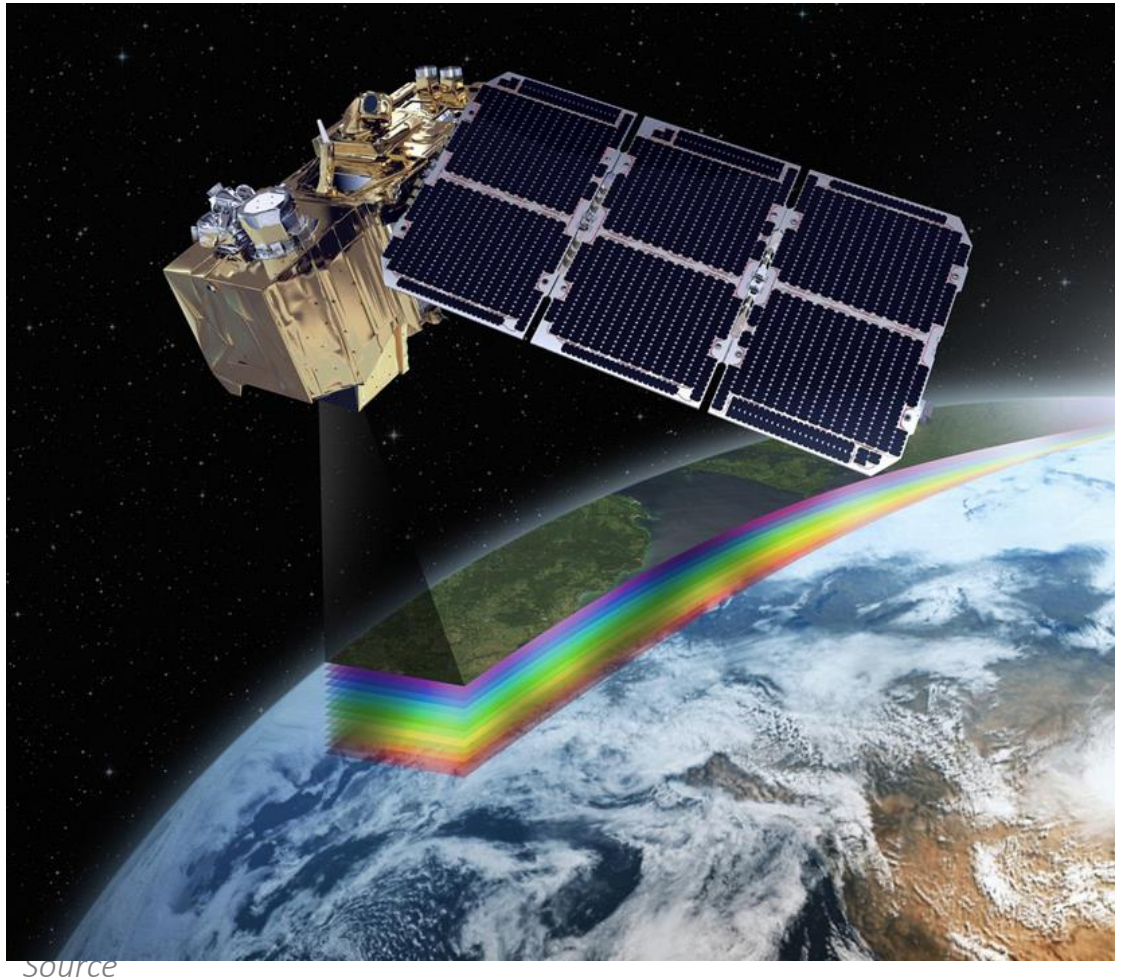
Ecosystem functional diversity: net primary production indicates activity and healthy status of trees.



Net primary production

Opportunities for further development

- What is Remote sensing and how do we use it.
- ACORN, Biodiversity and the data in between.



Source

- *Above ground biomass monitoring*
- *Deforestation monitoring*
- *Carbon sequestration and emission monitoring*
- *Monitoring impact of climate change and weather*
- *Crop development and crop growth monitoring*
- *Water mining*
- *Soil health monitoring*


Questions?