

Assisted natural forest regeneration: How polyculture in degraded rainforest can restore the landscape, biodiversity and create sustainable income for local and indigenous people



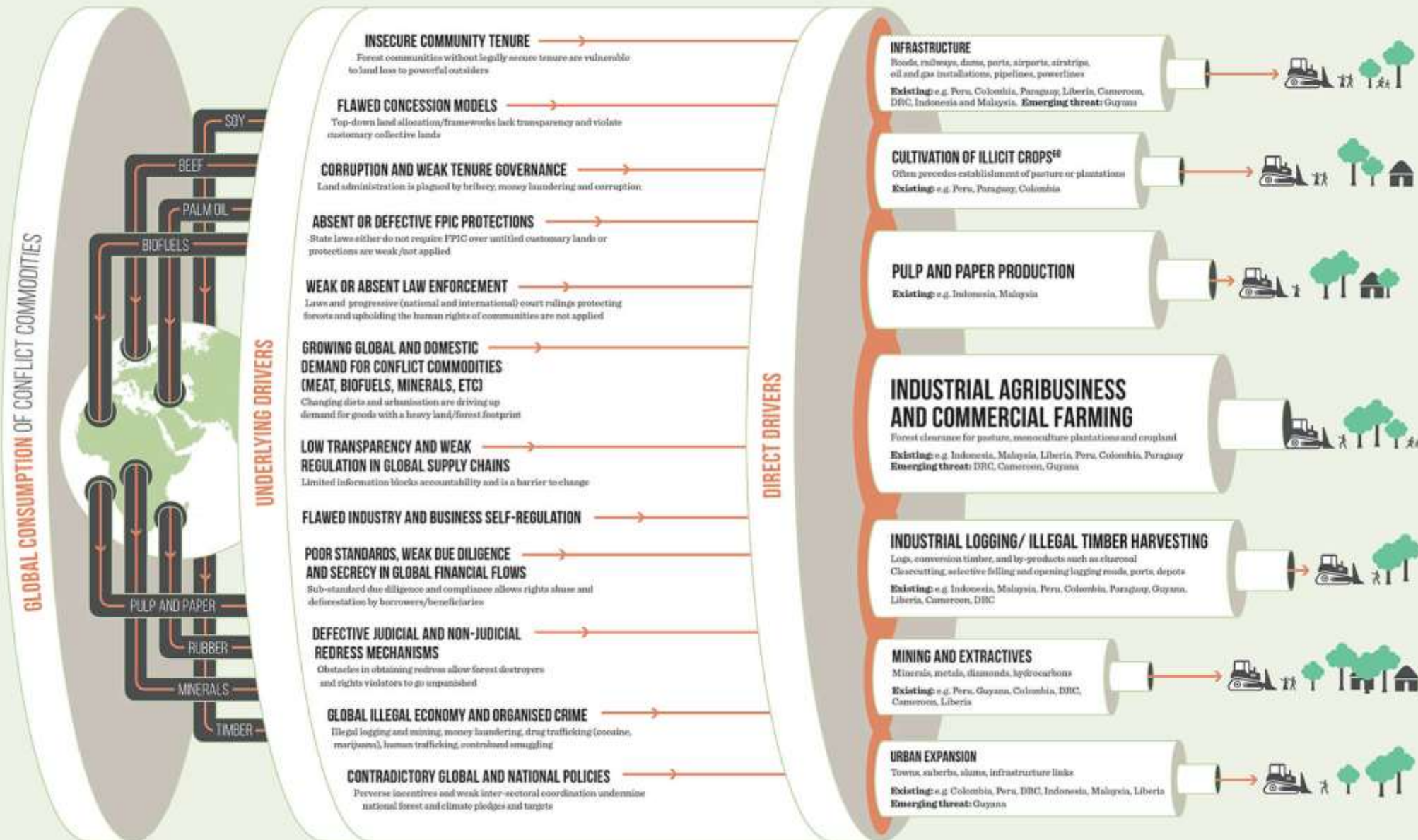
The Oxford
Centre for
Tropical Forests,
25/5/18

Jake Backus and I. Madé Setiawan

Environmental Change Institute



FIGURE 3: THE REAL DRIVERS OF DEFORESTATION





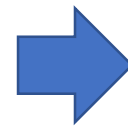
**Illegal forest destruction for
soybean production in Para, Brazil**



**Asia Pulp and Paper,
Sumatra**



**Palm Oil peat drainage,
Indonesia**



Deforestation

Mobilising resources to help achieve zero net
deforestation by 2020



The Key Commodities



Palm Oil



Soy



Paper & Pulp



Cattle



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Trees and forests

Guardian
Environment
Network

Mongabay, part of
the Guardian
Environment
Network

Fri 31 May 2013 15:17 BST



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World's largest Redd project finally approved in Indonesia

The 64,000-hectare forest carbon project is expected to reduce carbon emissions by 119m tonnes over its 30-year life-span









KPHL
KAPUAS
KAHAYAN

BERSAMA PETANI
KITA KUAT
SAAATNYA YANG MUDA
BERTANI





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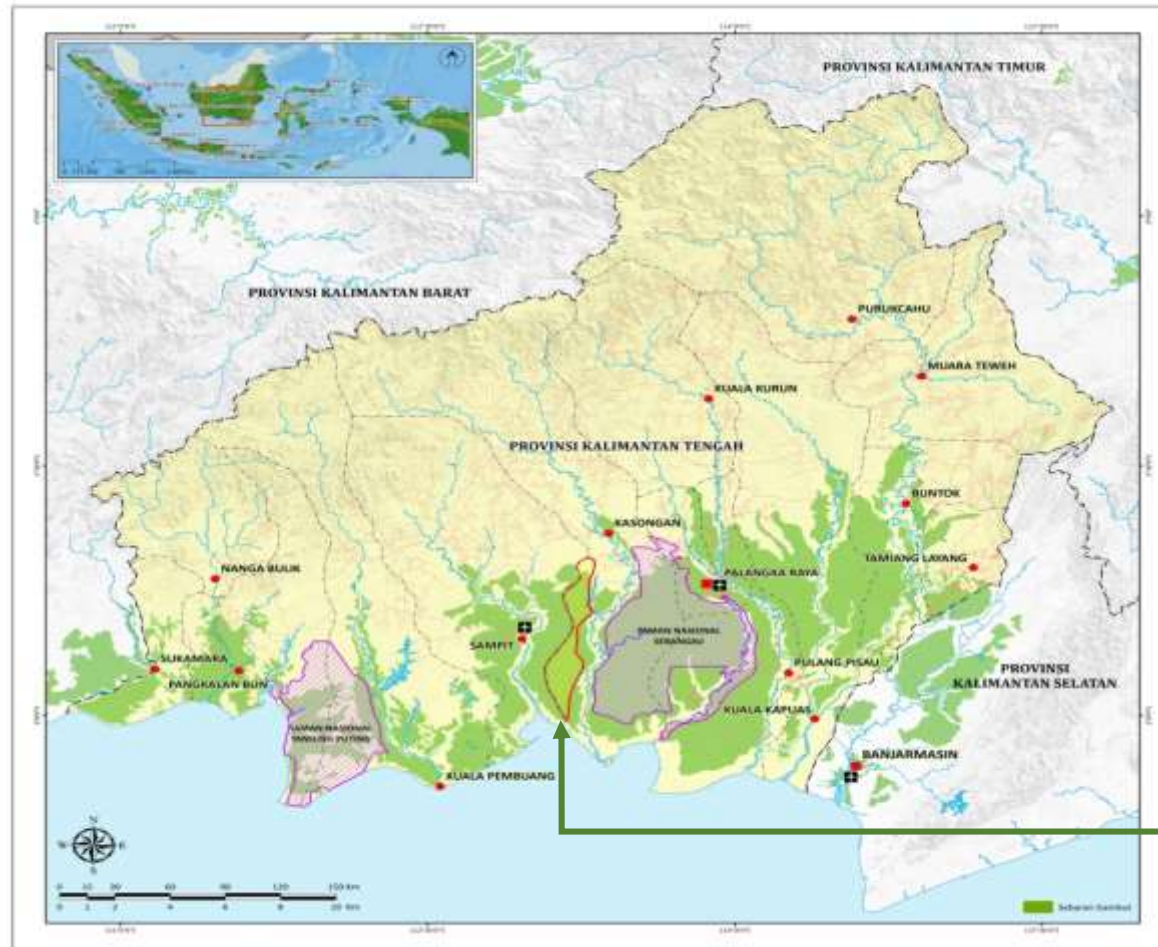
Katingan Project Research and Development initial Conception in Agroecology:

Organic soil fertility and biodiversity generation for sustainably productive agroecology plan at the community's areas, adjacent to RMU restoration zone in 2017

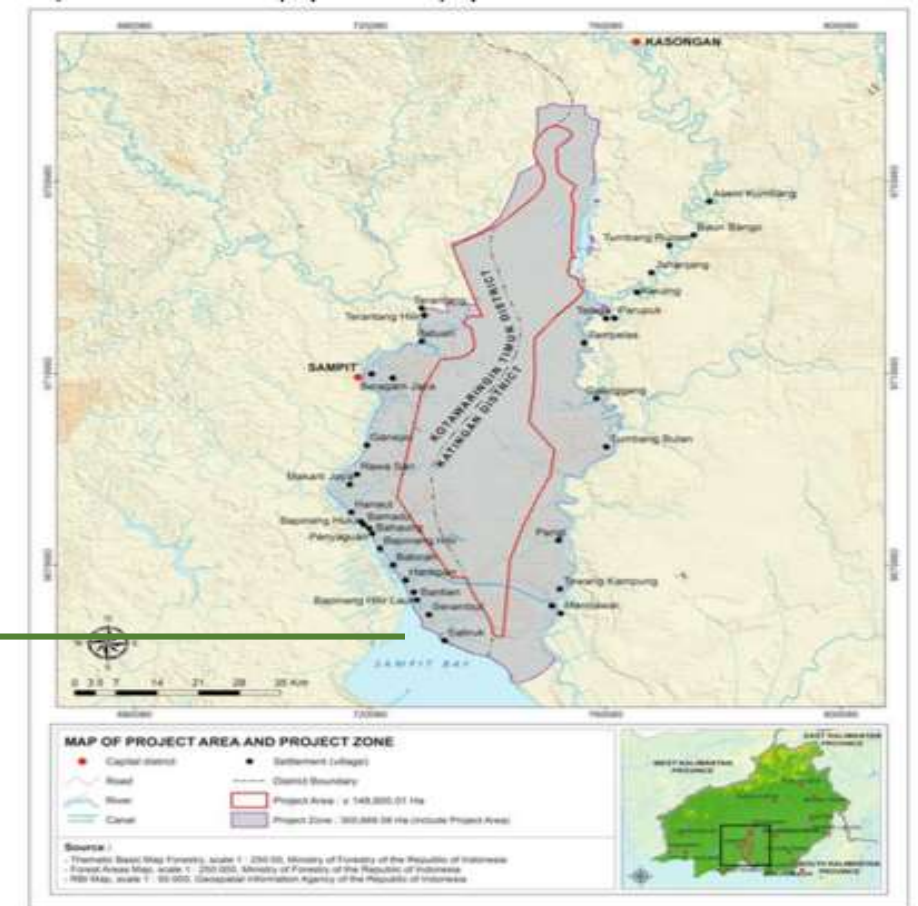
I Made Setiawan, Dwi Puji Lestari, Taryono Darusman

Katingan Project Location (RMU restoration zone)

- Katingan and Kotawaringin Timur Districts, Central Kalimantan Province, in Kalimantan

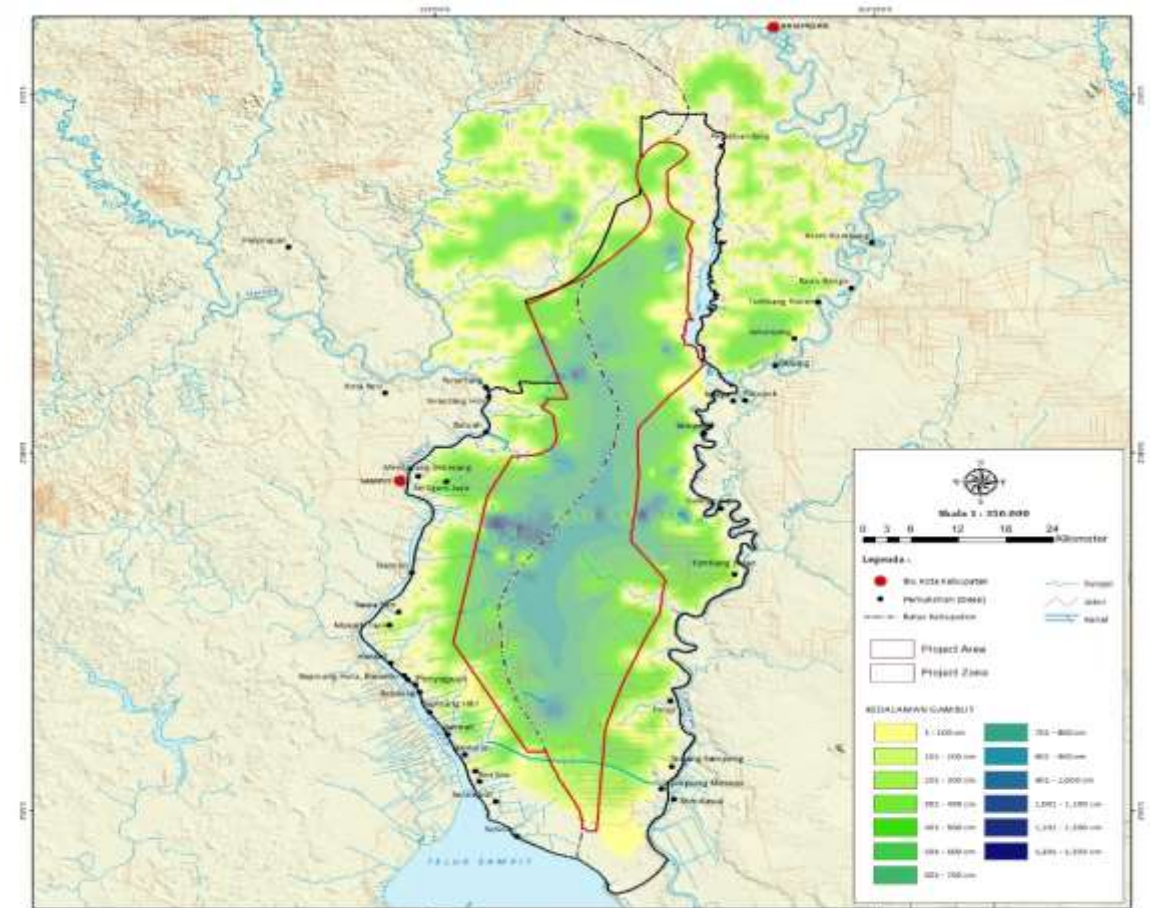


- PT. Rimba Makmur Utama (RMU) is the title holder for an ecosystem restoration concession



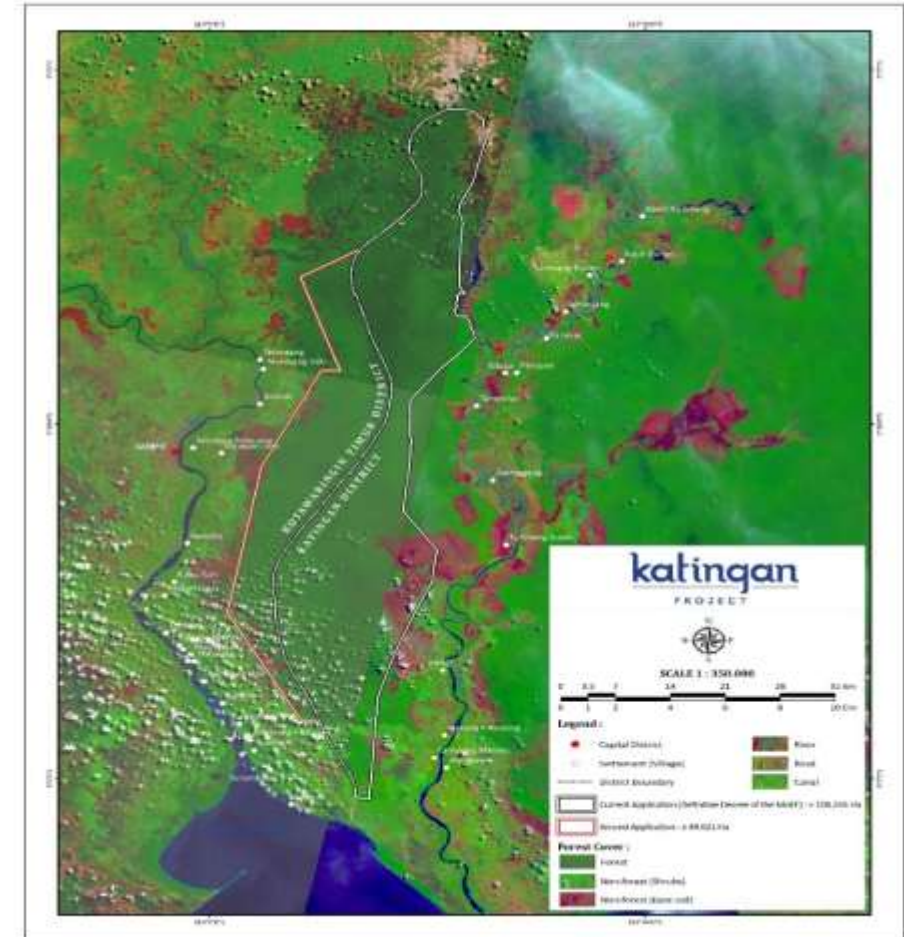
The Katingan Project

- The Katingan Project is a lowland peat forest restoration project (katinganproject.com)
- 157,875 hectares
- Average peat depth 5.7 meter (maximum 12.5 m – minimum 0.6 m)
- 34 adjacent community villages (14 in Katingan District, 20 in Kotawaringin Timur District)



The Katingan Project – Threats

- Forest fire
- Illegal logging
- Peat draining for agriculture (palm oil and other mono crop system plantation)



Agroecology and peat forest restoration and conservation

Main questions:

- How forest-community-based agroecology initiatives will impact forest restoration, regeneration, and conservation?
- How forest concession restoration, conservation and regeneration will impact forest community livelihood?



Current Katingan Project agroecology research and development

I. Rice cultivation (subsistence farming for domestic consumption)

1. Rice Cultivation in rain fed and tidal based irrigation system

- a. Instant forest (fast biomass generation) with appropriate legume cover crop (LCC) in field preparation phase
 - Mucuna varieties, Centronema, Calopogonium, mimosa, aeschynomene, crotalaria, ipomea, grasses, etc., for weed control and mulch
 - SP organic solution to improve LCC propagation and mulch decomposition
 - Affordable, safe, soil moisture retention, and biodiversity generation
- b. Rice cultivation method options
 - Broadcasting, direct drill, seedlings transplantation with LCC mulch
 - Minimum soil work



I. Rice cultivation (subsistence farming for domestic consumption) continued...

2. Polyculture of horticulture in tidal and rain-fed rice field area

- a. High-value horticultural commodities, keystone species, and LCC on the field paths and irrigation canal banks
 - Moisture and biodiversity as biological pest control
- b. Apiary establishment by the field paths and irrigation banks
- c. LCC and commercial crops during rice fallow period
 - Soil moisture, soil fertility and productivity



I. Rice cultivation (subsistence farming for domestic consumption) continued...

3. *Beje* aquaculture in rice field

- Improvement in rice field biodiversity (microbes, insects, mammal, birds)
- Water reservoir

4. Cultivation on the piles of clear cut woods (*simpukan*) in rice field

- Consumable bean, commercial crops, apiary
- LCC for moisture retention during dry season
- Soil biodiversity and long-term fertility building



II. Agroforestry as source of disposable income (family ATM)

Questions: Why do local people have difficulties in readopting their agroforestry system?

Government conventional agroforestry design in the offer:

- Monoculture, only about growing plant based commodities, no regards to soil and landscape condition
- Economically unattractive commodity offered
- Environmentally destructive
- Intensive caring and high cost
- Post-harvest market access problem

Indigenous agroforestry design:

- Polyculture with high-value commodities to ensure consistent flow of income, i.e. rattan, timber
- Agroforestry (locally known 'gardening in the forest') is not merely plants cultivation in the forest
- Areal and landscape sensitive (peat, mineral soil, soil depression)
- Low maintenance (by nature) and continuous annual harvest
- Harvest include cultivated crops, timber, NTFP, inward forest migrating fish, honey, games, etc.



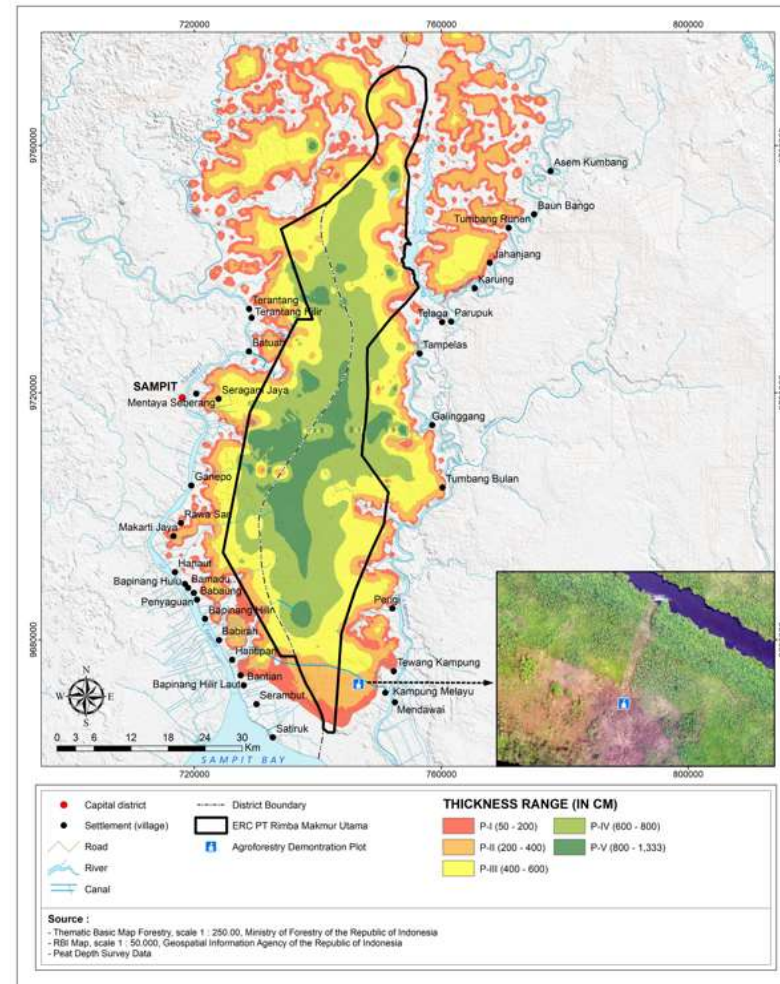
II. Agroforestry/ecology as source of disposable income (family ATM) continued

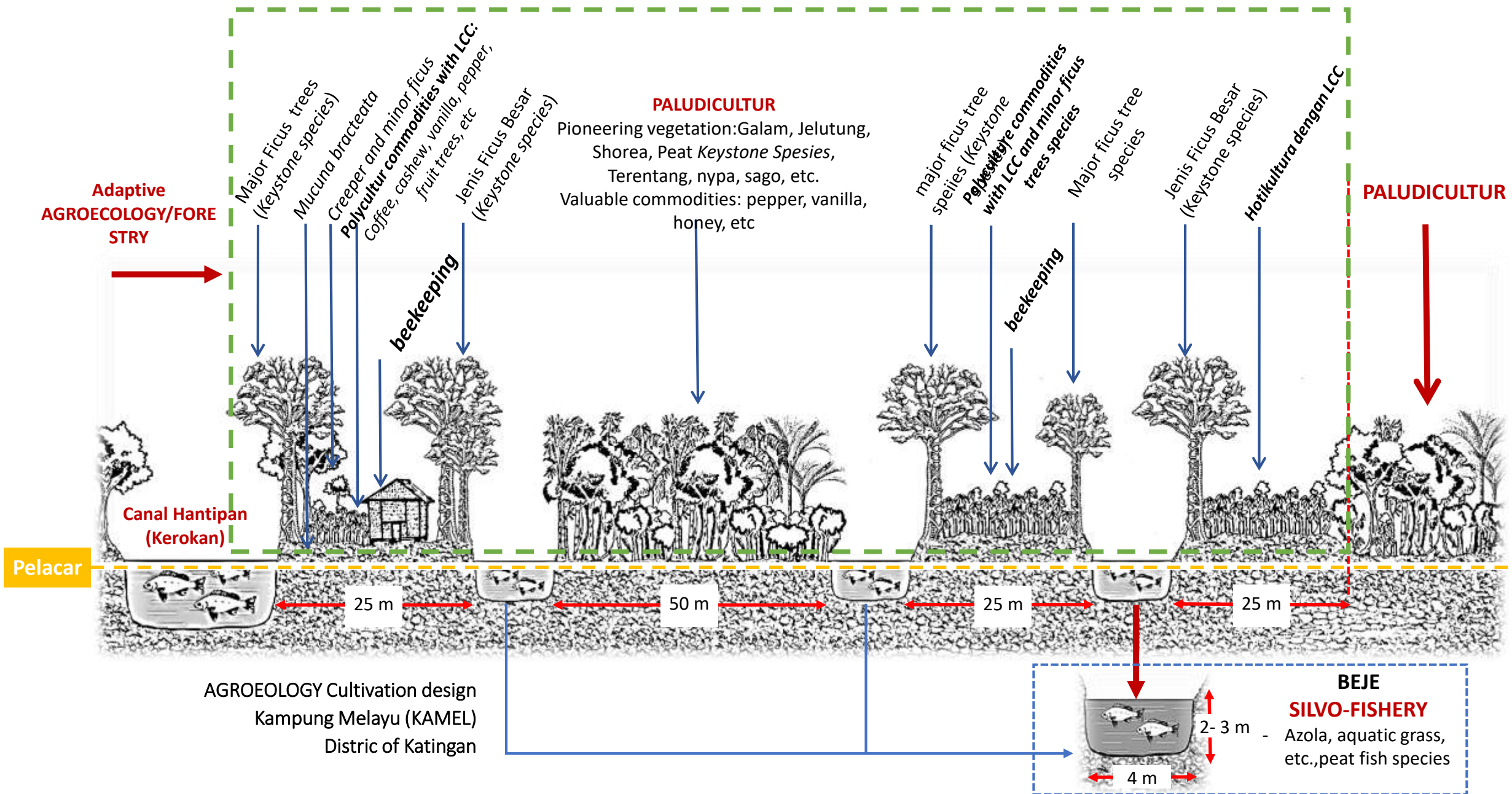
Indigenously inspired comprehensive agroforestry/ecology design (*mudah, murah, aman, produktif/ accessible, affordable, safe, productive*)

- a. Minimum areal and and soil amendment
 - Utilization of secondary and primary forest vegetation in alley cropping cultivation system
 - Original landscape orientation in cultivation
 - Areal hydrology sensitive
 - Selection of indigenous plants to retain water table and salt intrusion
 - Forest fire proof
 - Financially viable
 - High-value commodities in polyculture system
 - *Beje* aquaculture
 - Paliduculture (*Melaleuca C./galam* , *Melicope lunu-ankeda/rembangun*, and other peat swam tree based apiary, keystone tree species, sago, nypa)
- b. Mutually contributing to RMU zone forest regeneration and health, and community economy
 - Keystone tree species for frugivore, insectivore and ichthochory
 - Areal fire prevention
 - Reducing people's frequency forest visit
 - Productive agroecology based on soil and water phytoremediation in formerly open cast community's gold mine areas



Adaptive peat land agroecology demo plot map





Agroecology in peat land at glimpse

Current trials:

1. Forest vanilla and and forest regeneration
2. *Legume Covercrop in agricultural and community degraded land*
3. Rice natural farming in peat land with mulching and microbiotic solution
4. Permanent raised beds polyculture system
5. *Berhuma* revival of indigenous farming method
6. Polyculture (high value commodities) in agroforestry biodiverssity friendly
7. Inner forest fish migration aquaculture and forest regeneration
8. Ficus keystone vegetation and agroecology/forestry
9. Monoculture and traditional forest garden modification into polyculture agroforestry
10. Apiary
11. Raised bed in flood plain
12. Open space hydroponic/aquaponic rice and aquatic legume
13. Bioremediation forest regeneration and agroforestry



Forest vanilla and forest regeneration



Why does planting vanilla in degraded forest help low land peat forest regeneration?

Factors to consider:

I. Natural Vanilla:

Background:

- Highly valued spices
 - Global production is about 7000 tonnes annually (about \$700million)
 - Yields per hectare
 - Annual average price
 - 80% in Madagascar
 - Small scale farmers
- Global acreage (mostly lead to deforestation?)
 - About 200000 hectare
- Natural vanilla only meet 1% of total annual global demand
 - For food and perfume
- Natural vanilla shortage can affect summer taste
- Questionable market chains to profit small monoculture growers



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider cont...

Background cont..

Vanilla plant and tropical peat forest

- One of orchid members that suitable to grow with the low land peat areal ecology
 - Annual precipitation, sun availability and humidity
 - Various indigenous vanilla species in low land peat
 - Low land sub and surface soil mycelium ecology for orchid growth
 - Evidence of early growth symbiosis with local mycorrhizal fungi in moderate deep and thin layer peat
 - Human aided pollination
 - Potential to be part multi cropping system
 - Potential of job creation in all levels of vanilla production for small scale holder family (seedlings production, cultivating, pollinating, pods curing and conditioning, added value products (culinary, perfume, etc), direct global marketing, etc)

Vanilla trade and Indonesia

- Contributed to 20% of the global market
- Additional commodity in polyculture system
- History of bad trade practiced by local brokers
- Other monoculture agricultural commodities are more prominent



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider:

I. Natural Vanilla cont.:

Cultivation method

1. Intensive monoculture cultivation

- Up to 4000-6500 plants per hectare
 - 500-2000 kg cured pods
- 1-2 tutor trees (mainly legume species)
- Prone to disease during first time fruiting
- Chemical pesticide and fertilizer intensive
- Animal rearing often not part of the cultivations system
- Harvest price is prone to be determined by the brokers
- Often part of successive years of forward purchasing mechanism (through kinship or network)



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider:

I. Natural Vanilla cont...

Cultivation method cont...

2. Polyculture cultivation system in small scale established farm land

- Zero budget farming system (India)
 - Areal and sub soil biodiversity based soil fertility farming ('plants friendship')
 - More than 10 commercial agricultural commodities grow together with vanilla
 - Vanilla using tree based commodities as tutor
 - Animal rearing is an integral part (pruning vanilla shade as fodder)
- Multi cropping system (*Sistem tumpang sari/padat karya* (Indonesia))
 - Similar concept to zero budget farming
 - Cultivation on steep sloping forested area to compliment water and erosion retaining vegetation
 - Cultivation on existing garden with various tree based crops
 - Cultivation on the garden hedges
 - Cultivation on ornamental garden house trees
- Conditioned rainforest cultivation (Costa Rica)
 - Similar to multi cropping system in Indonesia
 - Well managed as part of national forest conservation movement



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider:

I. Natural vanilla....

Cultivation method cont...

3. Forest based cultivation:

- Low cost cultivation using available pioneering vegetation as tutors trees
 - Assisted natural growth
- Minimum landscape and soil amendment
- Forest floor soil ecology maintaining vanilla health
 - Availability of mycorrhiza colonies food-web from the pioneering vegetation (trees, grass and herbaceous)
- Environmental added value
- Require more areal than intensive vanilla monoculture system (1:5)
 - Increased natural vanilla consumption=increase forest regeneration and conservation
 - There are 11 million hectares (?) of degraded peat forest in Indonesia out of 75 million generally degraded forest from logging and conversion
 - Planting vanilla in 2 million hectares of degraded forest=increasing global natural vanilla supply to 5%
 - Will this stabilize the global annual price?
 - Estimated 1000-2000 plants per hectares depended on the pioneering trees availability
 - 100-300kg/hectare production
 - Carbon sequestration ability in peat areas
- No serious natural forest pest known
 - Well balanced forest ecology self control pest management



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider:

II. Degraded tropical peat forest natural growth (may support forest vanilla cultivation)

Current condition

- Pioneering vegetation areal and sub soil ecology
 - Mycorrhizal and meso-fauna for vanilla growth and health
Better usage in agroforestry and restoration
- Water retention
 - Peat draining effect (from previous logging and current landscape management for cultivation)
Monoculture and rice field creation project for staple security
 - Areal natural night and early fog capture
- Biomass accumulation
 - From pioneering vegetation
 - Gradual Soil biodiversity building
- Slash and burn fishing and hunting
 - Ash based salt attract big game
 - Burning clearing bracken and imperata grass from depressed area with pooled water/moisture
- Salt intrusion from tidal cycle
- Peat oxidation
 - Mycorrhizal and meso-fauna for vanilla growth and health
Appropriate utilization with least landscape and soil amendment
- Areal biodiversity regeneration via
 - Mammal, bird, reptile, and insect visitation



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider: cont...

III. Adjacent forest regeneration and conservation:

- Reduced the need to venture to the inner peat forest (*luawo*)
 - Reduce animal-human conflict
 - Reduce forest fire incident from human activities in the forest
Areal burning for hunting and fishing during dry season
- High value vanilla will be ensured safe from forest fire
 - Just like when rattan was a valuable crop and well protected from fire
- Standing pioneering trees as tutors and main forest pollinators and its food chain
 - Regular visitations from habitants of the primary forest to the forest with vanilla
 - Increase primary forest seeds dispersal via animal visitation to the forest with vanilla
- Potential ending big primate and big animal genetic isolation
 - Fastening regrowth of degraded forest with vanilla may provide canopy bridges



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factor to consider: cont...

IV. In accordance with community indigenous secondary forest gardening method:

- Organic (less chemical harm related illness)
- Forest garden game hunting
- Caring for keystone species vegetation for animal and human
- Reduced inner forest visitation and exploitation
- Regenerated forest garden to support riparian based NTFP income
 - Fishing increase area for spawning and *hagas*
 - Edible swiftlet (*aerodramous facifagus*, and *maxima*) nest increased production
 - Apiary
- Proximity to access traditional culinary, medicinal and spiritual plants



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider: cont...

V. Potential polyculture system with other tree based valuable crops (coffee, cocoa, seasonal fruit, ect) in conventional plantation system (or reclaimed old plantation adjacent to forest)

Modification of existing neglected monoculture plantation

- Neglected palm oil
- Neglected rattan orchard
- Neglected rubber plantation
- Neglected coconut palm
- Neglected *jelutung* (*Dyera costulata*) plantation
- Neglected coffee plantation
- Neglected albizia plantation
- Etc..



Why does planting vanilla in degraded forest help low land peat forest regeneration? Cont...

Factors to consider: cont...

VI. Current Indonesia forestry policy shift

- Forest community ownership of *Hutan Desa (traditional/tribal forest)*
 - Community's independency to manage tribal forest
 - No logging and no burning
 - Promoting NTFP harvesting
- Decentralization of small size forest (up to 20000 hectares) management by District government
 - No logging
 - No conversion to palm oil
 - No peat draining
 - Mostly secondary forest
 - Toward total rewetting long term strategy
- Strict rules enforcement on forest fire
 - Community, private businesses, and government collaboration



Current field development of forest vanilla and forest regeneration initiative

I. Communities lands adjacent to RMU concession areas

- 4500 seedlings supplied to the community at the end of rainy season (Feb, 2018)
 - more than 80% survival rate
- High demand (most desired crop due to its economic and ecological potentials)
- A shift of perspective toward useless and long abandoned overgrown land post logging, now seen as land for vanilla, and other suitable forest crops
- Collaborative plants growth monitoring through forest famers group association
- RMU and the community organize future post harvest management and marketing scheme







II. Forest community adjacent to failed Mega Rice Project in Anjir Kelampayan Mandomai Kapuas Central Kalimantan

- 18000 seedling planted (approximately 20 hectare of degraded formerly forest land)
 - 3000 planted in February 2018 (more than 90% growing)
 - 15000 planted in early May 2018
- High demand (most desired crop due to its economic and ecological potentials)
 - Women forest famers group took more interest with the initiative
- A shift of perspective toward useless and long abandoned overgrown land post logging, now seen as land for vanilla, and other suitable forest crops
- Collaborative plants growth monitoring through the women forest famers group association
- The local government forest management unit (KPH) facilitated the community mobilization to adopt the idea of selected agroforestry commodities and forest regeneration
- KPH and the community organize future post harvest management and marketing scheme aiming direct global market access





PT Rimba Makmur Utama



Legume Covercrop in agricultural and community degraded land

Soil fertility building with fast biomass generation

Fire proof



Rice natural farming in peat land with mulching and microbiotic solution



Permanent raised beds polyculture system



Berhuma revival of indigenous farming method



Polyculture (high value commodities) system Agroforestry biodiversity friendly



Polyculture (high value commodities) system Agroforestry cont..



Inner forest fish migration aquaculture and forest regeneration



Ficus keystone vegetation and agroecology/forestry



Monoculture and traditional forest garden modification into polyculture agroforestry



Apiary



Raised bed in floodplain area



Open space hydroponic/aquaponic rice and aquatic legume



Bioremediation forest regeneration and agroecology/forestry





Next steps:

- Research protocol
- Project proposal
- Said Business School MBA study
- Engage key vanilla buyers at an early stage
- Look for grant funding

Thank you!

