

A world in crisis...

Nature-based solutions



MASARANG

B&I Capital



Willie Smits

Presentation for B&I Capital
Zurich, October 3rd, 2022

Our world is in peril

Deforestation is contributing to several tipping points that will impact our world in many irreversible ways:

- Loss of biodiversity will rob us from new medicines and valuable genes
- Regional deforestation will cause more droughts, precipitation changes, fires, flooding, erosion, land slides and endanger food security
- Deforestation will cause accelerated extinction of flora and fauna, dead coastal zones, sea level rise, etc.
- Deforestation will contribute to more pandemics and poverty





Masarang looks at the total picture



Watershed management

Coastal Protection



Wildlife Rescue

Reforestation/
Rehabilitation

Nature Conservation

Environmental risks

Training



Local Culture

Jobs

Organic Farming

Education

Food Security

Local needs

Water

Sustainable income

Agroforestry

CO2 Issues

Temboan's Diversity



Grass lands

Primary forest

Secondary forest

Bamboo

Coral reefs

Beach creepers

Turtle hatchery

mangroves

Brackish lake

Magnetic black sand

Nipah palms

Road Access to beach

Temboan's Challenges



Fires, poverty, pollution, land slides, coral destruction, beach aberration, poaching, etc.

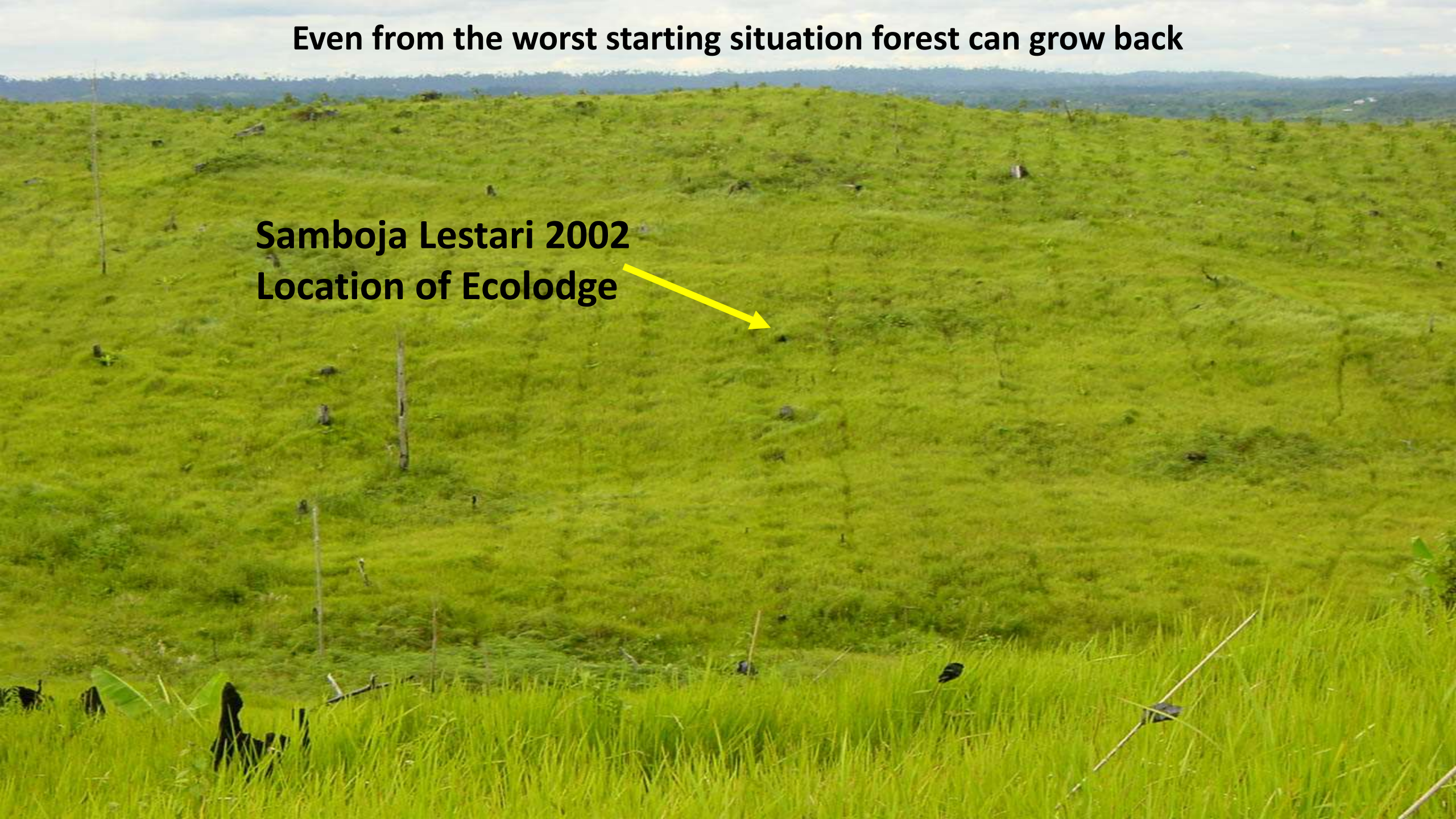


Magnetite und Chromium

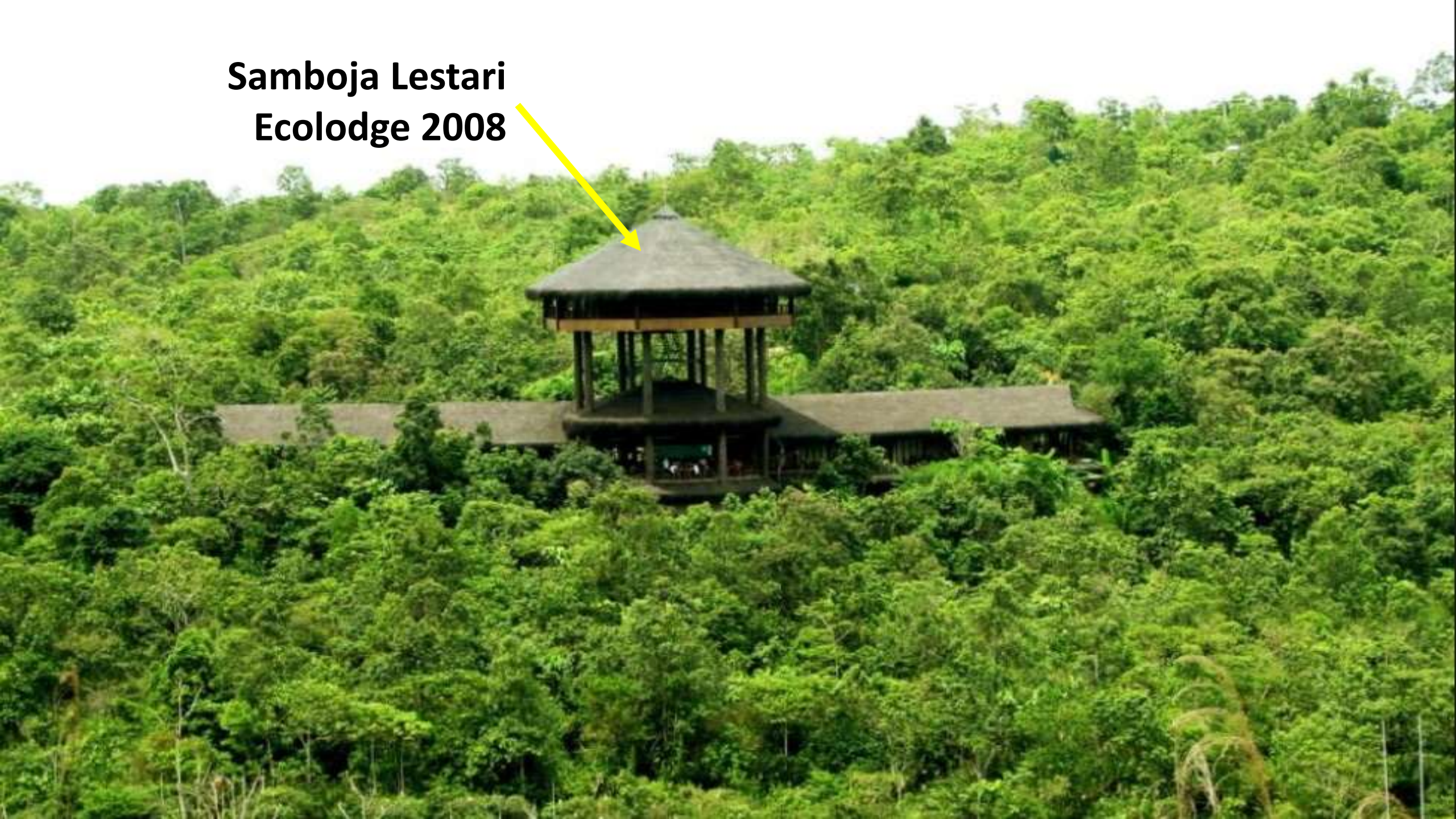


Even from the worst starting situation forest can grow back

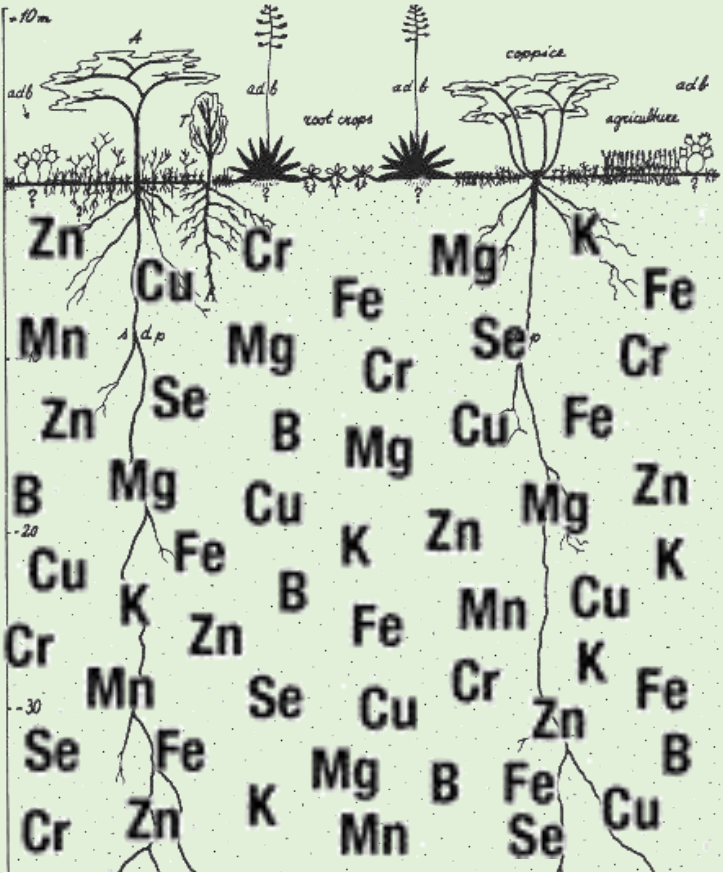
Samboja Lestari 2002
Location of Ecolodge



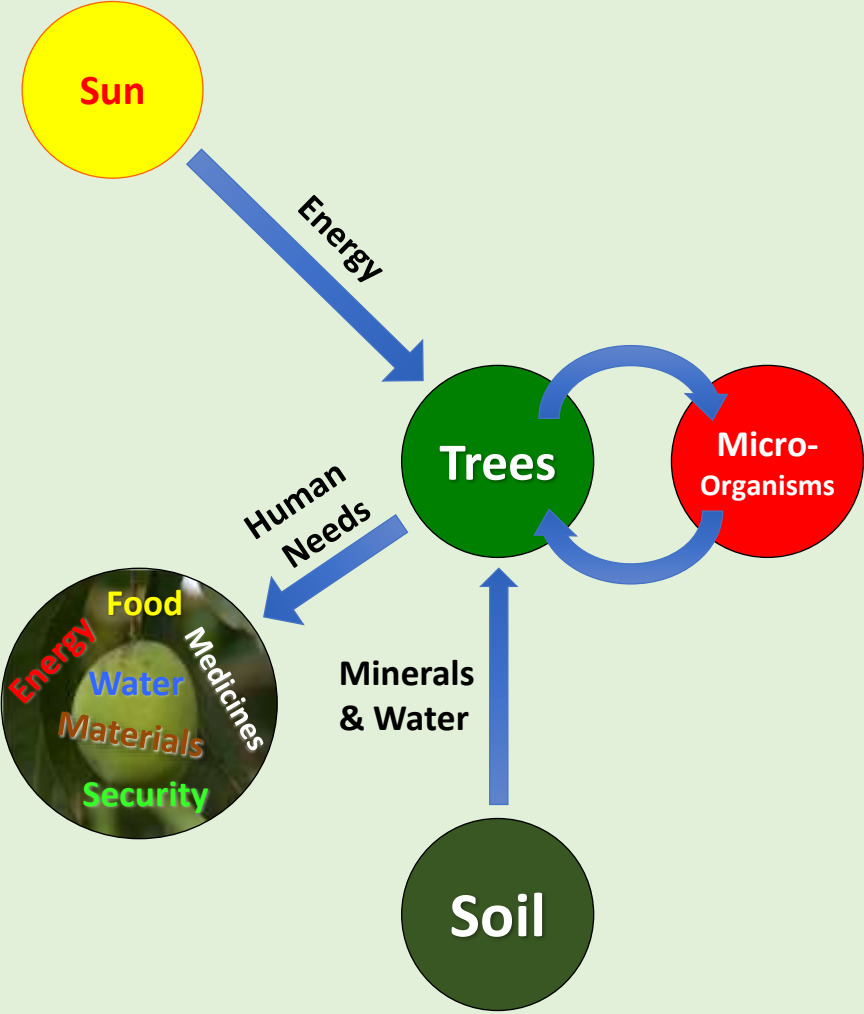
**Samboja Lestari
Ecolodge 2008**



But we have to start up the Nutrient Pump:



Nutrients = Capex \$\$\$



Most "modern" agriculture needs lots of artificial inputs...

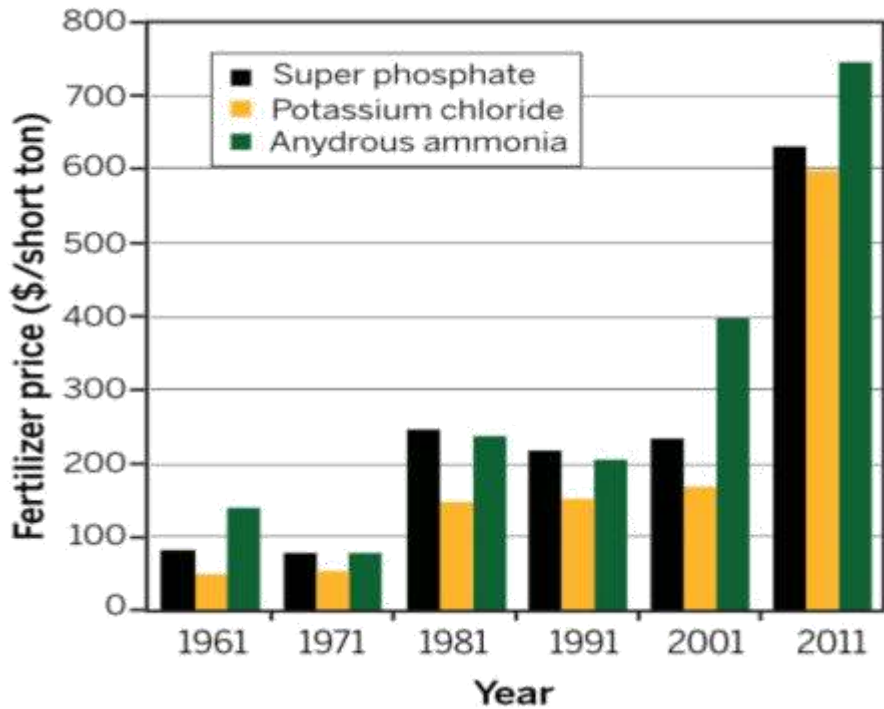


Oil Palm Inputs: Herbicides, Fungicides, Rodenticides, Insecticides, Fertilizers, etc. Mostly fossil fuel based!



On average 1.600 kilogram of Fertilizer & Pesticides/ha/yr





This trend is likely to continue...
 Example Phosphate:

Phosphate is a critical & finite Resource

Example nitrogen:

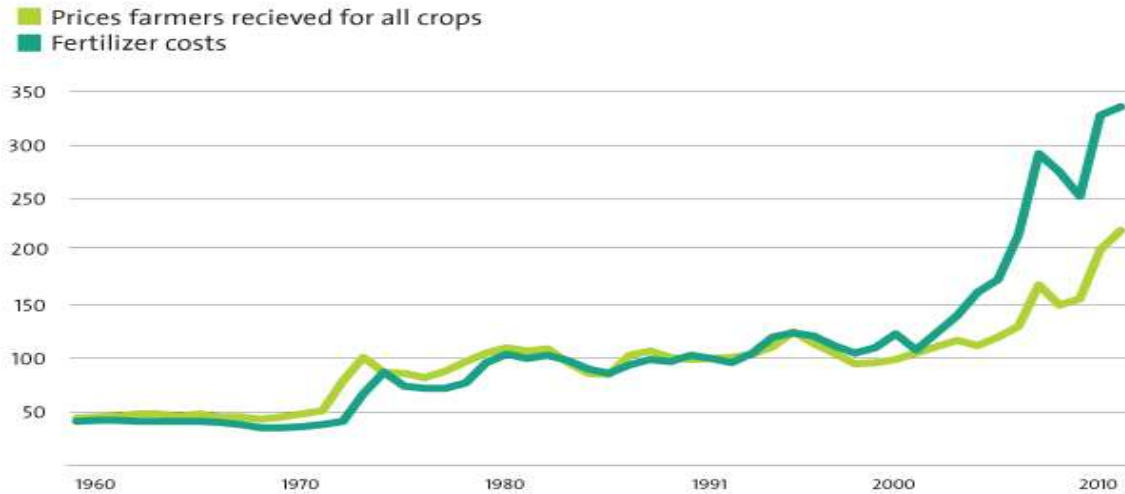
Made from fossil fuels (gas)

Fertilizer Prices have more than tripled over a 10-year period !

In Indonesia subsidies for fertilizer will end next year...

Farm Profits Can't Keep Up With Fertilizer Costs

Price fluctuations compared to 1992 prices



Source: NASS and BLS

Mother Jones

Overview Temboan



Palamba Village

Ci Paula

Temboan Village

Walinsorit Village

Rumbia Village

- Main road in red
- Village roads orange
- Paths in brown
- Border in blue
- Bright red roads already constructed inside the area

Google Earth

Image © 2021 Maxar Technologies
Image © 2021 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

2 km





boan Village

Walinsorit Village

Rumbia Village

Hundreds of pieces of land bought to become one official new conservation area

Four kilometers of uninhabited beach fronts and coral reefs

The area is an important sea turtle nesting site without any light pollution

Coral reef restoration helps the fish population and thereby the local people

Google Earth

Image © 2021 Maxar Technologies
Image © 2021 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO



2 km

Aims:

- Serve as example of what can be done restoring critical lands
- An Education/Training facility
- Show inspiring, truly sustainable eco-tourism
- To sequester vast amounts of carbon in various ways
- Providing sustainable jobs
- To operate an animal rescue center open to volunteers and researchers
- To demonstrate renewable energy and biochar production from biomass
- To demonstrate coral restoration and preventing beach aberration
- Provide a wild animals release area
- To demonstrate economic feasibility
- To practice permaculture and show various environmental technologies
- To provide the most transparent live online monitoring system for biodiversity, carbon, restoration
- To become an area where most of Sulawesi's biodiversity can be preserved for the future



Severely disturbed areas inside the Temboan area

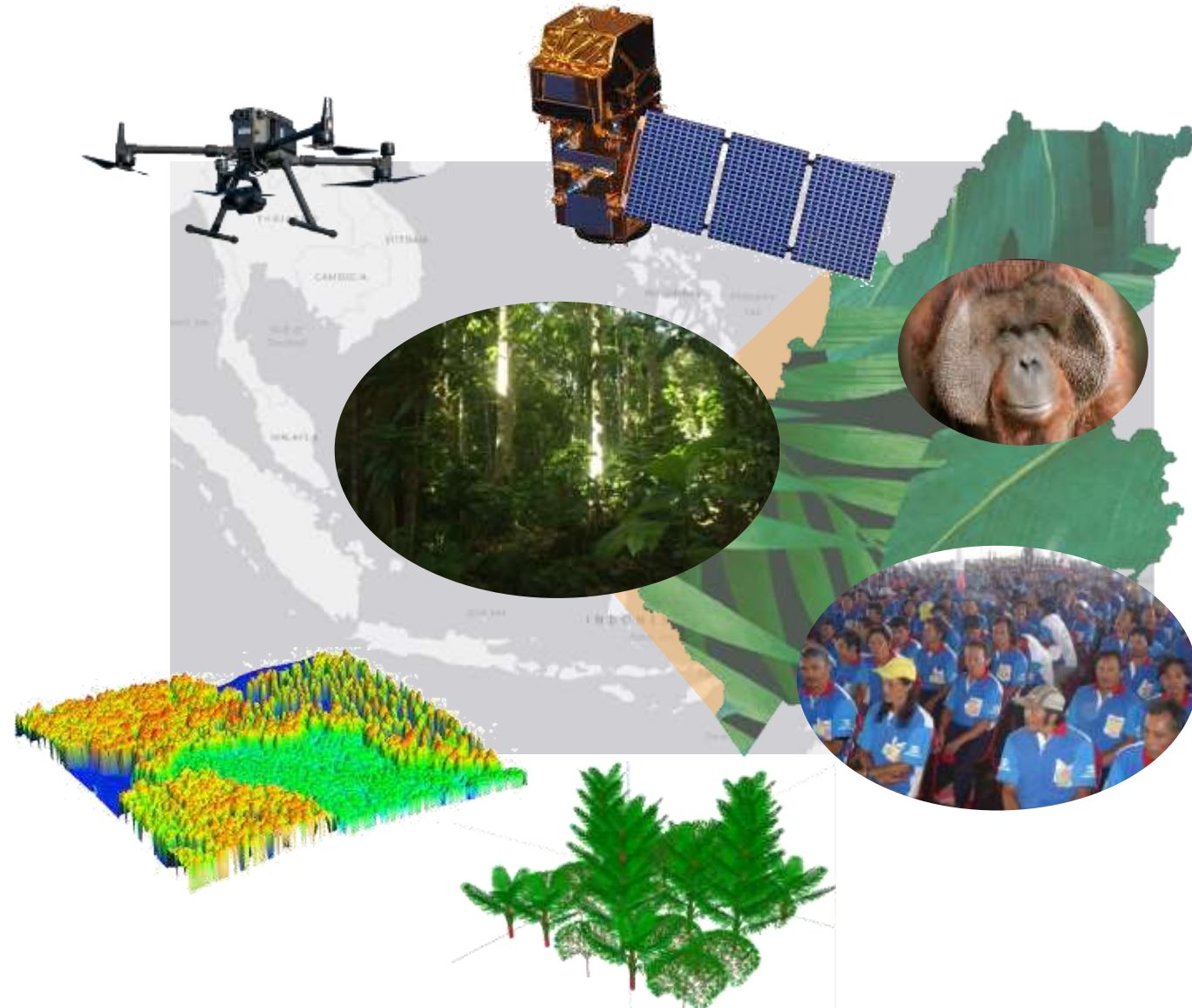


Creating real transparency with an online connection to the field and scientific monitoring of carbon, biodiversity, hydrology, jobs, local income, education, etc.



Advanced monitoring of the Temboan Project

Latest technologies enable unprecedented insights and detailed transparency as basis for cooperation and trust between caring parties



Example of independent monitoring our reforestation in Temboan through Google Earth imagery





Google Earth

12/2020: Preparing planting strips

Image © 2022 CNES / Airbus



Google Earth

08/2021: Newly planted trees start becoming visible

Image © 2022 CNES / Airbus



Google Earth

03/2022: First parts in wetter valley start closing the tree crowns

Image © 2022 CNES / Airbus



Example: the yellow lined area is being sponsored by Parakito

Example of monitoring reforestation in Temboan with drone

An aerial photograph of a hillside in Temboan, showing a mix of dense green forest and lighter green grassy areas. A specific area is highlighted with a yellow border and filled with a darker green color. This area is labeled 'Parakito area'. The surrounding landscape consists of rolling hills with varying vegetation density.

Parakito area

Example: the yellow lined area is being sponsored by Parakito



In this drone shot we can see many interesting facts from the dark spots, different ages of forest, and the location from where the slide before was taken, the arrow pointing out the direction





Cassava

Gmelina

Gliricidia

Mahogany

Mahogany

Banana

Balsa

Wild Pepper

Pogon grass

Lemon grass

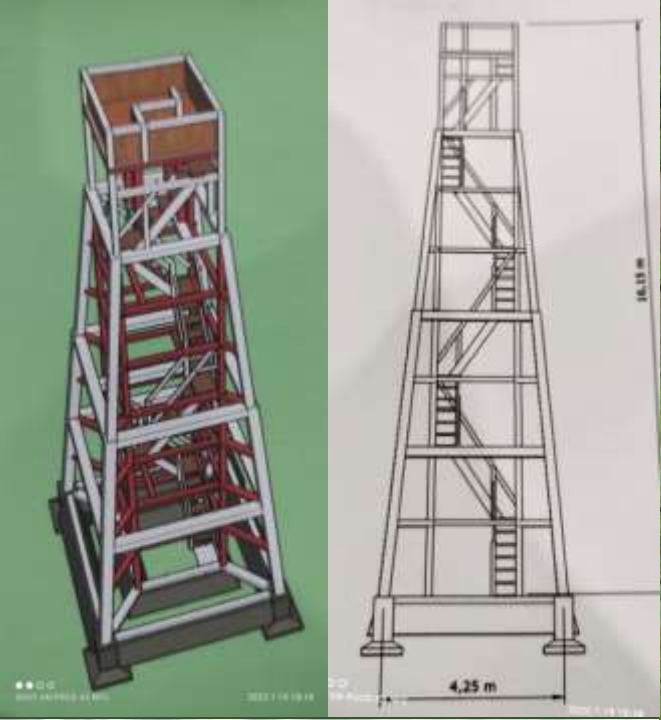
And this is what the adopted plot looks like from the dot in the previous slide.

After less than 2 years the crown closure is almost complete and the micro climate has been restored

The notorious Pogon grass is losing the battle and is being shaded out

A multiple of useful products is already being produced in the mixed reforestation

All data on species, number of plants, costs, etc. carefully recorded



This is the tower under construction, allowing 360 adopted plot looks like from the dot in the previous slide.

The tower will still be 5 meters higher and is made of very sturdy good wood from fallen trees in the Temboan area

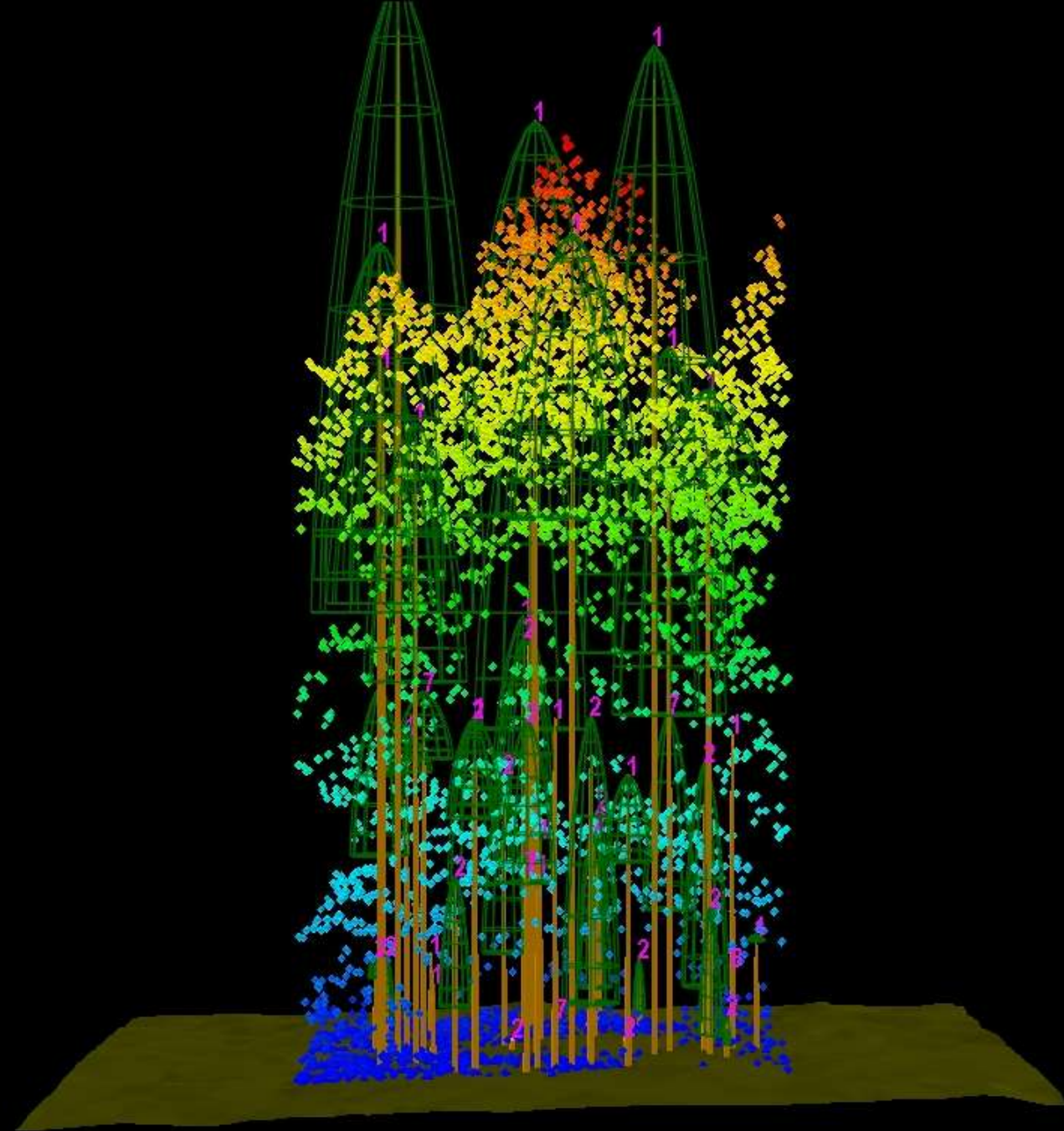


The wood will be preserved by applying wood vinegar and wood tar a byproduct from our biochar production

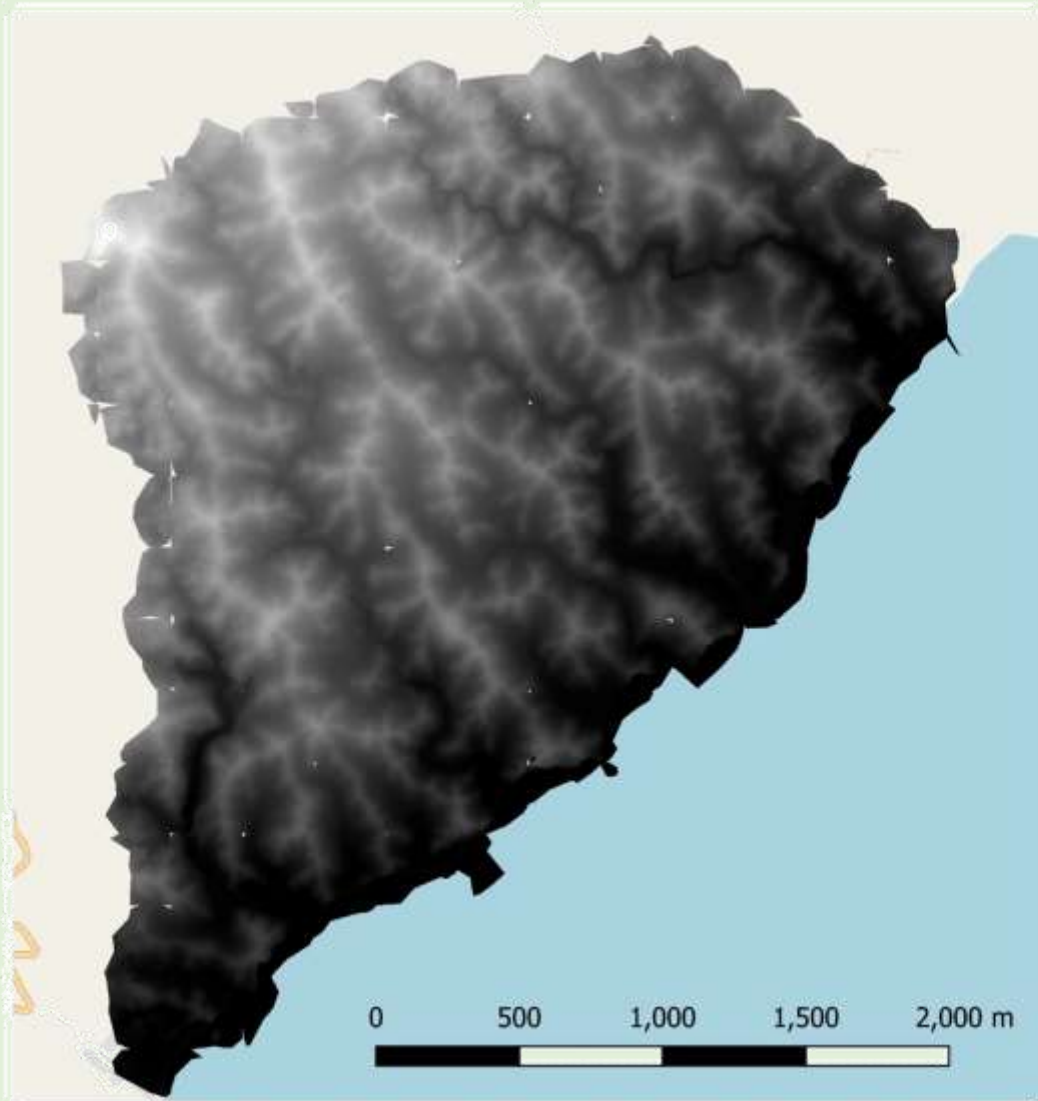
A camera connected to the Internet will provide live views with possibility to zoom in on single trees

How we use LIDAR in Temboan:

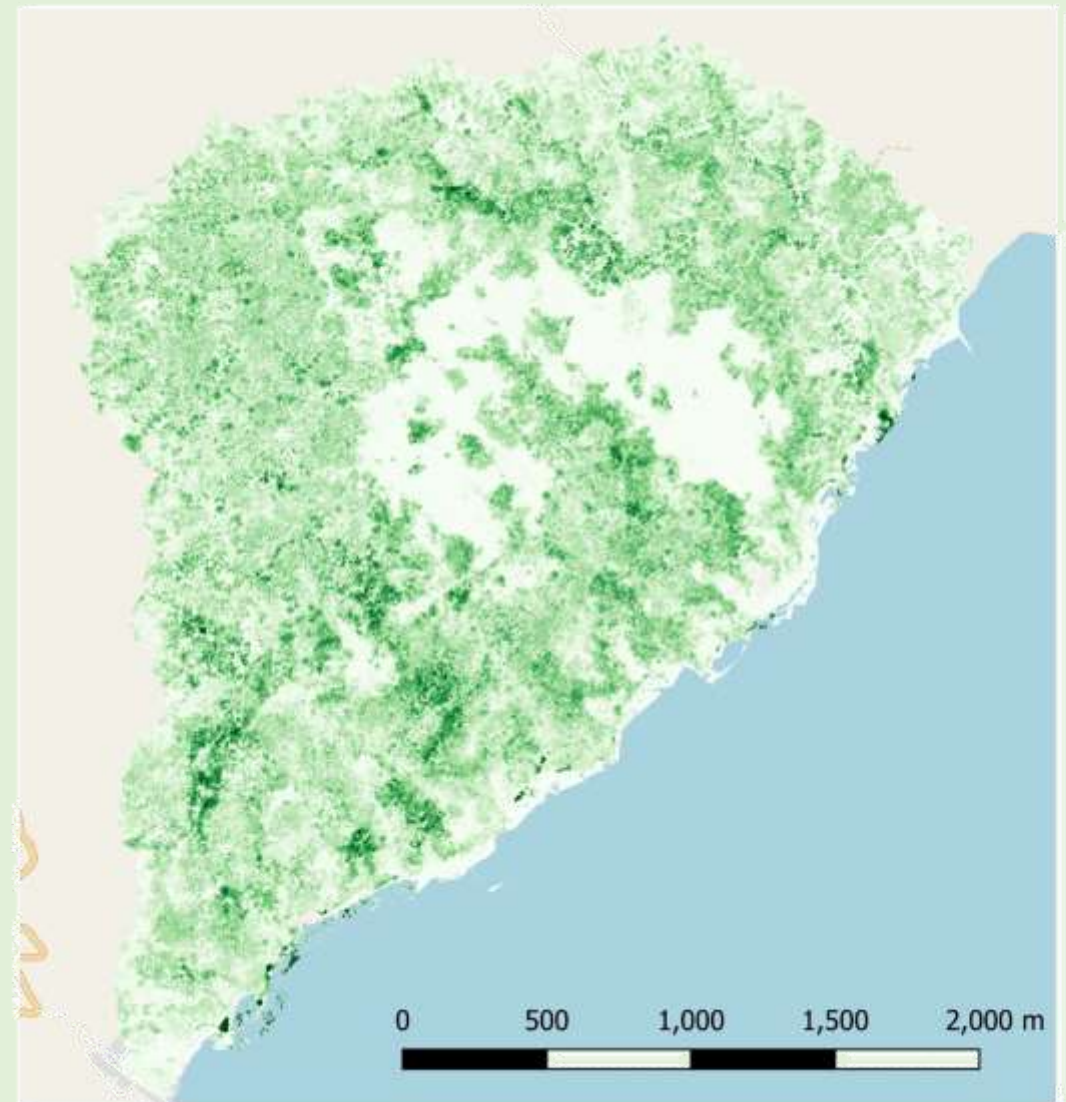
- Radar can penetrate small gaps between the trees, branches and twigs
- In this way the signals that reach the soil can be combined and a terrain map can be made
- Besides the topography the lidar can also plot the tree positions, height and crown diameter and thus biomass and carbon sequestration



LIDAR: DEM versus TEM



Legend



Legend





Image © 2022 Maxar Technologies

Google Earth

Mapping area in blocks for practical management

This animation shows how we combine Lidar based topographic maps with other layers such as watersheds and their partitions

With a Lidar drone we hope to regularly do highly accurate measures of the performance of our multi species agroforestry-based land restoration.

Measurements will include biomass, biodiversity, carbon, climate, hydrology, costs, labor needs, income generated, . jobs created etc



Working with local students and local materials. 9-8-2022





SEIRO

VIRUS

CELCIUS

TSUNAMI

YOGYAKARTA MEMORIE
TUMBUKUM
T.A. 1977
(TUMBUKUM)

ITMA

ITMA



Composite rock deposit



Rocks and Pumice



Dead Coral

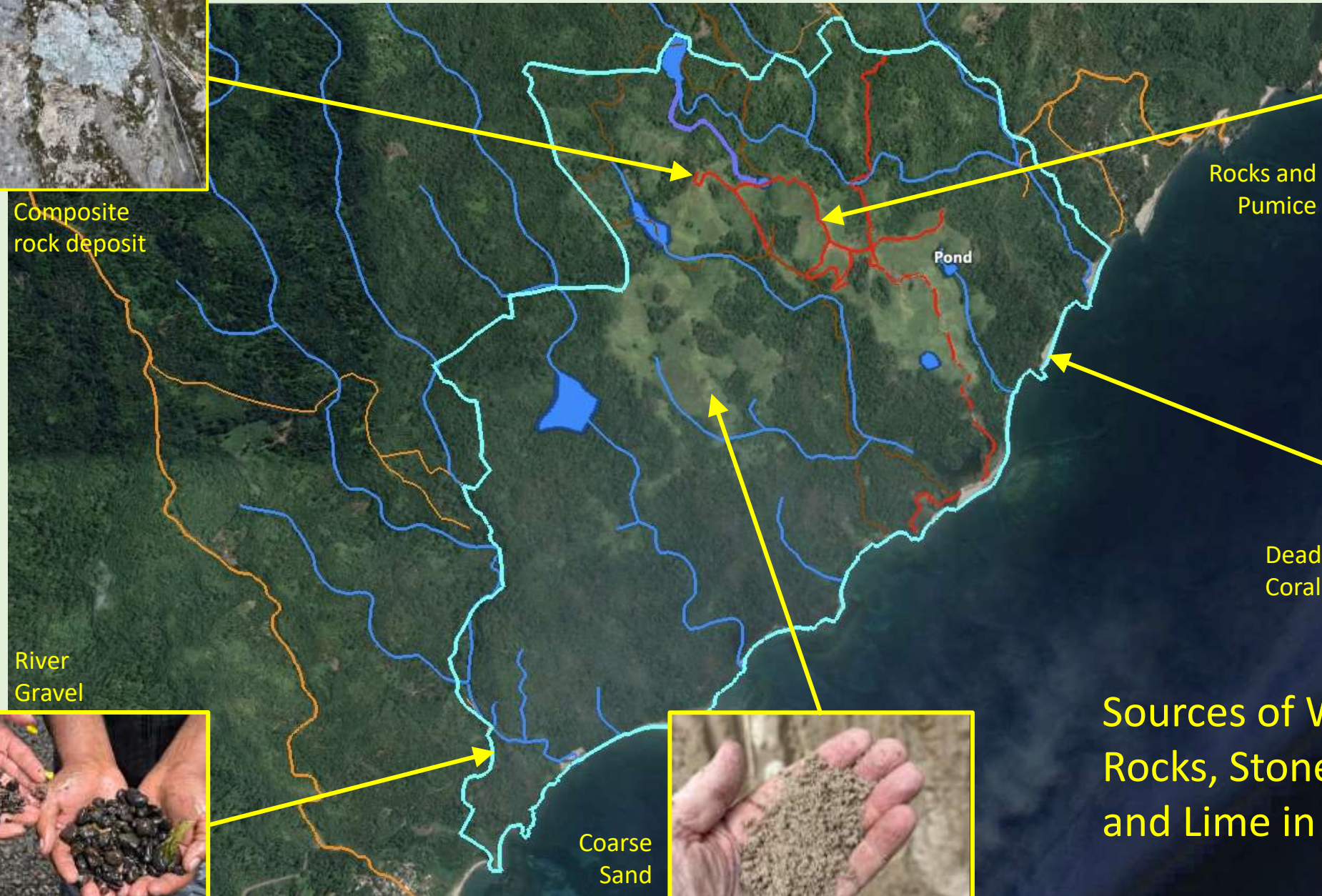


River Gravel



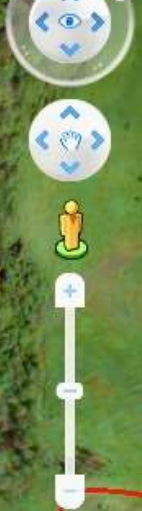
Coarse Sand

Sources of Water, Rocks, Stones, Sand and Lime in Temboan



Other local construction materials

- Bamboo
- Palm leaves from sugar palm, woka palm, coconut palm, nipah palm
- Rattan and lianas
- Palm fibres from sugar palm
- *Imperata cylindrica* grass for roofing material and isolation
- Plastic waste from the beach for building materials
- Driftwood for construction, decoration, biochar, sales
- Naturally fallen timber trees for woody constructions
- Coconut timber/shells/fibres/oil
- Adobe, rammed earth
- Organic waste for biochar production and compost
- Shells, seagrass
- Natural coloring agents
- Local ornamentals
- Etc.



Ecolodge location

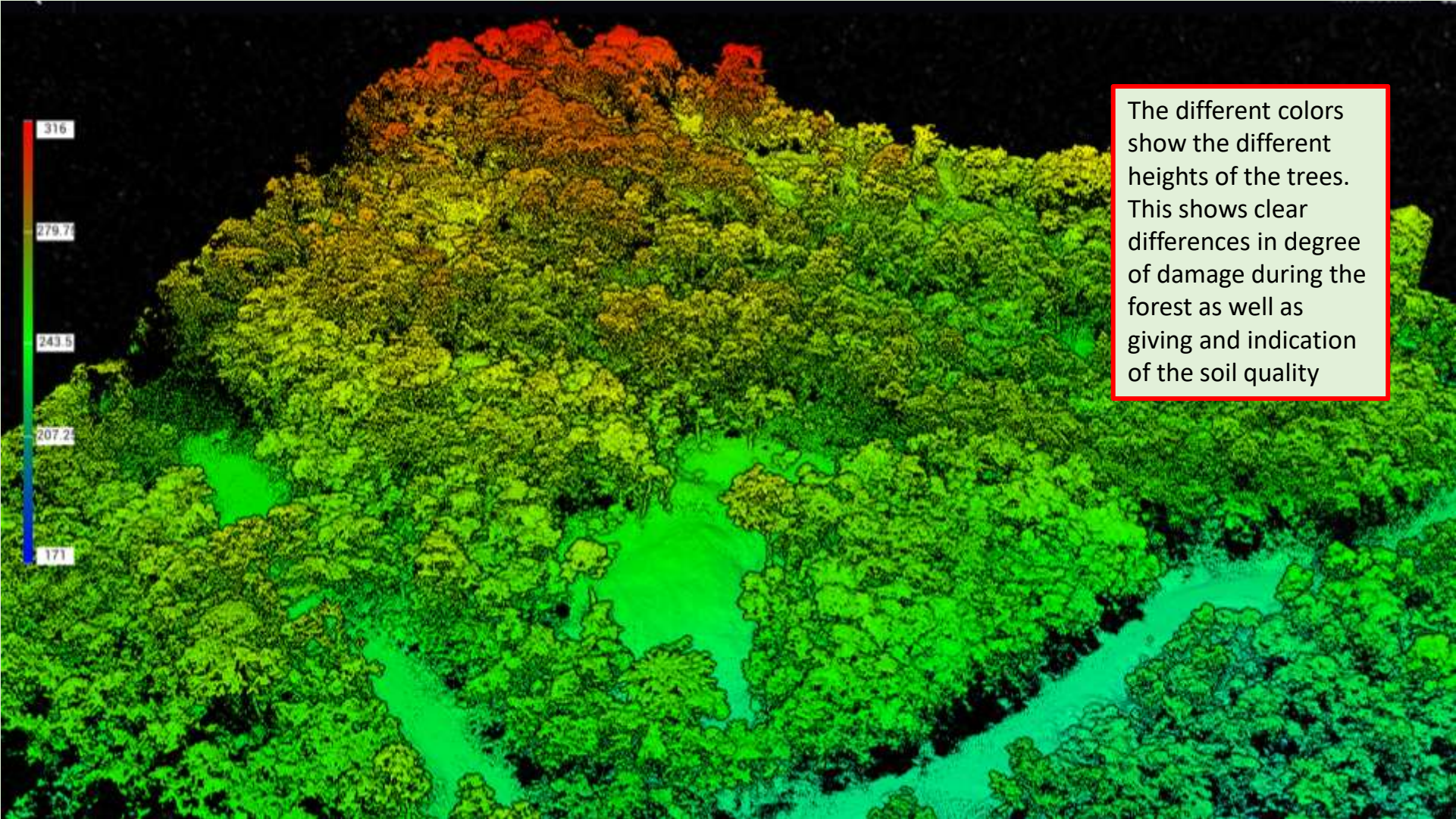


Some uses of LIDAR

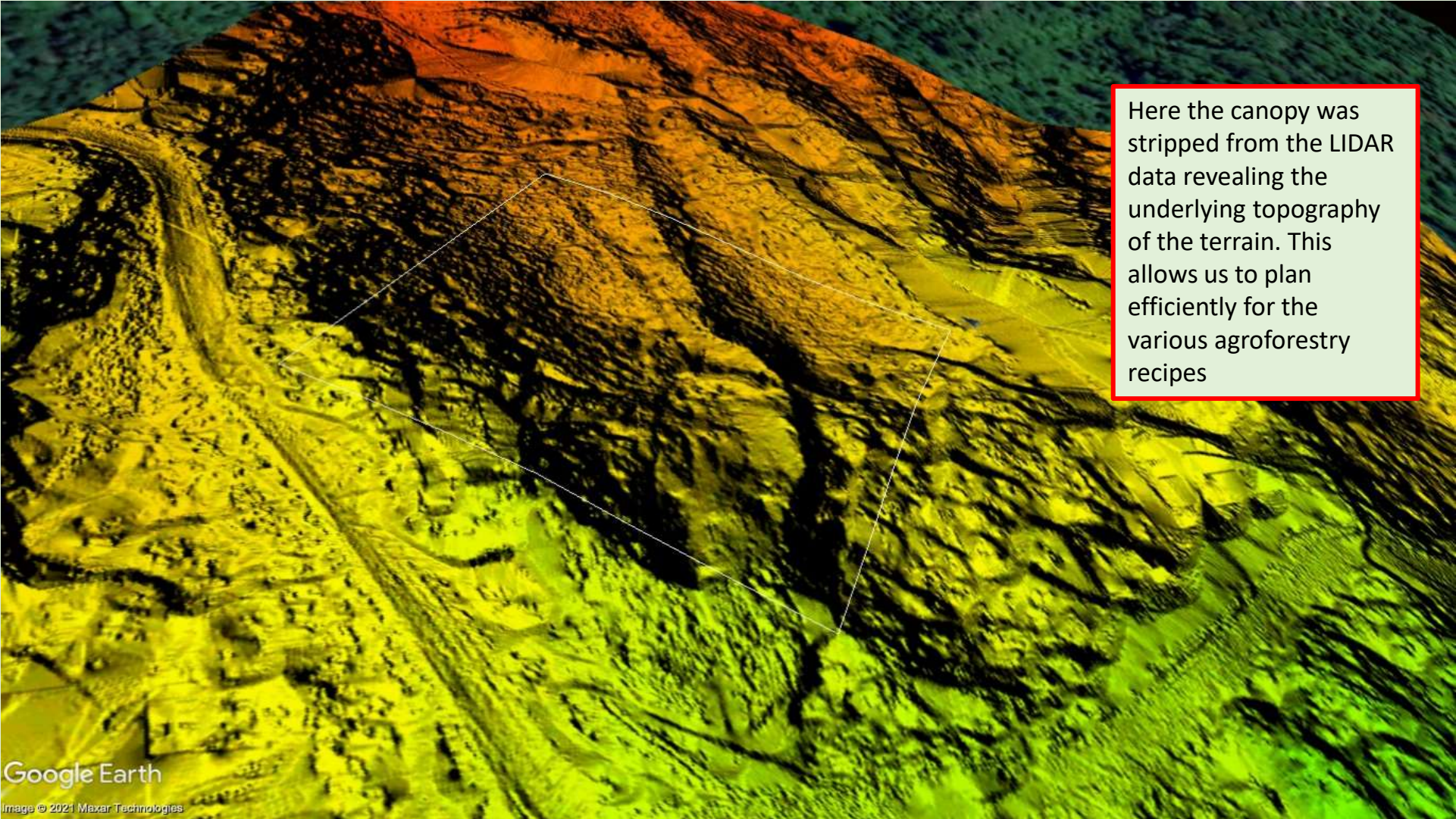
- Tree species recognition
- Detailed topographic map
 - Harvest planning
 - Recipe layout
- Tree mapping for cruising
- Biomass determination
- Carbon balances & values

But LIDAR needs:

- High capacity computers
- and a fast Internet



The different colors show the different heights of the trees. This shows clear differences in degree of damage during the forest as well as giving and indication of the soil quality



Here the canopy was stripped from the LIDAR data revealing the underlying topography of the terrain. This allows us to plan efficiently for the various agroforestry recipes

Google Earth

Image © 2021 Mazar Technologies



Tops of ridges, valley bottoms, land slides, different slopes, all kinds of soil types and depths, wind exposition, distance from access, etc. etc. are factors in deciding what recipes to apply where and when



Ponds for fire fighting, wildlife, as sediment traps, fish ponds, water plants for organic fertilizer, temperature regulation, etc.

Classical Forestry

Short Rotations 5-8 year (Timber Estates)

Short Rotation Short Rotation Short Rotation Short Rotation Short Rotation

Problem: Micro Nutrient Depletion

Long Rotations 35 year (Natural Forest Management)

Long Rotation

Problem: Very difficult to Protect

Mixed Recipes

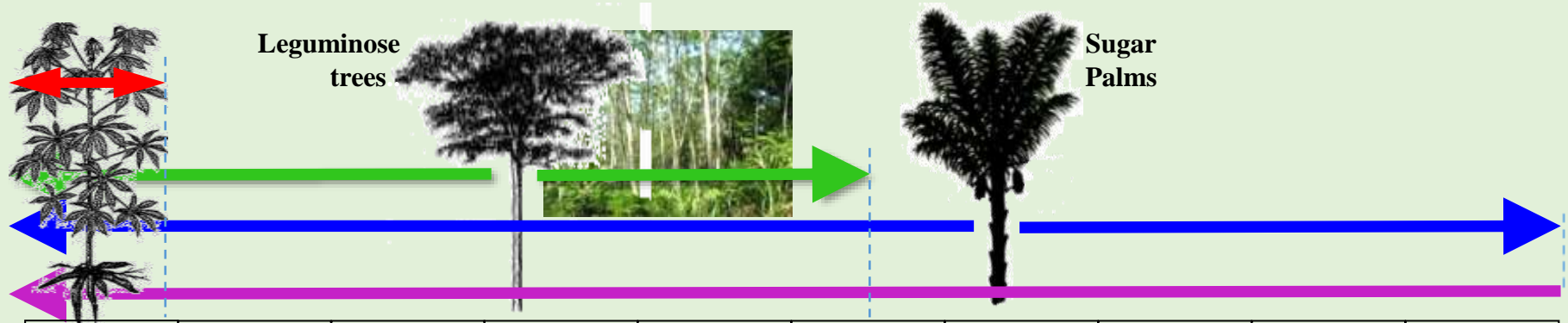
Long Rotation

Short Rotation Short Rotation Short Rotation Short Rotation Short Rotation

1

2

3



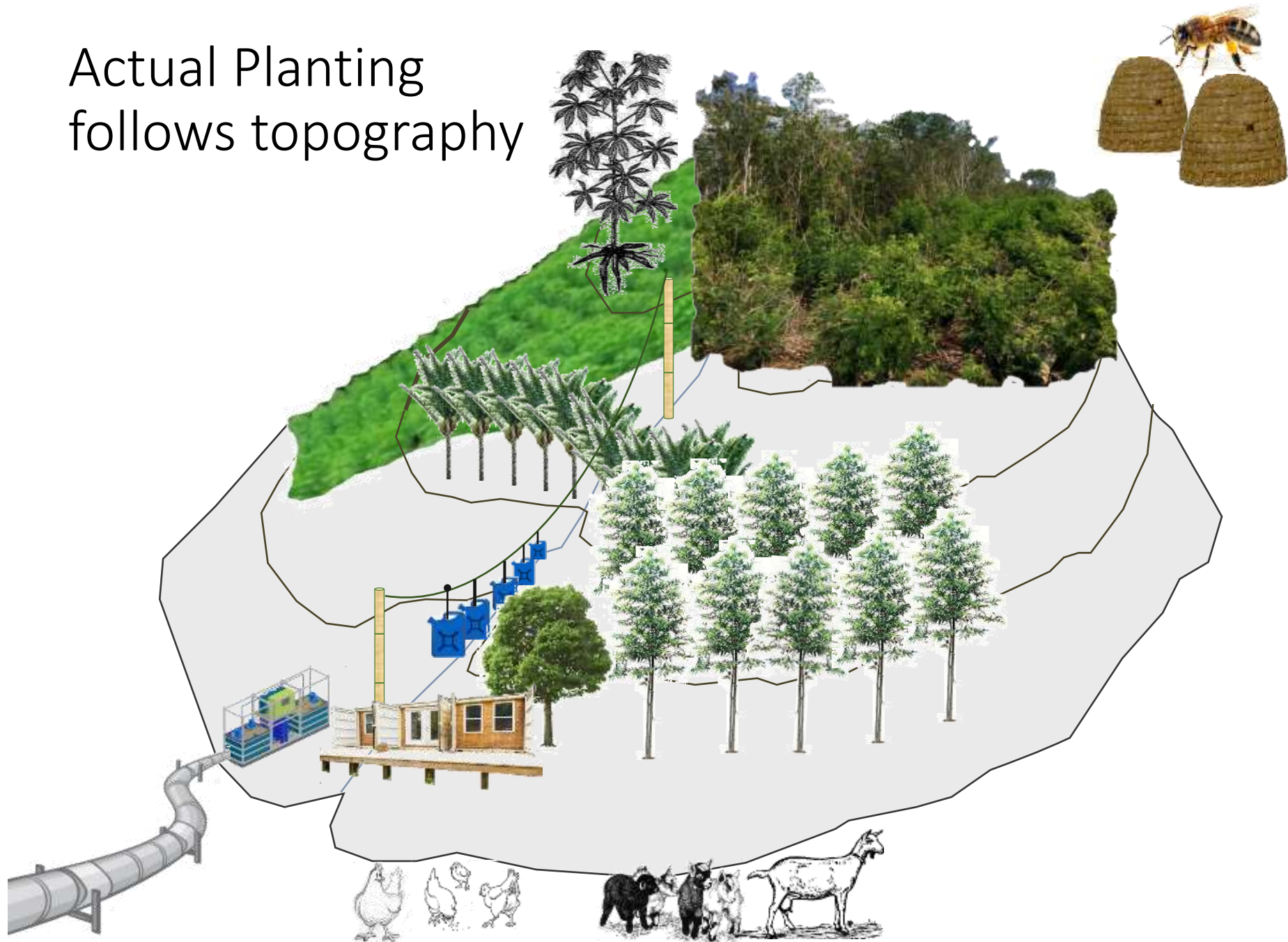
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cassava	Animal Feed			Palm Fibres, Biochar, Crops			Sugar Palm Juice		
Jobs in harvesting, land preparation, planting, maintenance, fibre collecting, etc.							Tapping sugar palms, maintenance		
Torrefaction & Biochar	Honey, Milk, Biochar, Fertilizer, Fish, Fruits, Palm Fibres, Starch, etc.				Torrefaction Materials	Palm Sugar, Ethanol, Wet Cake Cattle Feed, Starch, Honey, Fish, Bamboo			



Year 11	Year 12	Year 13	Year 14	Year 15
Sugar Palm Wood/Fruit Honey, etc.	Food crops	Maintenance	Torrefaction Pellets, Wood, Animal Feed	
	Biochar	Rattan, Bamboo, etc.		

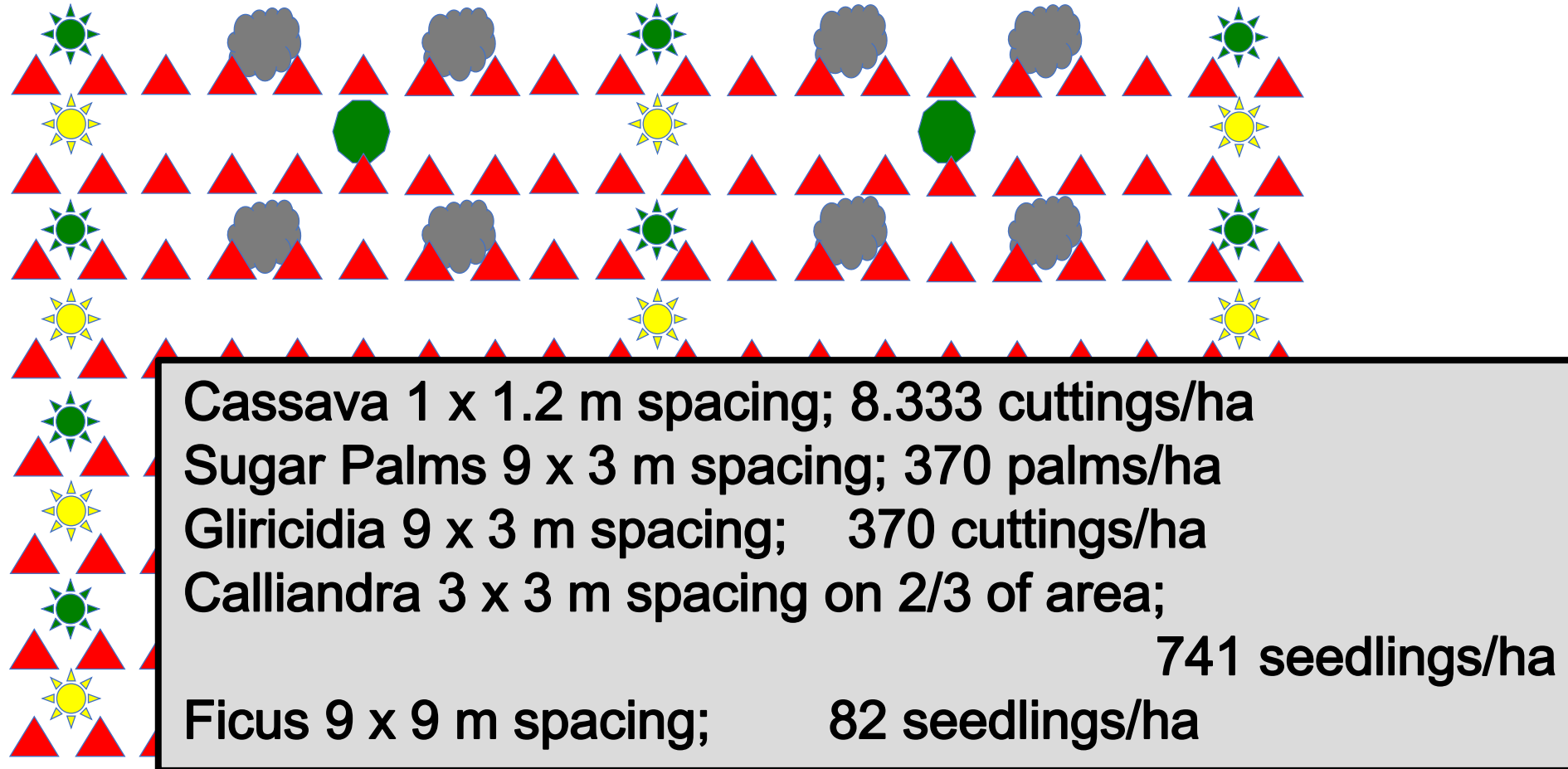
And is fully based upon nutrient retention, optimal light/CO₂ capture, plant synergies, erosion control, water regulation, jobs, food security & biodiversity

Actual Planting follows topography



Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

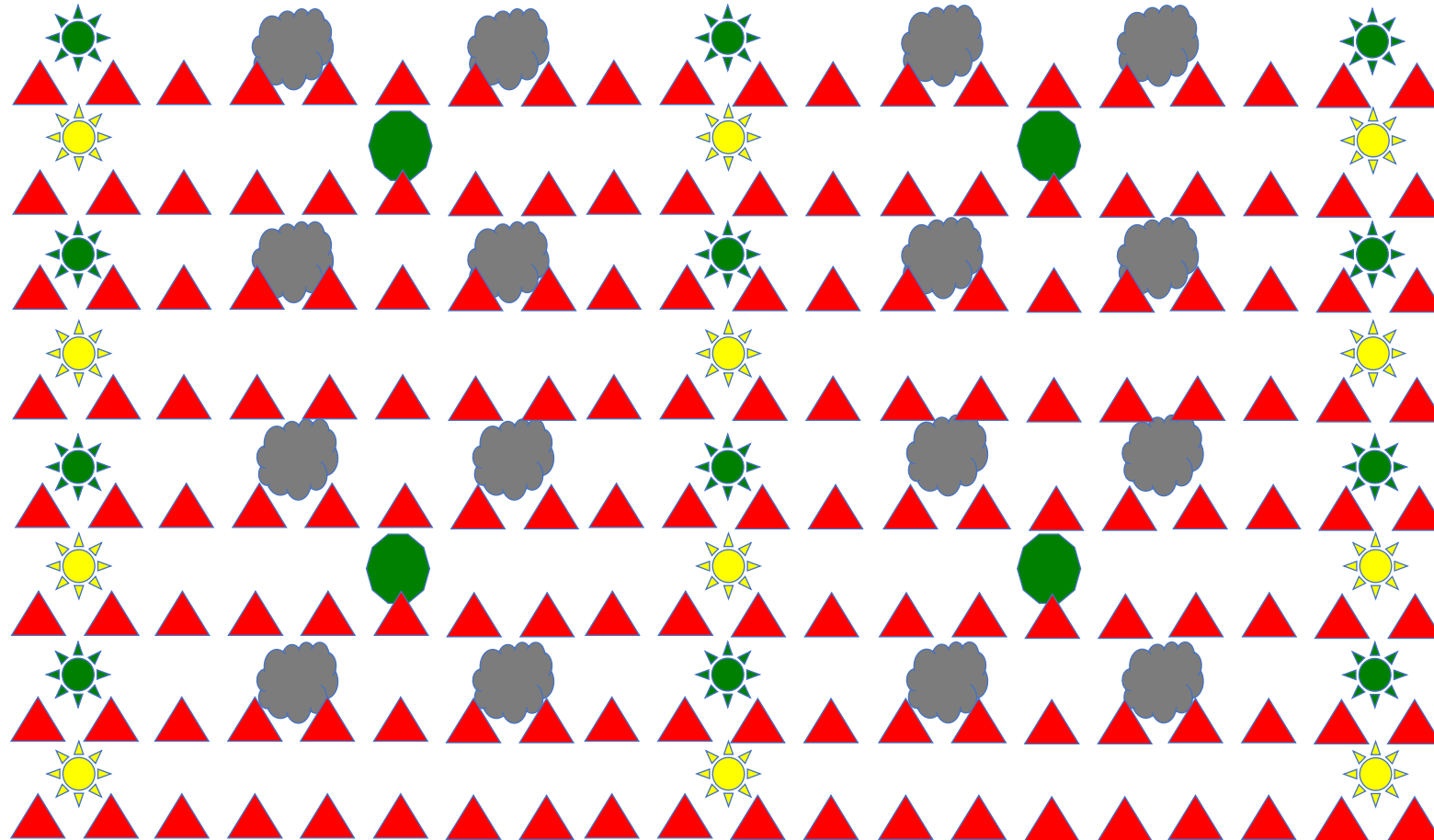
Simultaneous planting of all species with biochar in planting holes



Year 0

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Harvesting of Cassava

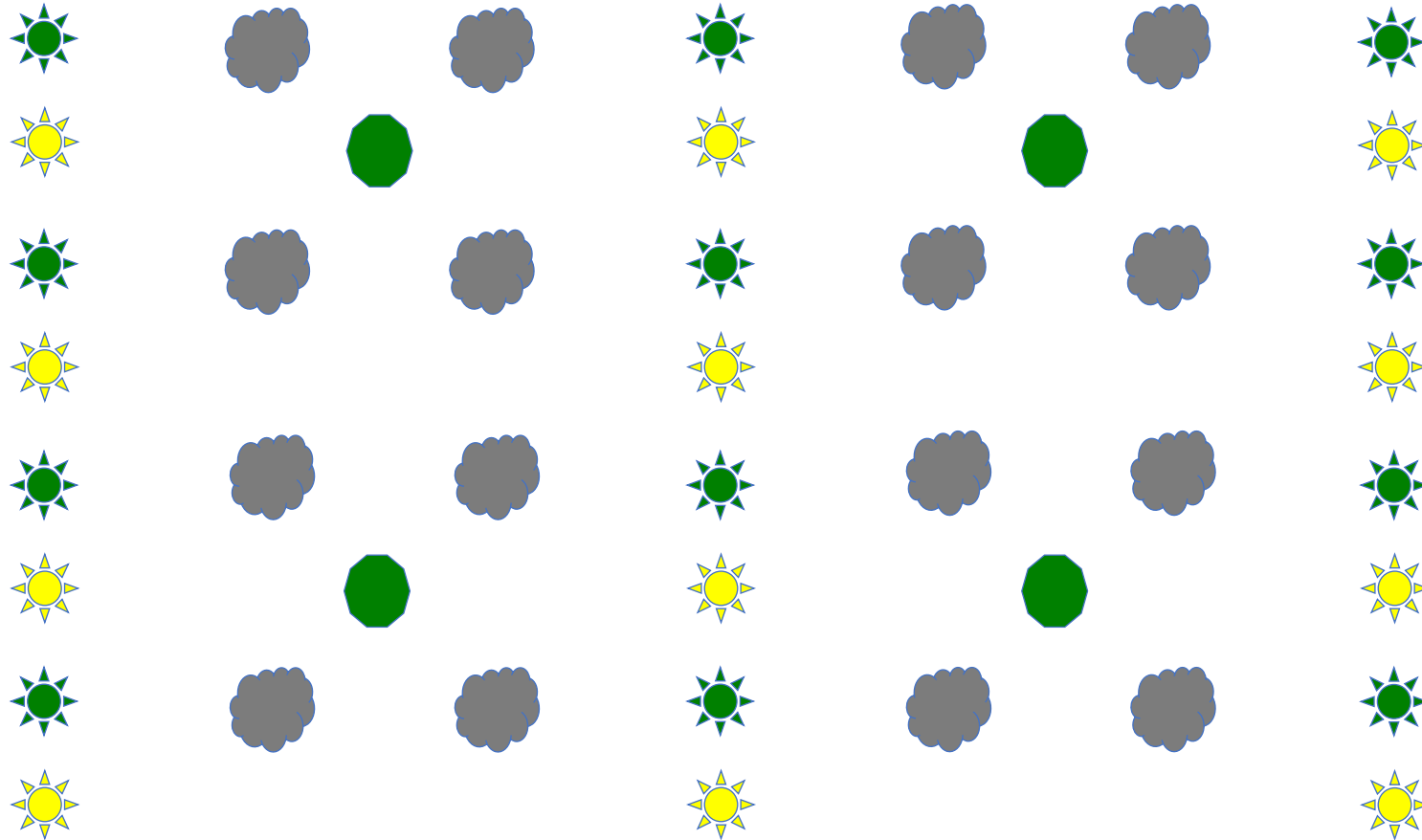






 = Cassava  = Gliricidia  = Ficus
 = Sugar Palm  = Calliandra

Year 0.8

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Harvesting of some of the Gliricidia

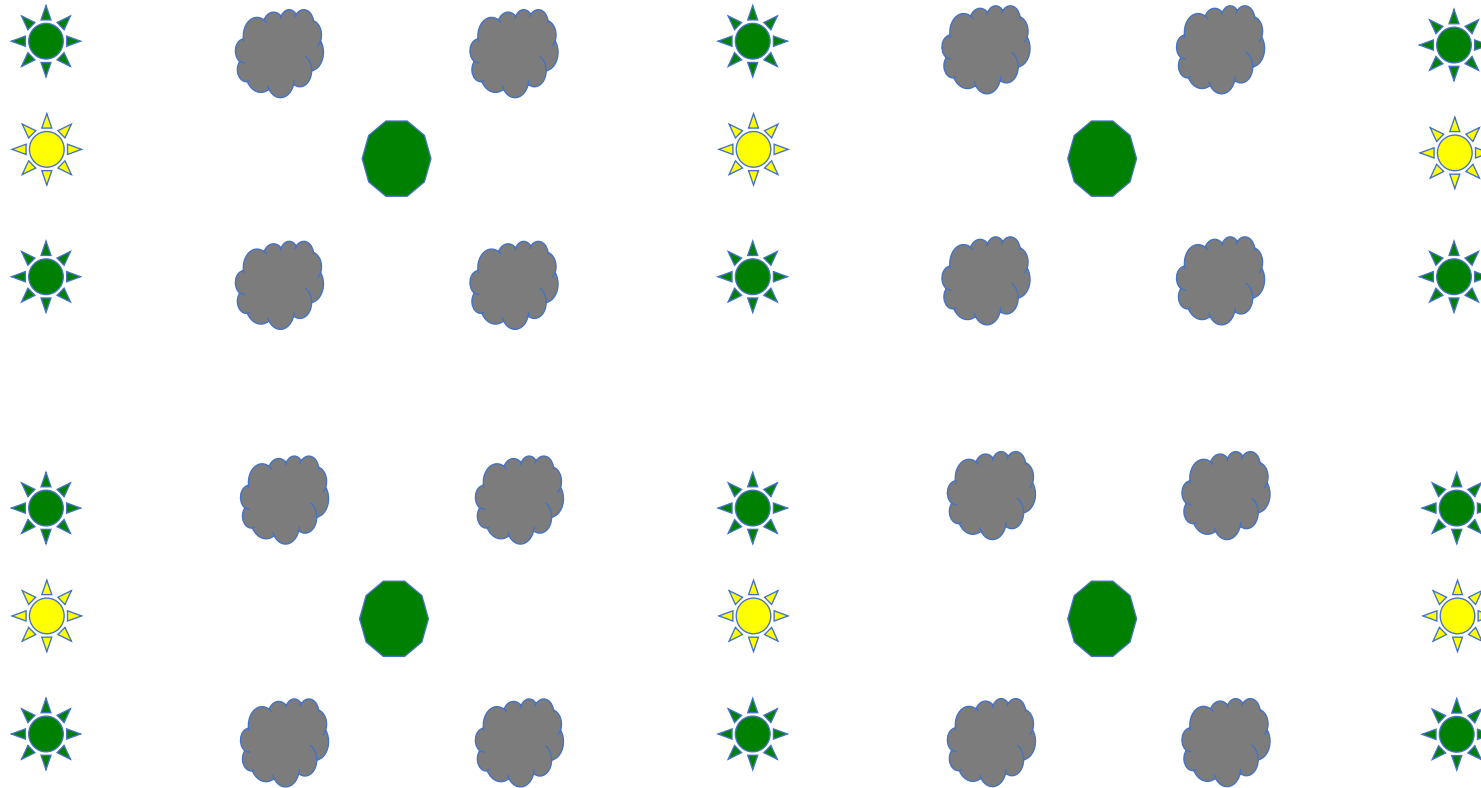






 = Gliricidia  = Ficus
 = Sugar Palm  = Calliandra

Year 0.8

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Harvesting of half the Calliandra for wood and fodder



 = Gliricidia  = Ficus
 = Sugar Palm  = Calliandra


Year 3

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Coppicing of Calliandra cut in the previous year



 = Gliricidia

 = Ficus

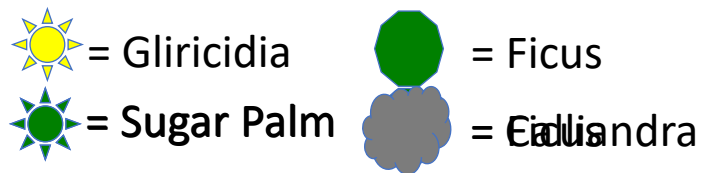
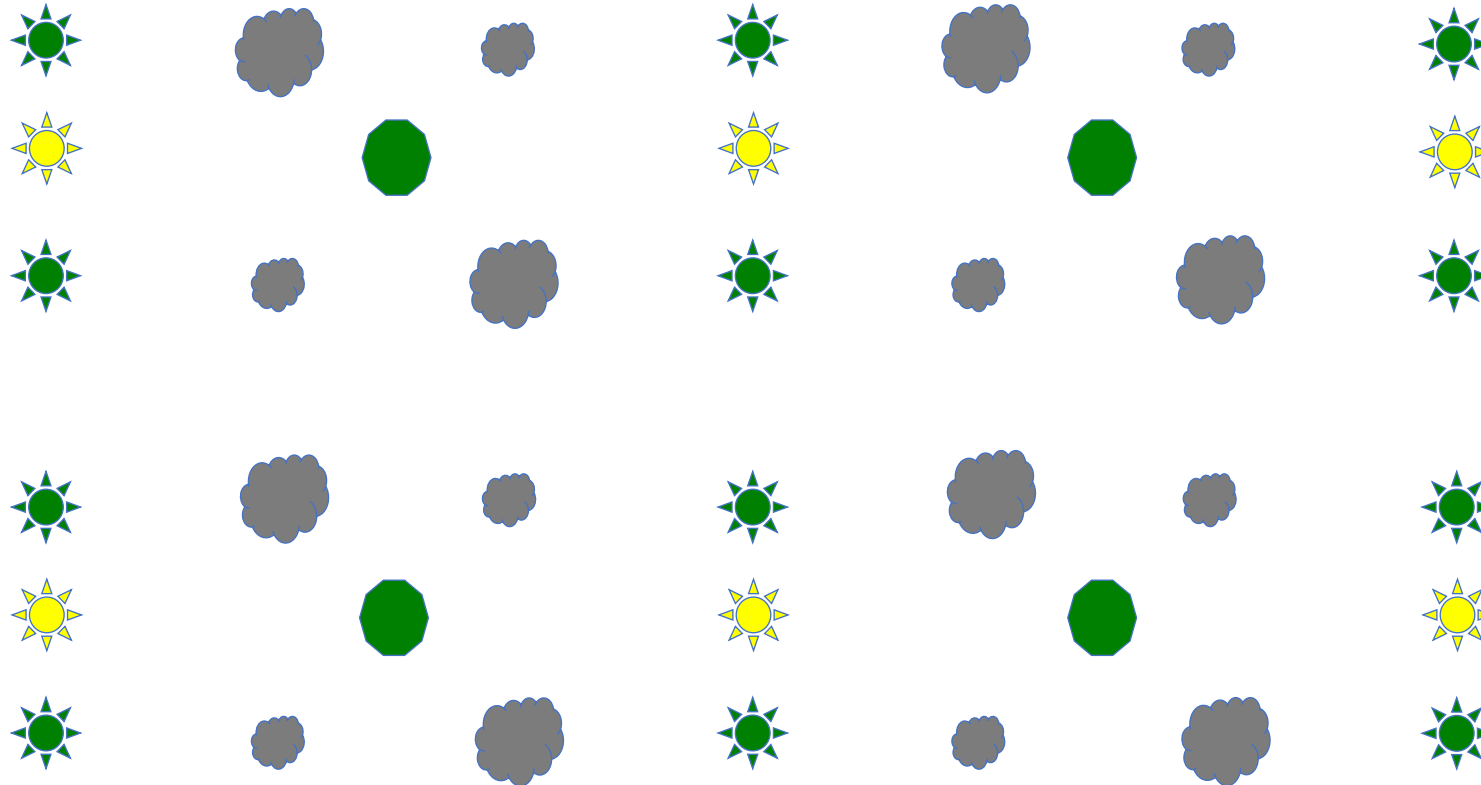
 = Sugar Palm

 = Calliandra

Year 4

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

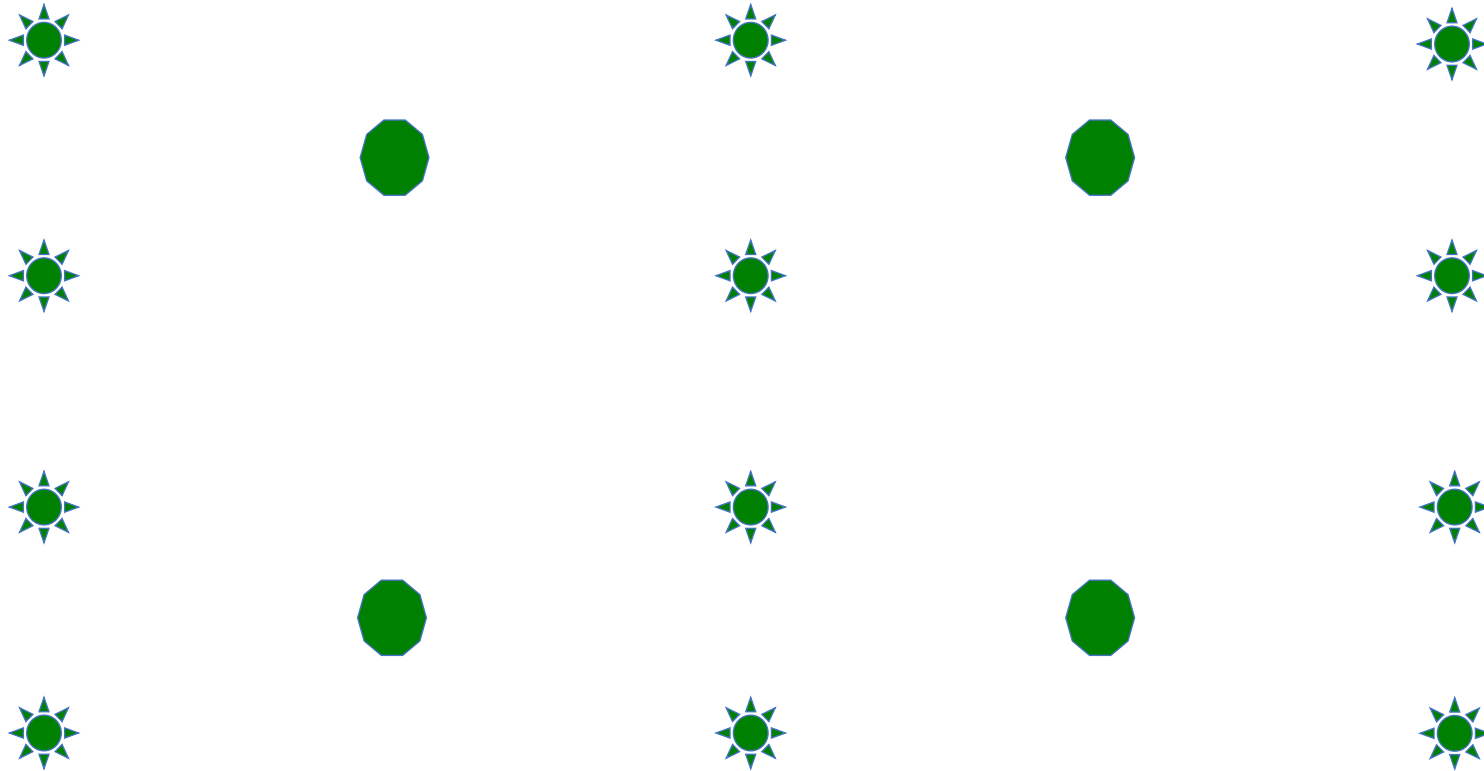
Harvesting of remaining Calliandra and Gliricidia trees





Year 6

Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Harvesting of Sugar Palms



 = Sugar Palm  = Ficus

Year 11


Recipe 12C: Cassava/Sugar Palm/Leguminose/Ficus

Harvesting of Ficus



Restart of recipe



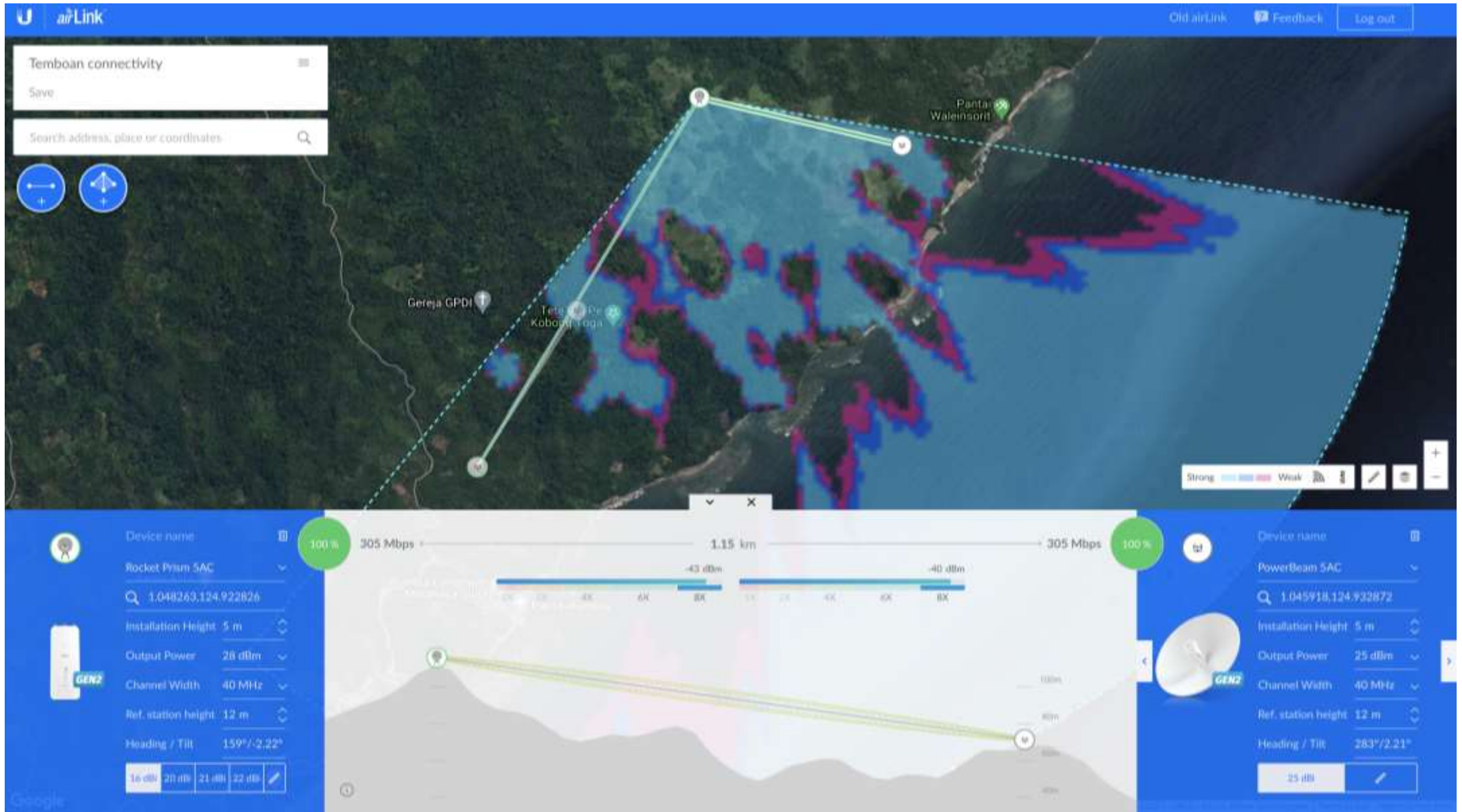
 = Ficus

Year 15

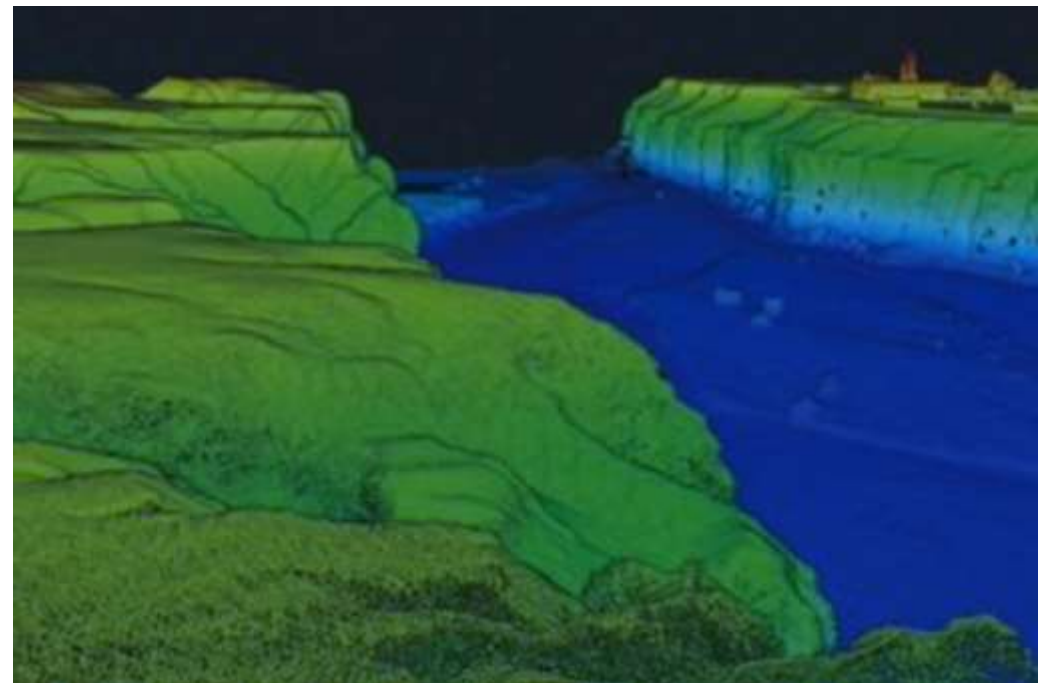
Transparency

- We want the Temboan project to provide transparency in many different ways:
 - A network of cameras connected through an ubiquiti radio data network from where live images of the area can be observed
 - People adopting trees in the area will be able to move cameras to observe and see how “their” trees have grown
 - Cameras along the more than two miles of coast with important turtle nesting beaches will monitor nesting and security issues
 - Through the operation of an advanced drone system, we will monitor the growth, carbon sequestration and health of the new trees that Masarang plants in the Temboan area
 - Through a number of climate stations, we will monitor the impact of our tree planting on the local climate

Planning the Ubiquiti data network

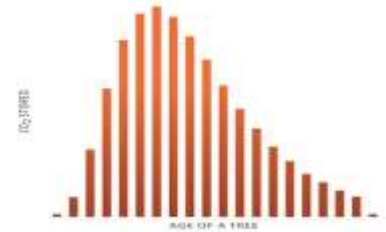


Through the data network and a differential GPS system we can get extremely accurate drone data of the field condition and even the nutrient status of the trees, the biomass, the presence of people and animals, the detailed topography, and many other aspects of the regenerating forest. These data are combined with on the ground measurements as well.





RELATIVE CO₂ FIXATION RATE OVER THE LIFETIME OF A TREE





Despite Covid our animal rescue operations had to continue. The Temboan area will also function as a release area for protected wildlife from Sulawesi.





MASARANG



Preserving nature through the empowerment of local people

*There is still time and there are still opportunities
to clean up the mess man has created*



**Profitable
Climate
Solutions**