# Opportunity costs of carbon emissions from land use change: need to broaden scope of REDD

**Meine van Noordwijk, Sonya Dewi and Peter Minang**
World Agroforestry Centre (ICRAF)

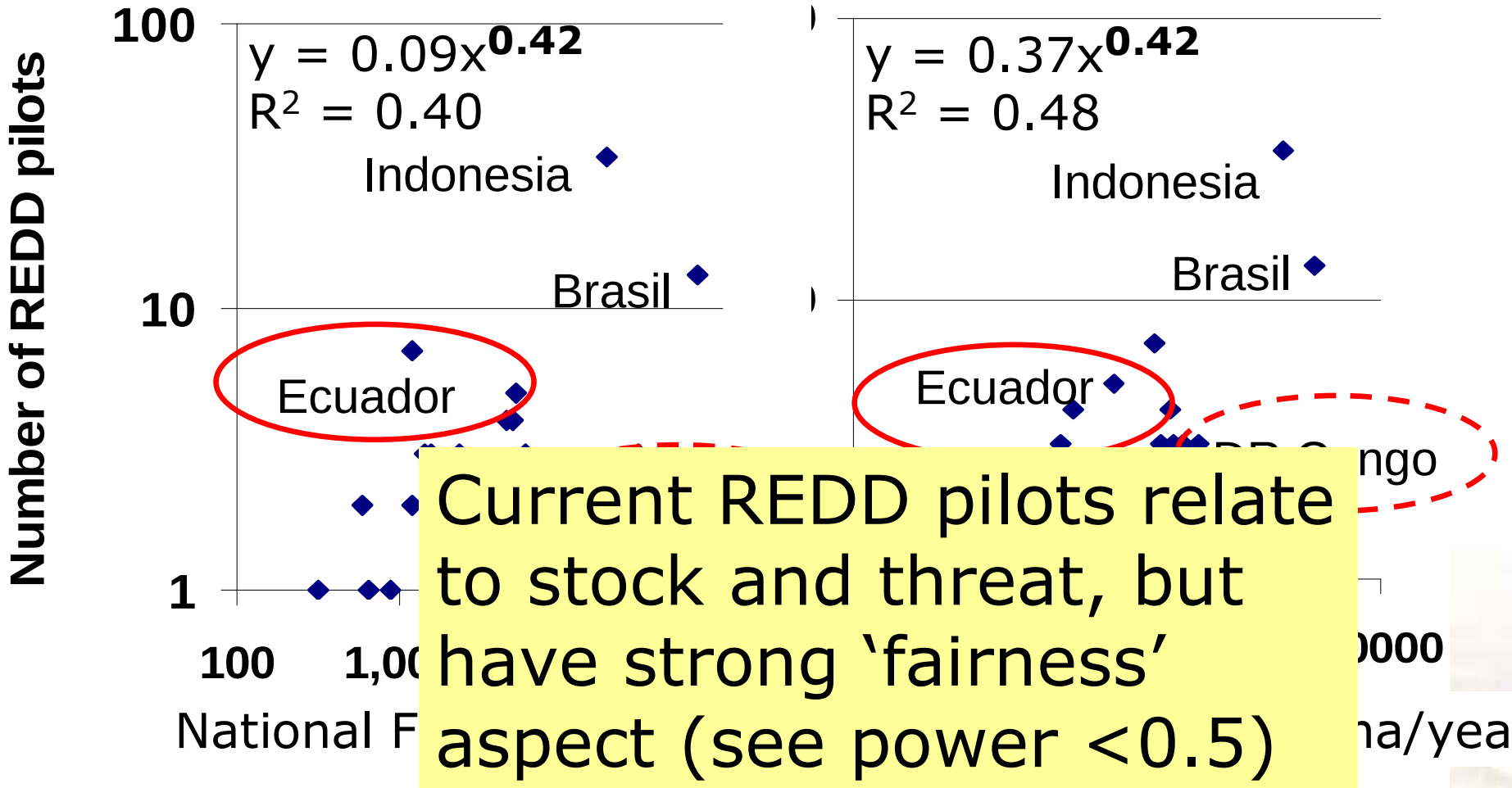
EU Side event: 'Deforestation, Forest Conservation and the climate challenge'
10 December 2009,Copenhagen

# Key messages:

- Does anybody understand what forest definition will apply to REDD+? A REDD+ agreement here in Copenhagen will have to be quickly followed by efforts to Reduce Emissions from All Land Uses to reduce impacts of arbitrary forest definitions.
- Tree-based land use outside of 'forest' store large amounts of carbon, while enhancing other environmental services and creating climate change adaptation benefits for smallholder farmers.
- NAMA's (Nationally Appropriate Mitigation Actions) need to be aligned with Globally Appropriate Mitigation Actions (GAMA?) and Locally Appropriate Mitigation Actions (LAMA?): there are Fairness vs Efficiency challenges at each level, but we have tools to clarify the tradeoffs

# Global survey of REDD projects:

## What implications for global climate objectives?




Current REDD pilots relate to stock and threat, but have strong 'fairness' aspect (see power <0.5)

# Definitions of **deforestation** on the Web:

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The state of being clear of trees; the ***removal of trees***
wordnetweb.princeton.edu/perl/webwn

The process of ***destroying a forest and replacing it with something else***, especially by an ***agricultural*** system
en.wiktionary.org/wiki/deforestation

Deforest - remove the trees from; "The landscape was deforested by the enemy attacks"
wordnetweb.princeton.edu/perl/webwn

Deforest - ***To destroy or to fell all the trees of a forest*** en.wiktionary.org/wiki/deforest

The removal of forest stands by cutting and burning to provide land for agricultural purposes, residential or industrial building sites, roads, etc., ***or by harvesting the trees*** for building materials or fuel. www.bigskyco2.org/whatisit/glossary

The direct human-induced ***conversion of forested land to non-forested land***.
www.mfe.govt.nz/issues/climate/lucas/glossary/glossary.html

Those practices or processes that result in the ***change of forested lands to non-forest*** uses. www.climatechange.ca.gov/glossary/letter_d.html

The ***permanent*** removal of forest and undergrowth
www.abheritage.ca/abnature/glossary.htm

the clearing of forests.
www.energex.com.au/switched_on/glossary.html

Destruction of forests ***to make land for agriculture***. www.wikinvest.com/glossary/Deforestation
today.com/environment/env-vocabulary.html

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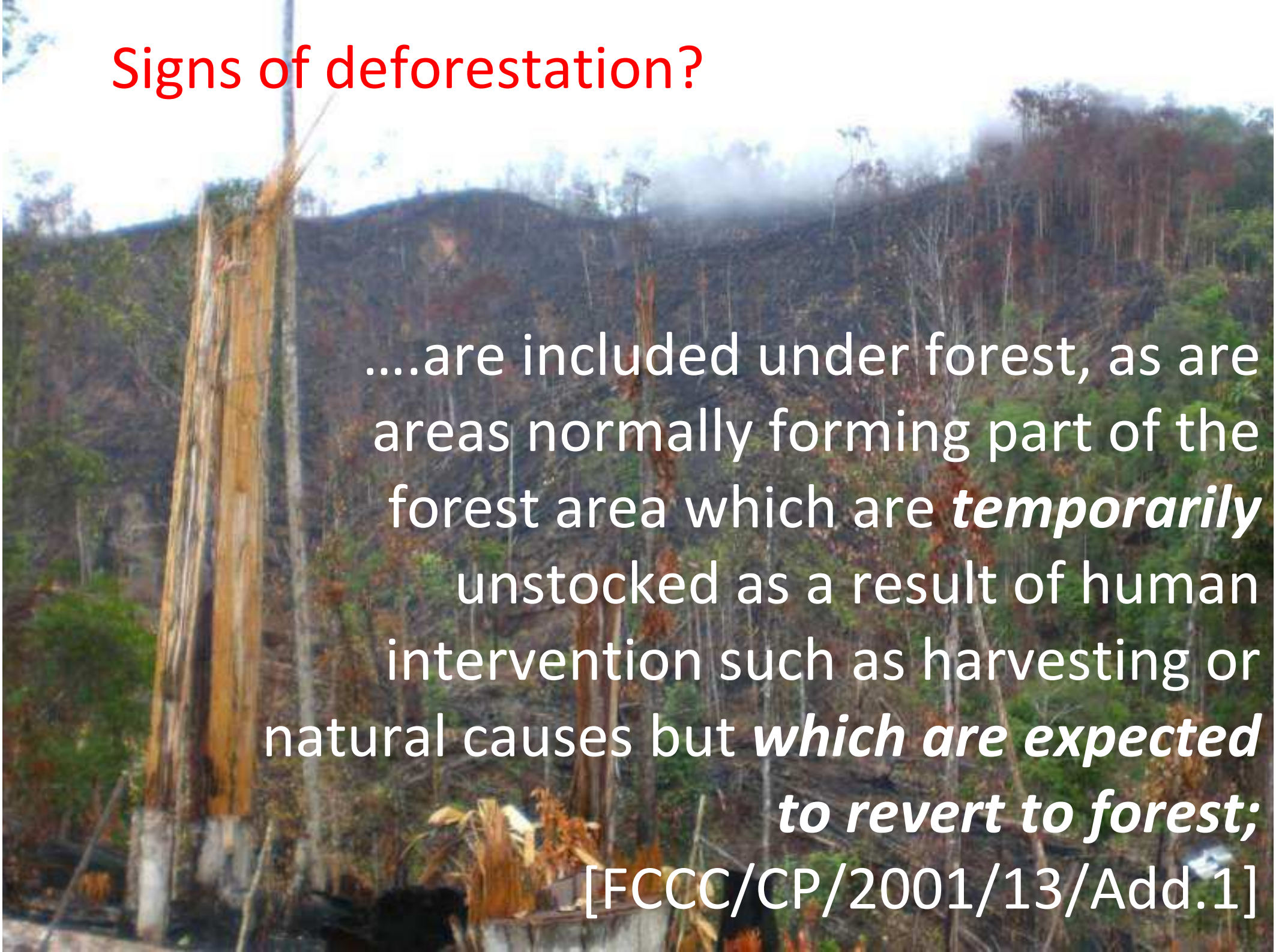
**How do you understand the word forest in the context of current debate?**

- all land that has at least 10% tree canopy cover, even if the trees have been planted
- all land that is managed by a forestry institution, even if 'temporarily unstocked'
- only undisturbed closed canopy natural forest
- all or none of the above, depending on context
- the question is too difficult and irrelevant for what we try to achieve

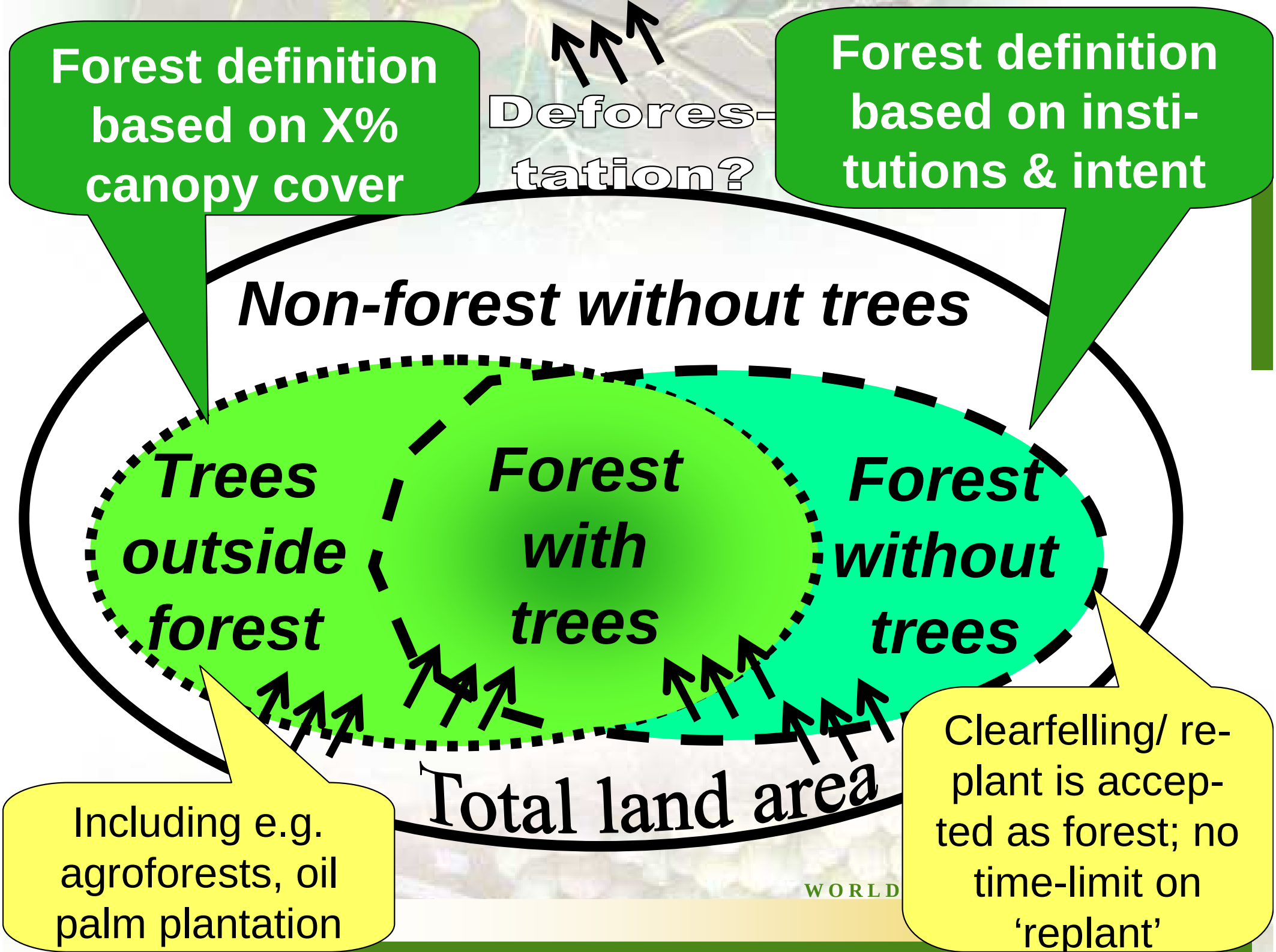

PLANTATIONS
ARE NOT
FORESTS
Agricultural tree crops (plantations)
are not forests!

# Signs of deforestation?

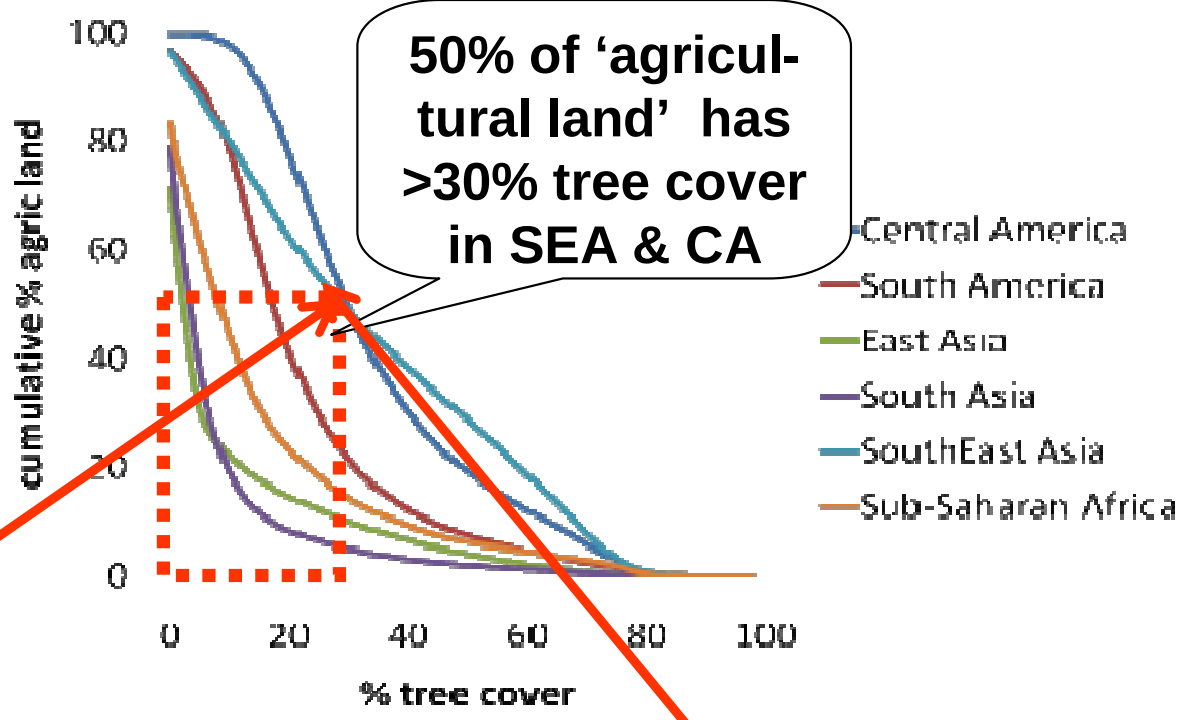


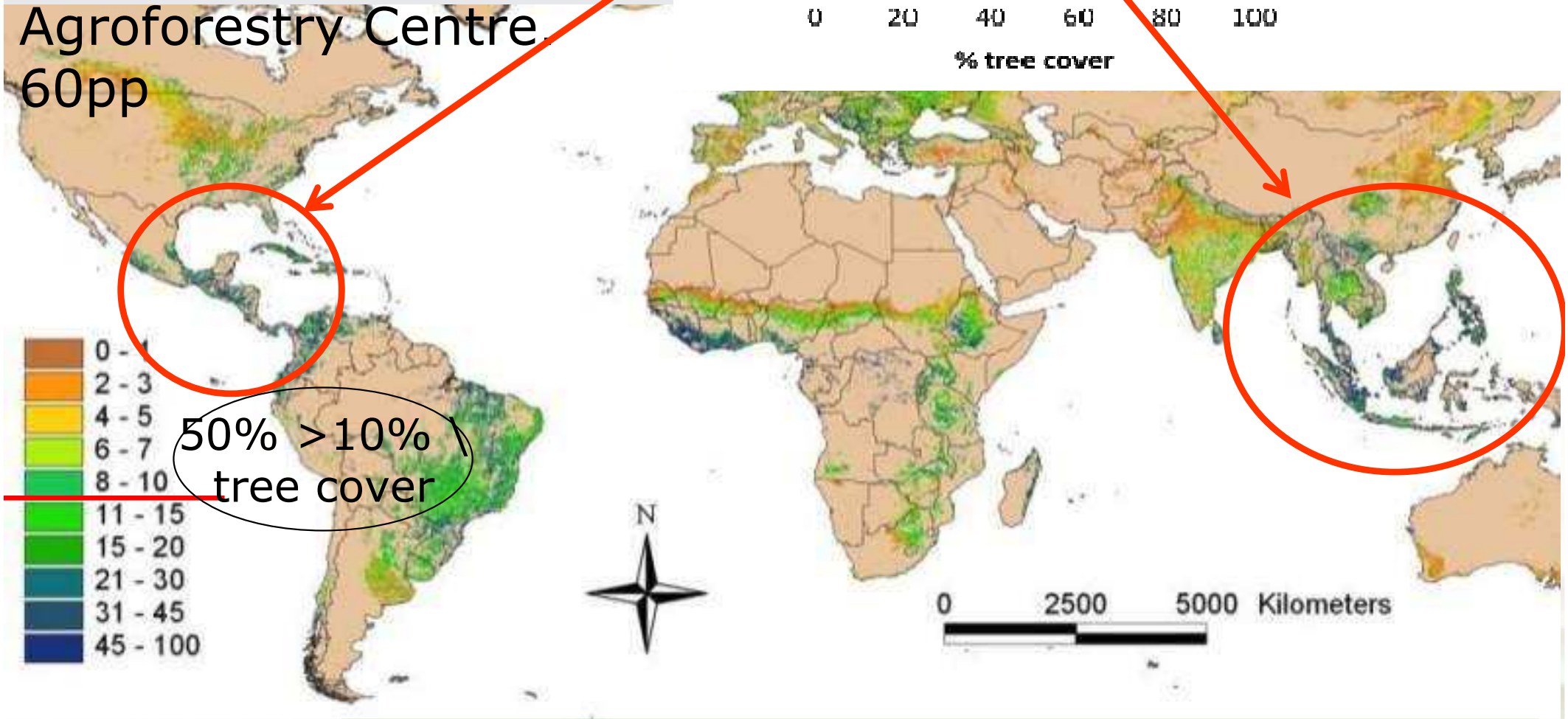
….are included under forest, as are areas normally forming part of the forest area which are ***temporarily*** unstocked as a result of human intervention such as harvesting or natural causes but ***which are expected to revert to forest;***

[FCCC/CP/2001/13/Add.1]


Forest definition based on X% canopy cover
Defores-tation?
Forest definition based on insti-tutions & intent
Non-forest without trees
Trees outside forest
Forest with trees
Forest without trees
Total land area
Including e.g. agroforests, oil palm plantation
Clearfelling/ re-plant is accep-ted as forest; no time-limit on 'replant'

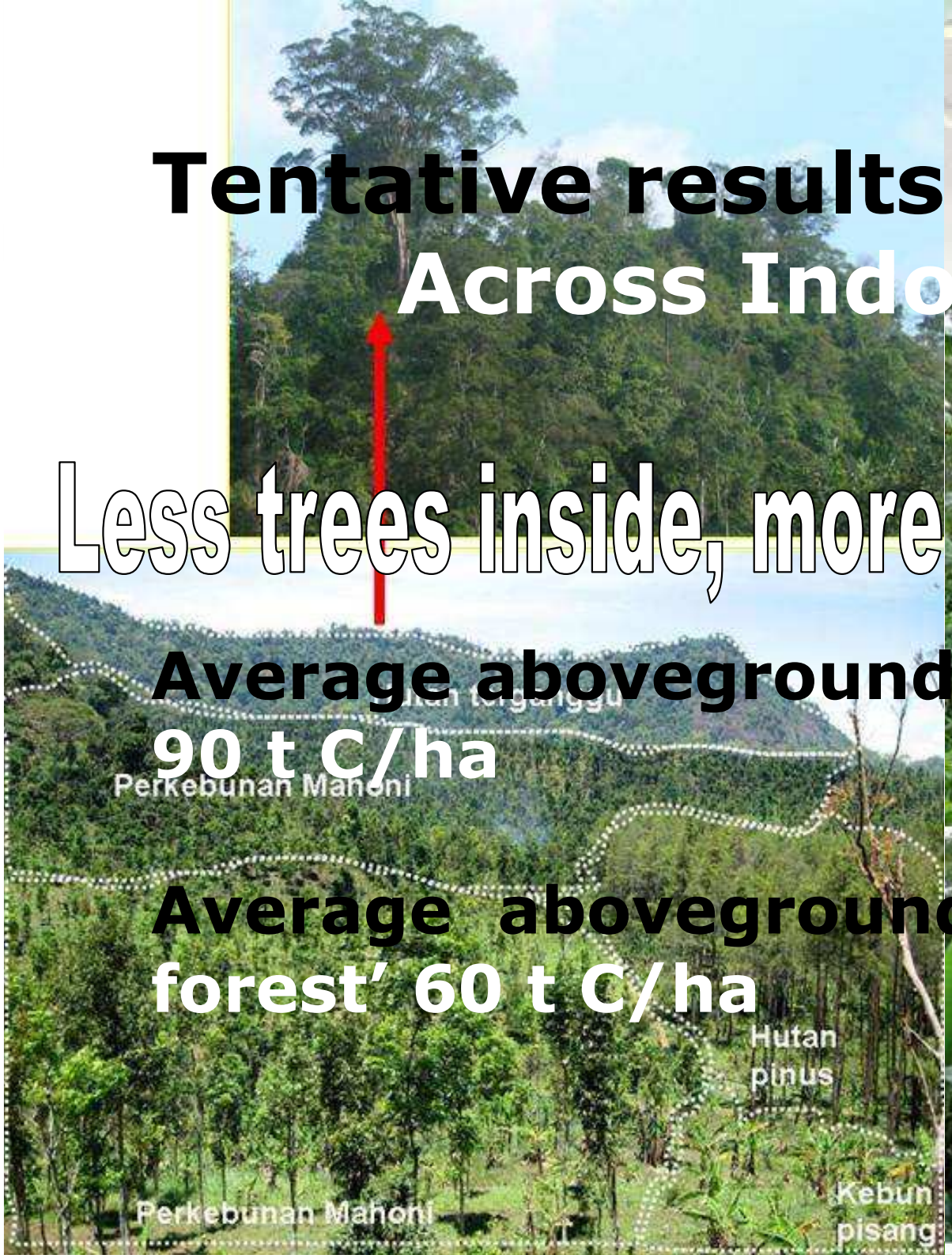
Zomer et al. (2009) Trees on Farm: Analysis of Global Extent and Geographical Patterns of Agroforestry. ICRAF Working Paper no. 89. Nairobi, Kenya: World Agroforestry Centre. 60pp



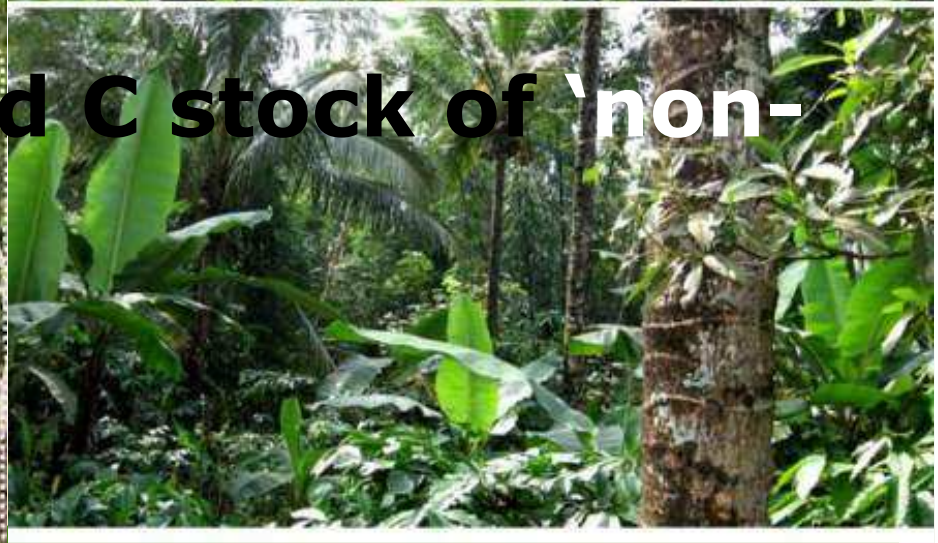



# Tentative results ALLREDDI:

## Across Indonesia:





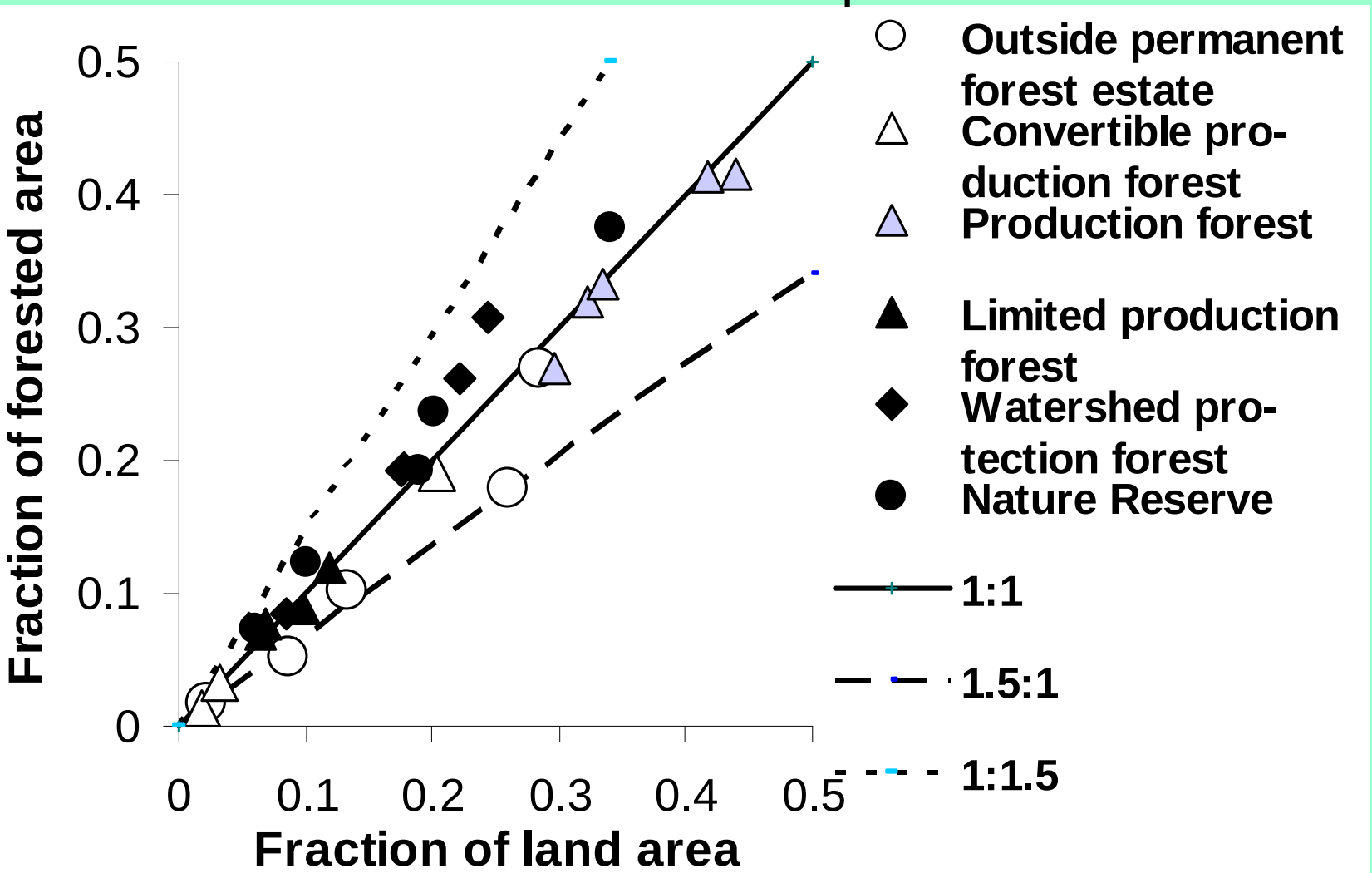


**Less trees inside, more outside the 'forest'**

**Average aboveground C stock of 'forest' 90 t C/ha**

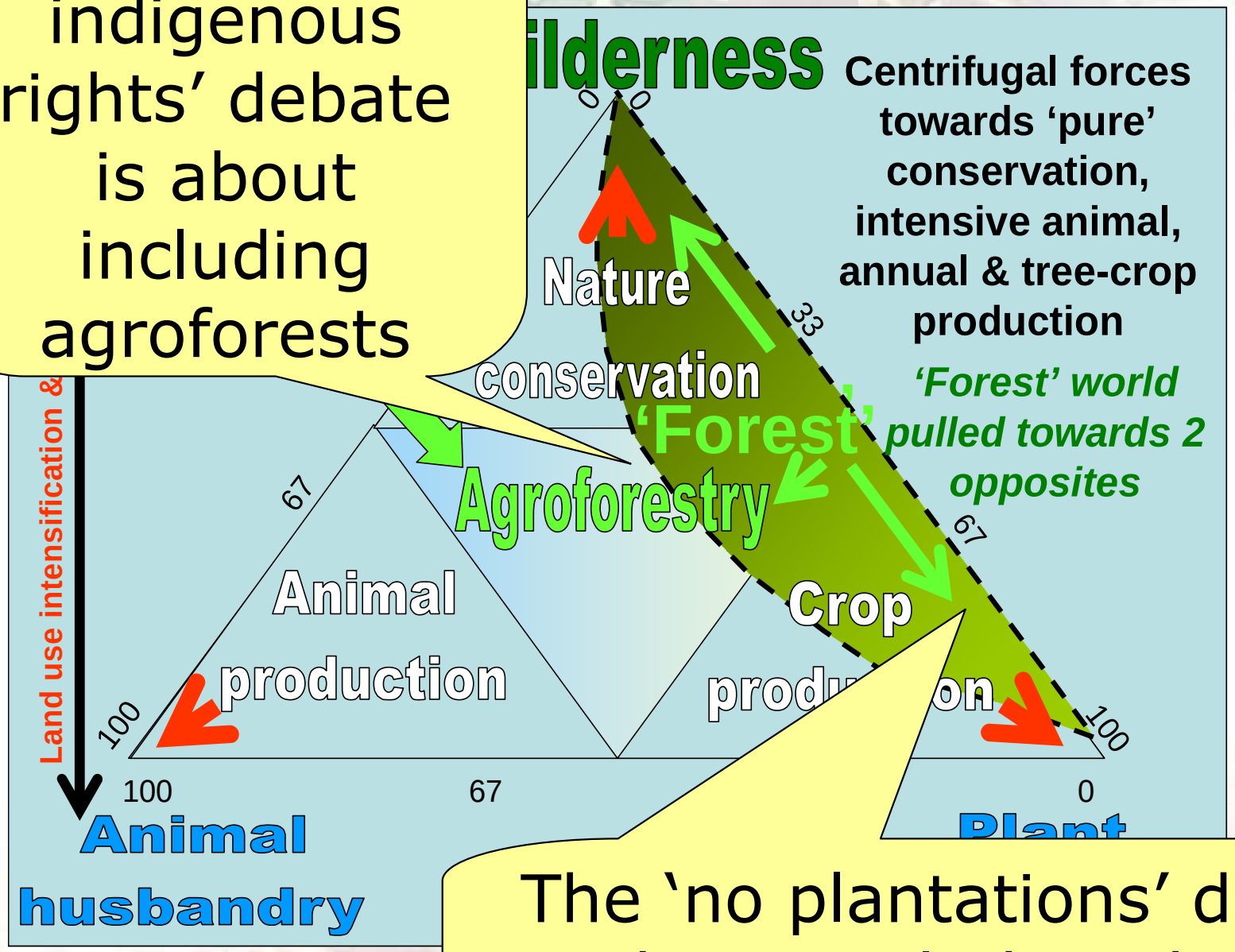
**Average aboveground C stock of 'non-forest' 60 t C/ha**

Data for five provinces in Indonesia (one each in Sumatra, Kalimantan, Java, Sulawesi and Papua) show that actual tree cover does not differ much between the various 'land use categories' – the proportion of 'non forest lands' that has tree cover meeting the forest definition is close to that of 'permanent forest estate' lands in the same province



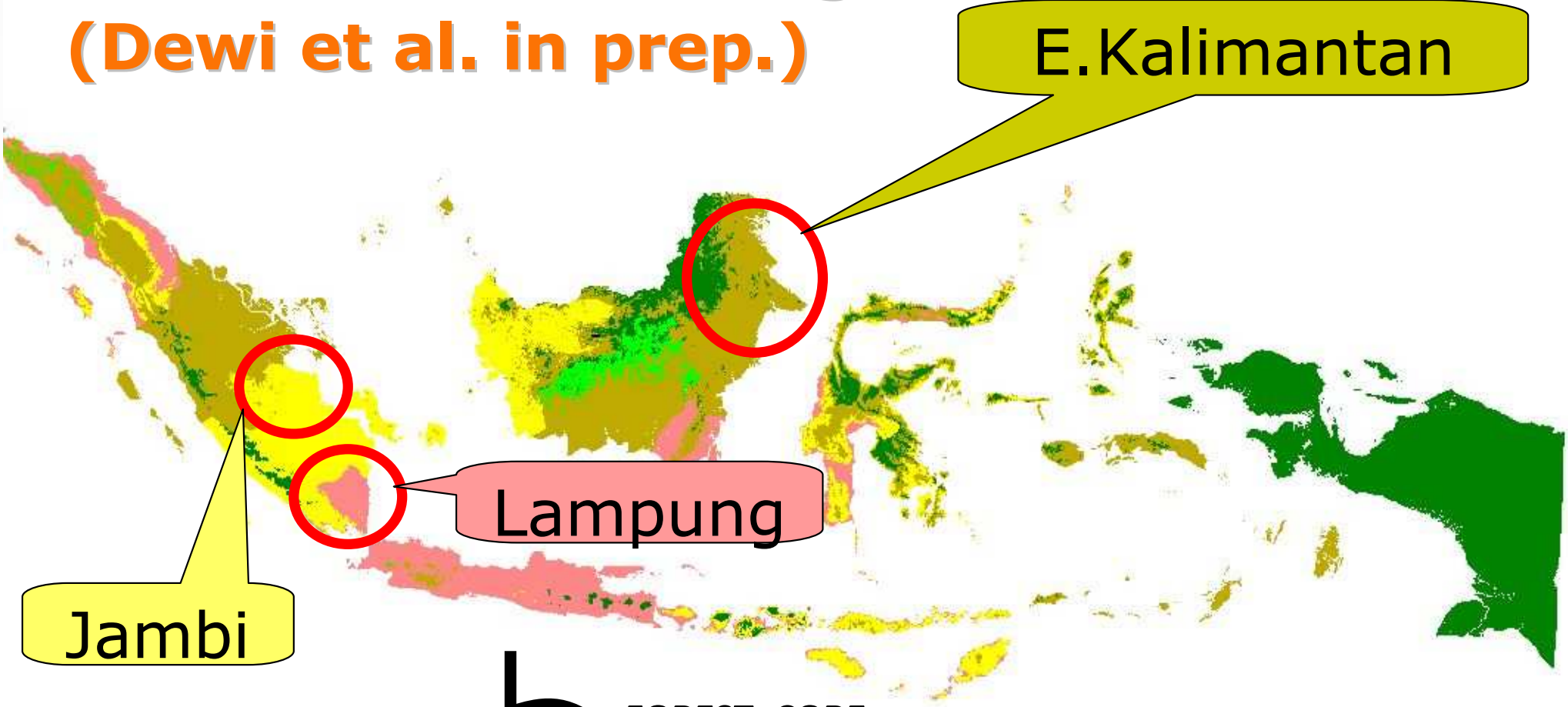

***Source:*** **Data for 2006 analyzed by BaPlan**

The ‘respect indigenous rights’ debate is about including agroforests




The ‘no plantations’ debate is about excluding this part of the forest domain

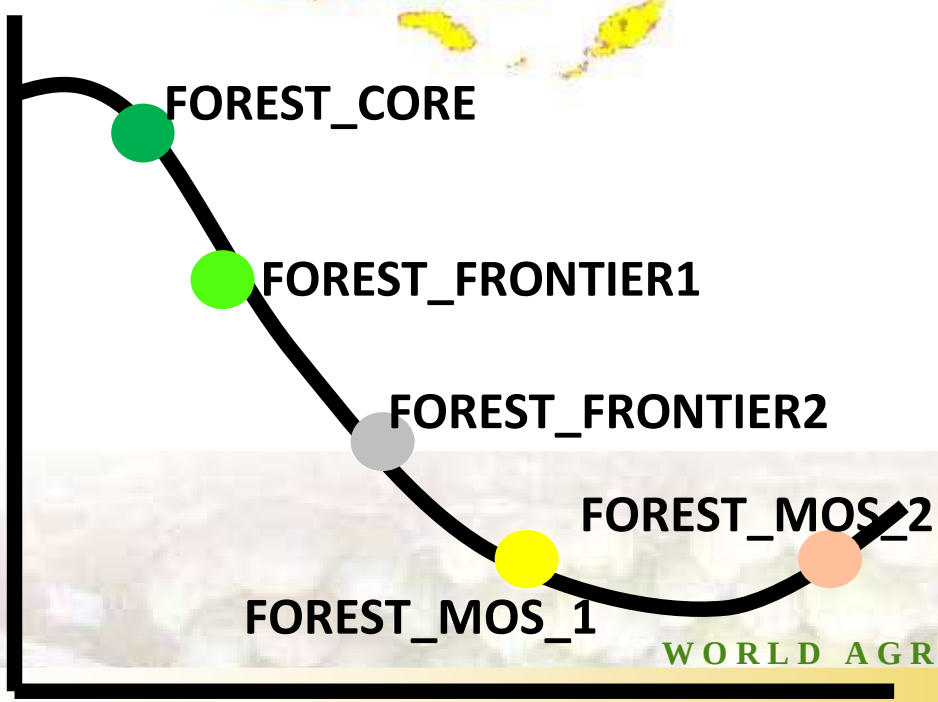
# (Dewi et al. in prep.)

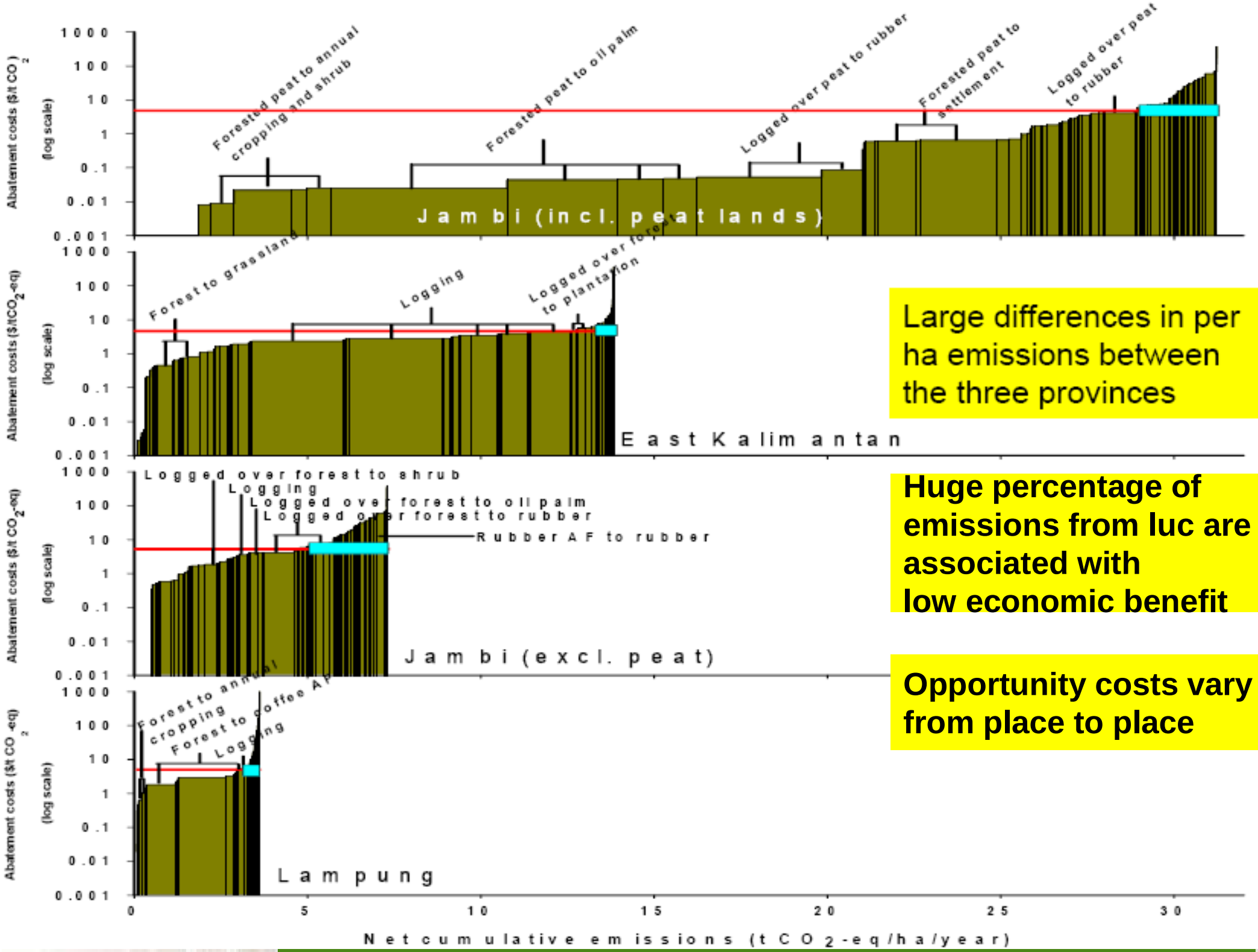



Forest Transition Stages

- FOREST_CORE
- FOREST_FRONTIER_1
- FOREST_FRONTIER_2
- FOREST_NON_1
- FOREST_NON_2

FOREST_CORE
FOREST_FRONTIER_1
FOREST_FRONTIER_3
FOREST_MOSAICS_1
FOREST_MOSAICS_2






Large differences in per ha emissions between the three provinces

**Huge percentage of emissions from luc are associated with low economic benefit**

**Opportunity costs vary from place to place**

# Huge emissions, but very little 'deforestation'

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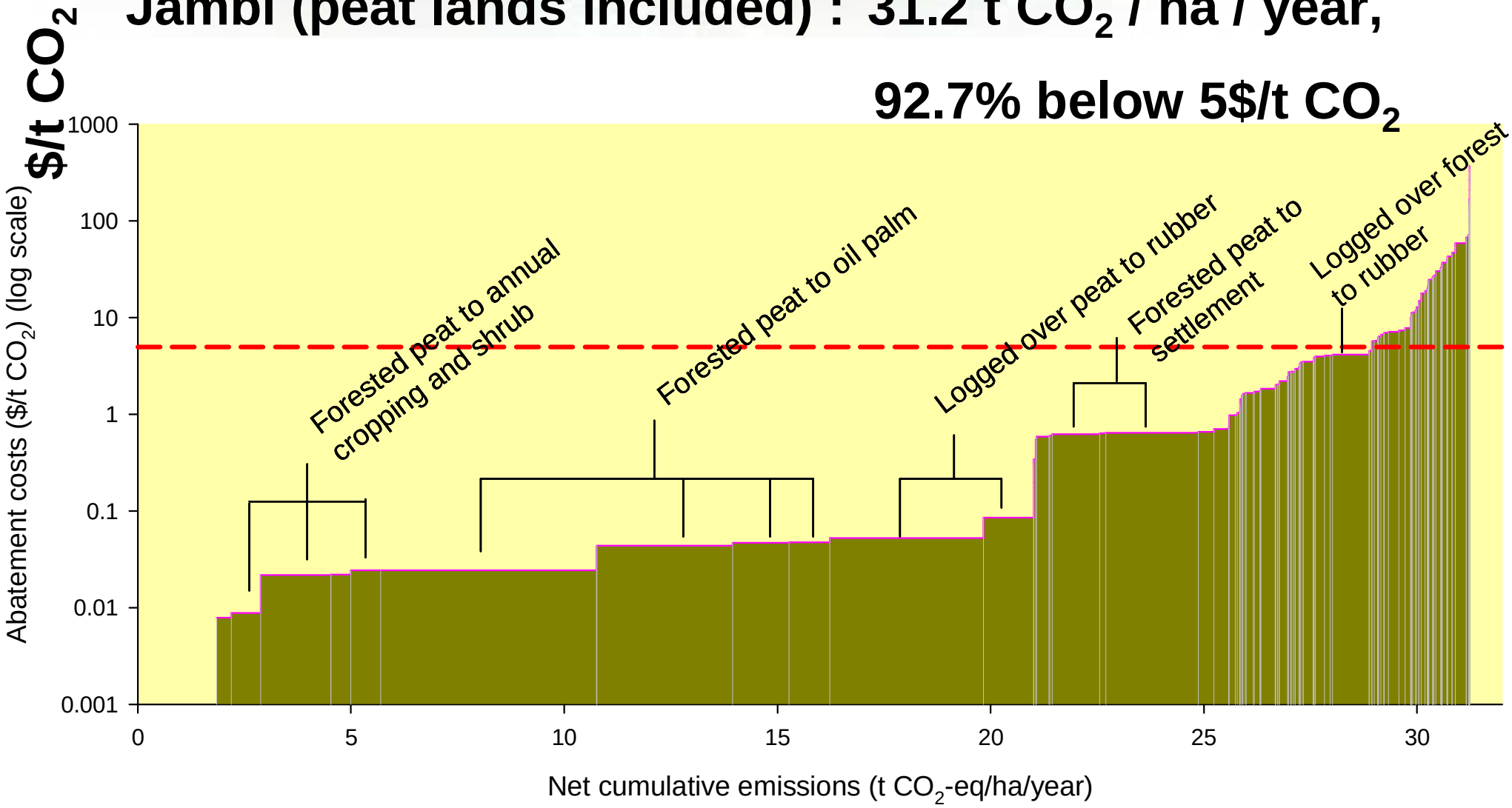
**Jambi (peat lands included) : 31.2 t $CO_2$ / ha / year,**

**92.7% below 5$/t $CO_2$**

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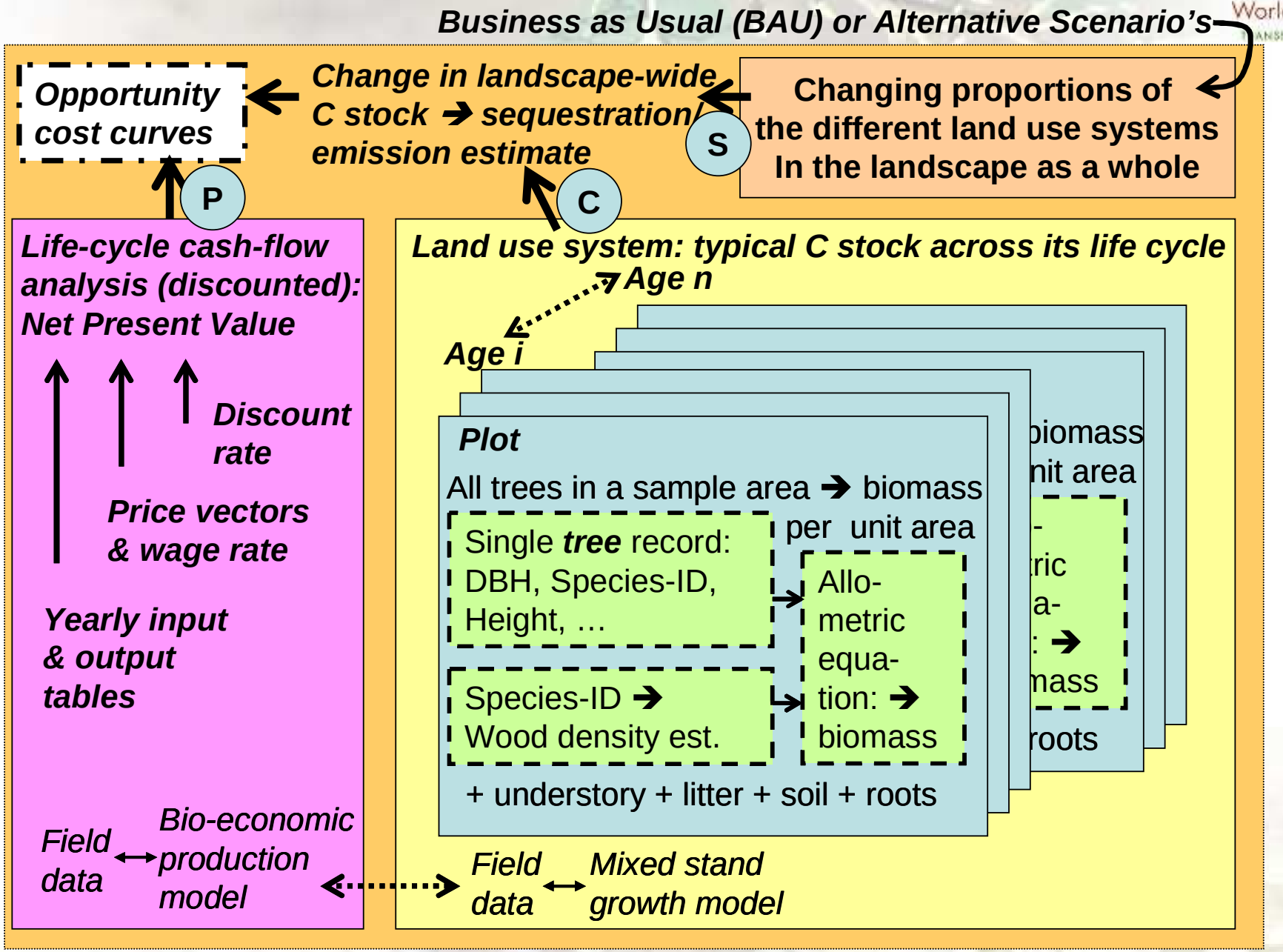
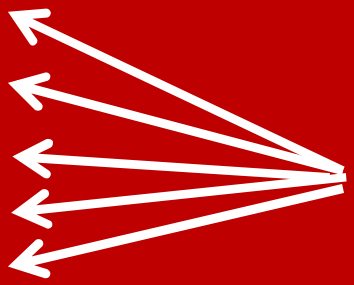
**t $CO_2$ / (ha yr)**


Business as Usual (BAU) or Alternative Scenario's
Opportunity cost curves
Change in landscape-wide C stock ➔ sequestration/ emission estimate
Changing proportions of the different land use systems In the landscape as a whole
S
P
C
Life-cycle cash-flow analysis (discounted): Net Present Value
Discount rate
Price vectors & wage rate
Yearly input & output tables
Land use system: typical C stock across its life cycle
Age n
Age i
Plot
All trees in a sample area ➔ biomass per unit area
Single tree record: DBH, Species-ID, Height, …
Allo-metric equa-tion: ➔ biomass
Species-ID ➔ Wood density est.
+ understory + litter + soil + roots
Field data
Bio-economic production model
Field data
Mixed stand growth model

# Clarifying the part of the land use change matrix (and AFOLU accounting)

| REALU | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Land cover | Natural forest | Logged-over I | Logged-over II | Fastwood plantation | Tree crop plantation | Agroforest | Open-field crops | Grassland | Urban + roads |
| Natural forest | | | | | | | | | |
| Logged-over I | | | | | | | | | |
| Logged-over II | | | | | | | | | |
| Fastwood | | | | | | | | | |
| Tree crop plantation | | | | | | | | | |
| Agroforest | | | | | | | | | |
| Open-field crops | | | | | | | | | |
| Grassland | | | | | | | | | |
| Urban + roads | | | | | | | | | |



Possible cut-off points for 'forest definition' & scope of $RED_j^{+j}$

RED = Reducing emissions from (gross) deforestation: only changes from 'forest' to 'non-forest' land cover types are included, and details very much depend on the operational definition of 'forest'

REDD = idem, + (forest) degradation, or the shifts to lower C-stock densities ***within*** the forest; details very much depend on the operational definition of 'forest'

$REDD^+$ = idem, + restocking within and towards 'forest' ; in some versions $RED^+$ will also include peatlands, regardless of their forest status ; details still depend on the operational definition of 'forest'

$REDD^{++}$ = REALU = idem, + all transitions in land cover that affect C storage, whether peatland or mineral soil, trees-outside-forest, agroforest, plantations or natural forest. It does not depend on the operational definition of 'forest'

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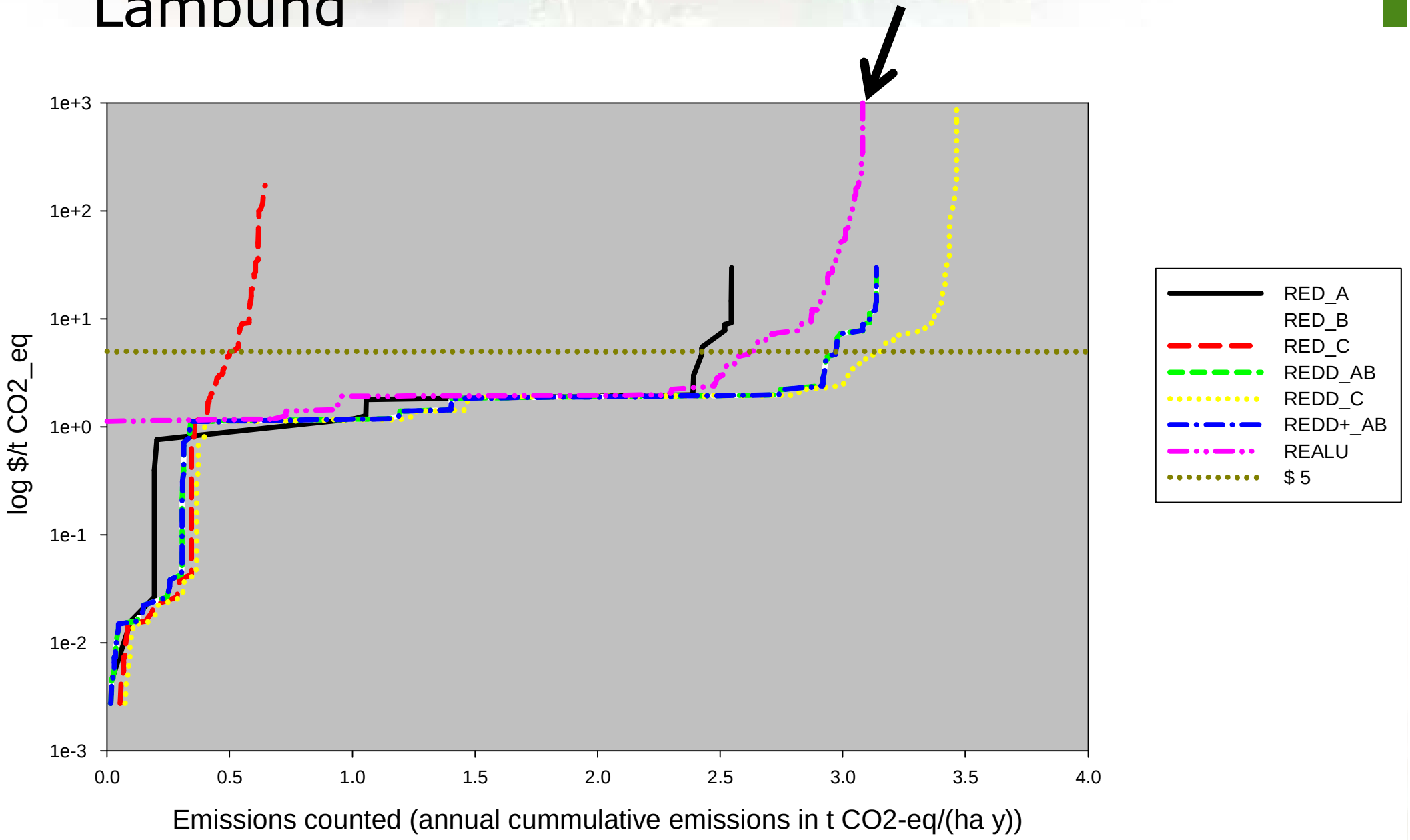
# Lampung



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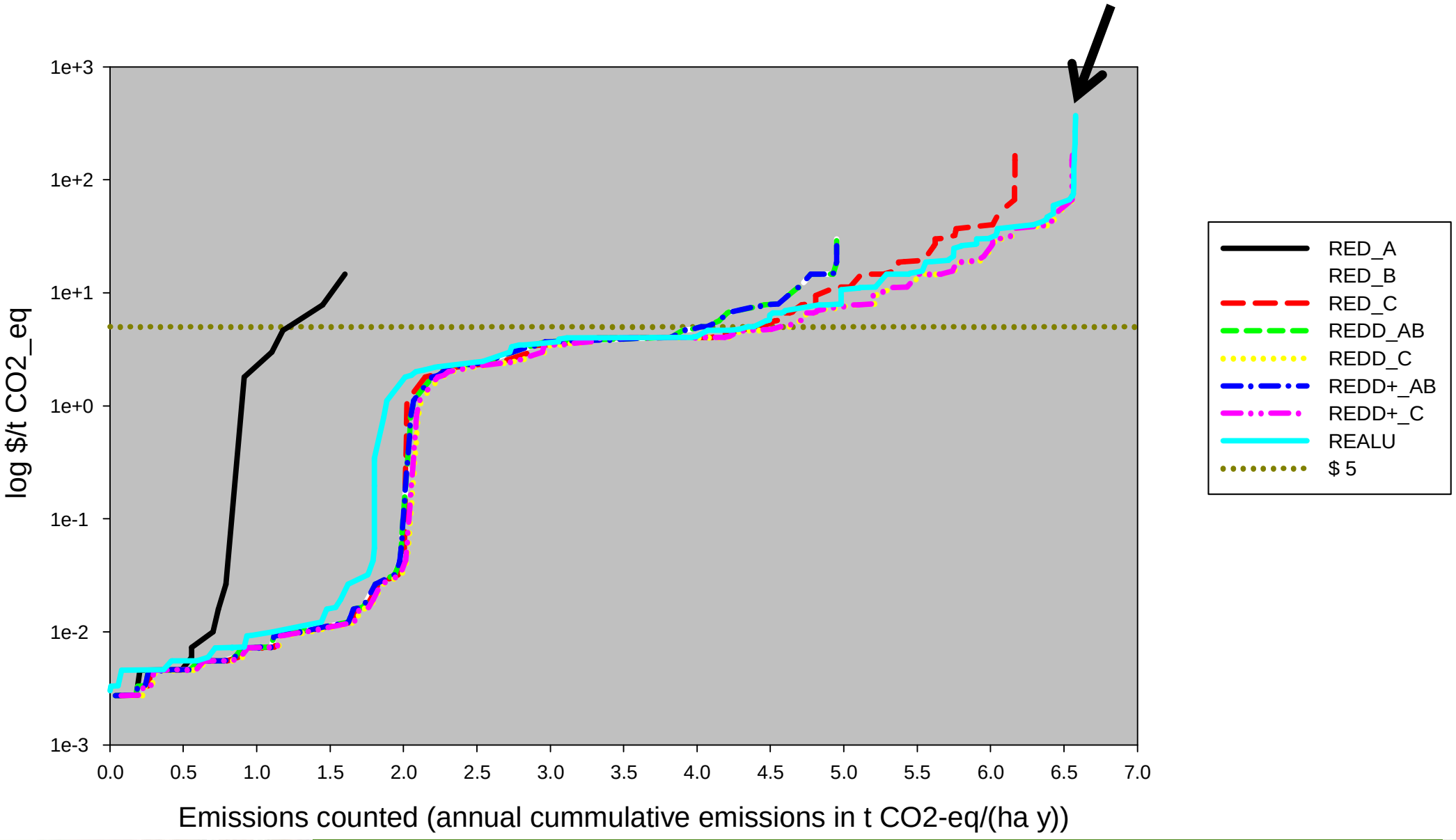
# Jambi



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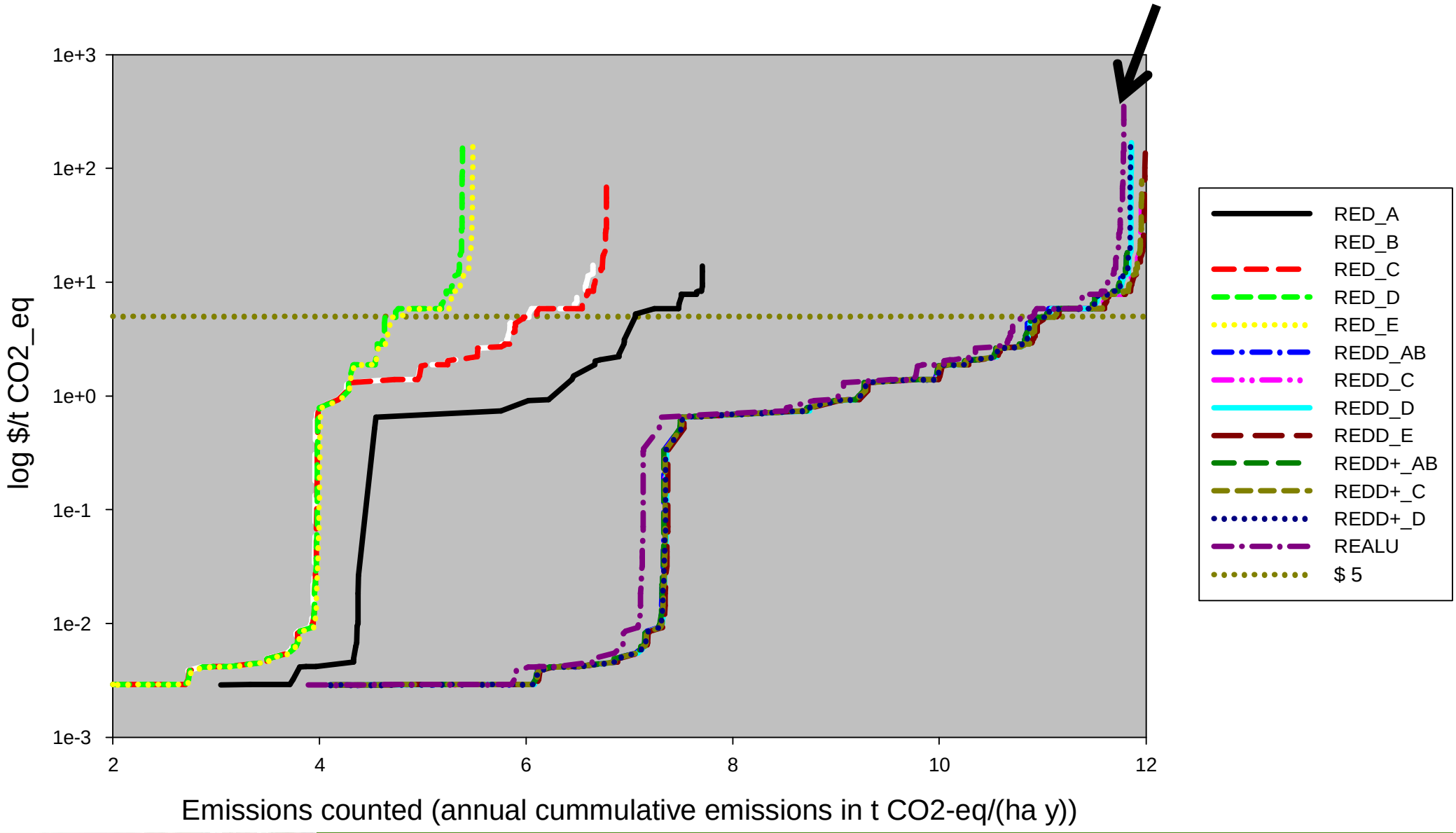
# Kalimantan Timur



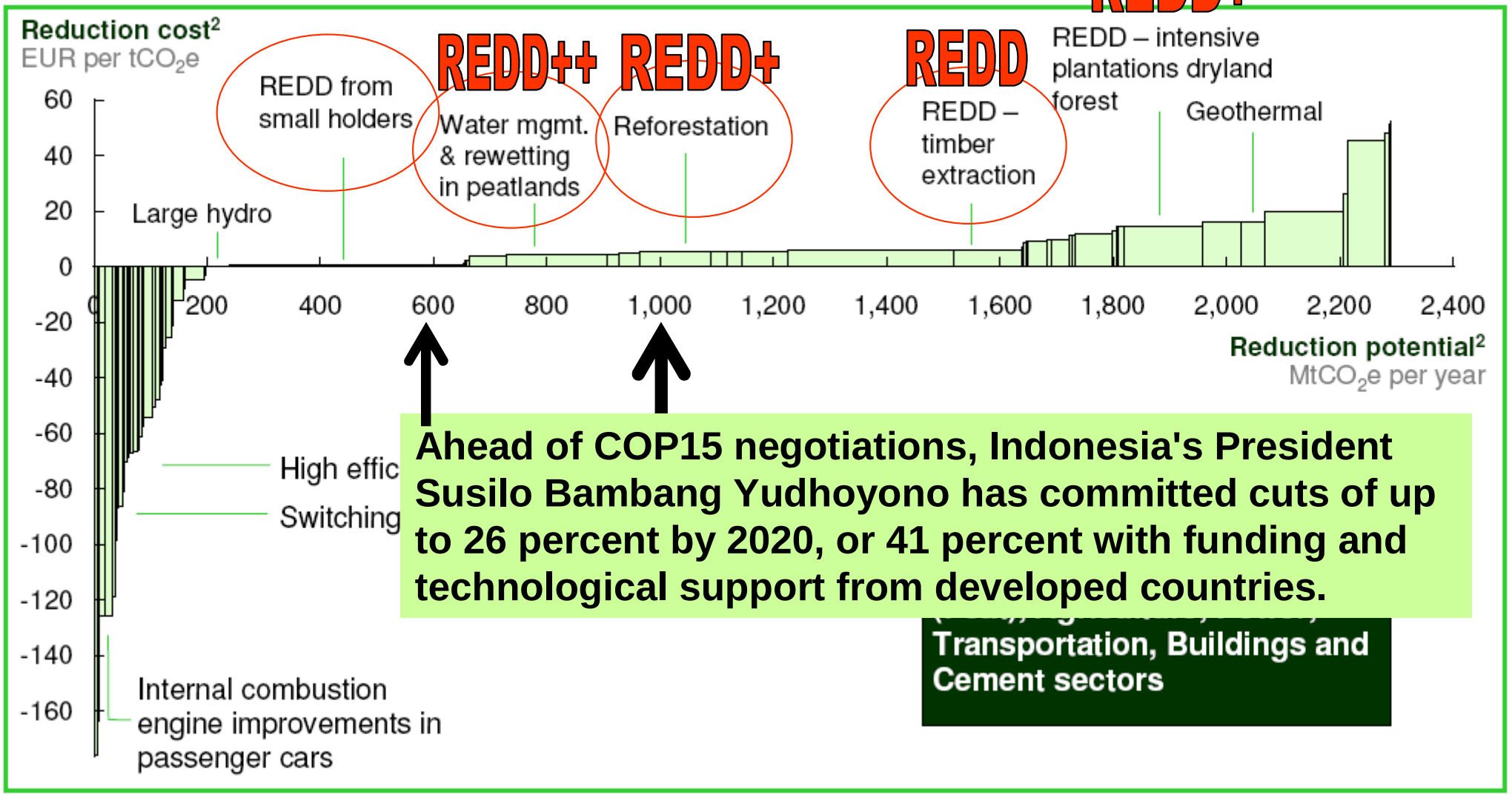
Emission estimates for three provinces of Indonesia with different RED(D)(++) rules and different forest definitions; (ton CO2-eq/(ha y))

| *Lampung* | RED (gross emissions, only from forest to non-forest) | REDD (gross emissions, from forest to lower C-stock forest or non-forest ) | REDD+ (net emissions, from forest to any land cover) | REALU (net emissions, all changes |
|---|---|---|---|---|
| Forest definition A | 2.55 | 3.14 | 3.14 | 3.08 |
| Forest definition B | 3.14 | 3.14 | 3.14 | |
| Forest definition C | 0.65 | 3.47 | 3.15 | |
| *Jambi* | | | | |
| Forest definition A | 1.60 | 4.95 | 4.95 | 6.58 |
| Forest definition B | 4.95 | 4.95 | 4.95 | |
| Forest definition C | 6.17 | 6.57 | 6.56 | |
| *E. Kalimantan* | | | | |
| Forest definition A | 7.71 | 11.83 | 11.83 | 11.79 |
| Forest definition B | 6.67 | 11.83 | 11.83 | |
| Forest definition C | 6.78 | 11.96 | 11.96 | |

*Forest definitions: A. Only undisturbed forest; B. Natural forest (undisturbed and logged-over forests); C. Natural forest and agroforest (mixed tree-based systems)*

# Indonesia has the potential to reduce $CO_2$ emissions by up to 2.3 Gt per year by 2030

Societal perspective[1], 2030



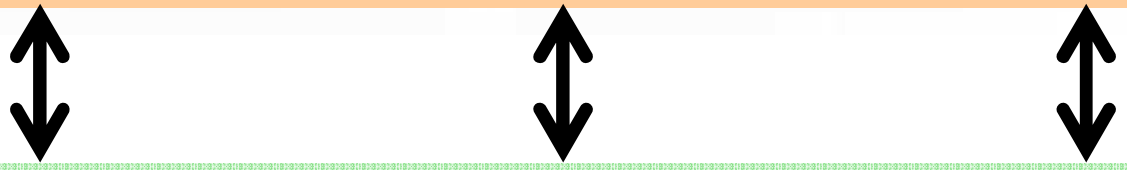

**Ahead of COP15 negotiations, Indonesia's President Susilo Bambang Yudhoyono has committed cuts of up to 26 percent by 2020, or 41 percent with funding and technological support from developed countries.**

1 Societal perspective implies utilizing a 4% discount rate

2. The width of each bar represents the volume of potential reduction. The height of each bar represents the cost to capture each reduction initiative

SOURCE: Indonesia GHG Abatement Cost Curve

Globally Appropriate Mitigation Actions (GAMA)



Nationally Appropriate Mitigation Actions (NAMA)

Locally Appropriate Mitigation Actions (LAMA)

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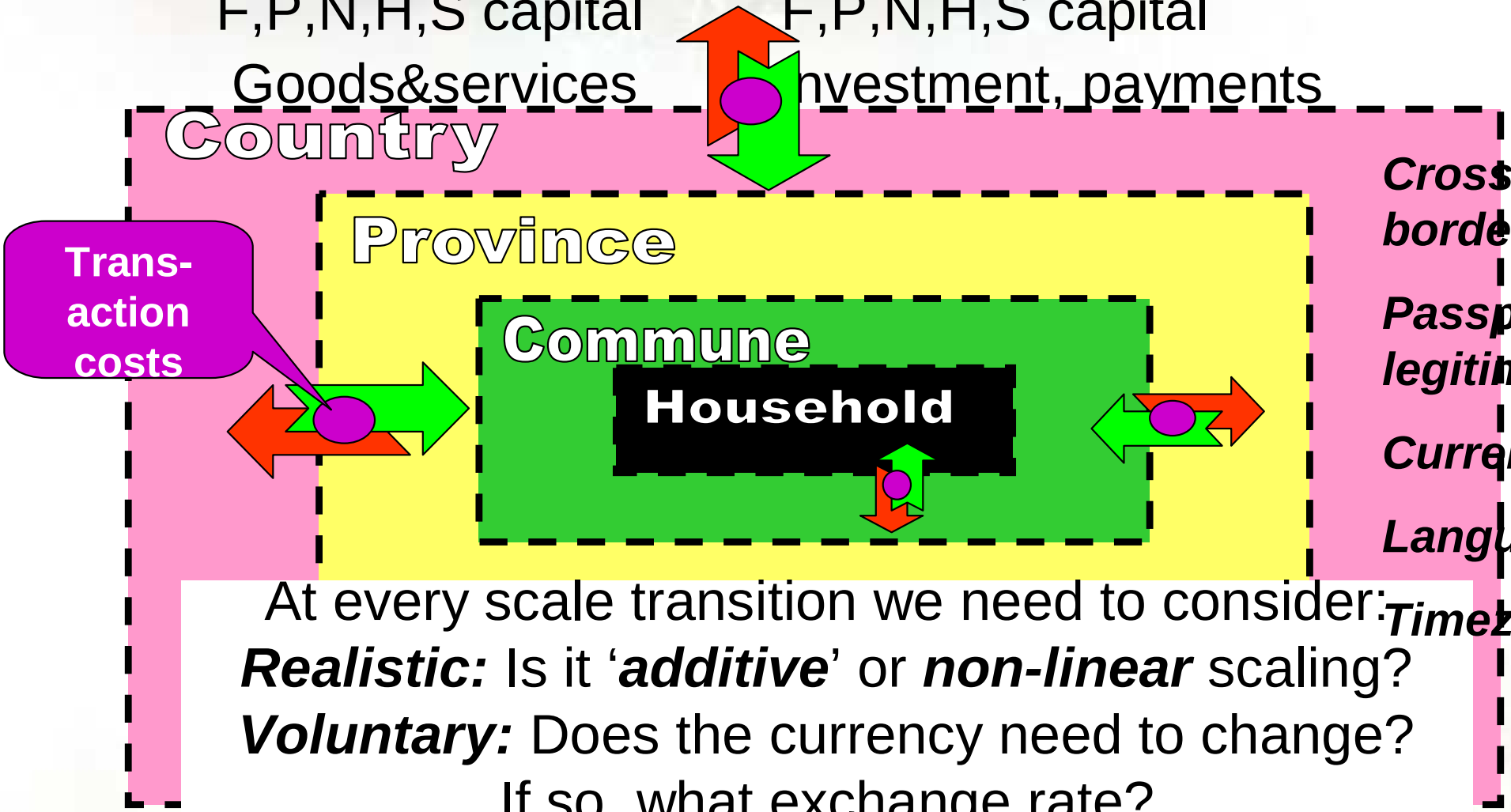
# World

F,P,N,H,S capital
Goods&services

F,P,N,H,S capital
Investment, payments




***Crossing borders:***

***Passport – legitimacy***

***Currency***

***Language***

***Timezone***

At every scale transition we need to consider:

***Realistic:*** Is it '***additive***' or ***non-linear*** scaling?

***Voluntary:*** Does the currency need to change?
If so, what exchange rate?

***Conditional:*** How to 'derive' flow from stock and build up stock through flows?

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Policybrief

# Fair and Efficient REDD Value Chain Allocation (FERVA): Lessons from Indonesia

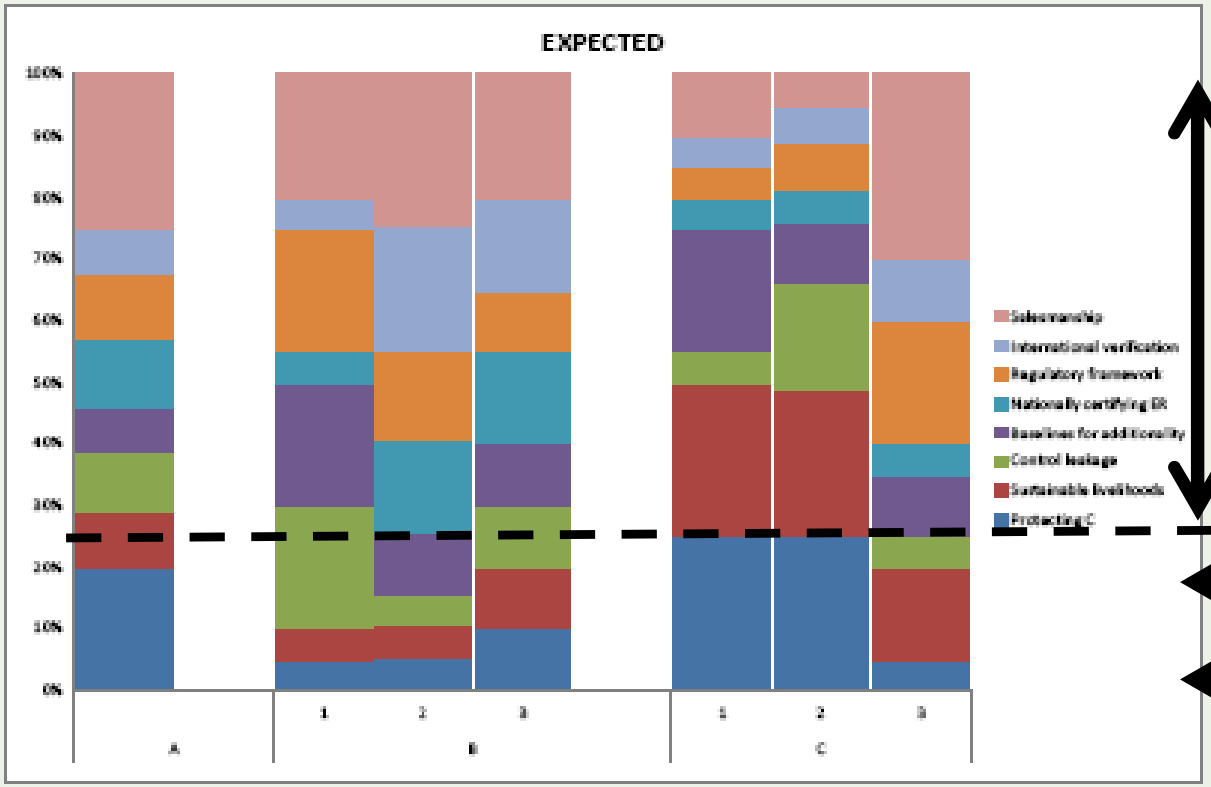
Mitigation actions, reductions of the net emission of greenhouse gasses to the atmosphere, need to be appropriate at global, at national and at local scales. They need to be effective (reaching their goal), efficient (effectiveness per unit inputs) and fair (balancing rights, responsibilities and incentives). As the international agreements on climate change are primarily agreements between countries, emphasis has been on what is fair and efficient between global and national scales. If agreements are to be implemented, however, the fairness and efficiency balance also needs to apply in the relationship between local and national scales. Current global discussions have focused on mechanisms for Reducing Emissions from Deforestation and Degradation in Developing Countries (RED/REDD/REDD+) as part of globally appropriate mitigation actions, that might also ne nationally appropriate. We need to know how such mechanisms can be locally appropriate. The FERVA method was designed to negotiate a balance between fairness and efficiency across scales. We discuss initial results for Indonesia, the country with the globally highest emissions from forest and land use change.


**Figure 1.** Key argument for fairness and efficiency in REDD

Results so far show that there is a considerable range of opinions and a challenge for achieving the two goals of fair and sustainable development' and 'efficiency in emission reduction' simultaneously.

**Table 1.** Typical arguments in REDD Fairness and Efficiency issue

| *Typical arguments for 'fairness'* | *Typical arguments for 'efficiency'* |
|---|---|
| **1.** Moral imperative: those managing C stocks effectively in their landscapes deserve rewards | **1.** Maximize $CO_2$ emission reduction per scarce dollar invested: focus on real threats only |
| **2.** Poverty reduction as the primary Millennium Development Goal mandates a pro-poor approach | **2.** Markets seek the "right" = "fair" price, if protected from monopolies |
| **3.** Avoid perverse incentives that enhance emissions by rewarding active and credible 'threat' | **3.** We need to show success in emission reduction to maintain public support |
| **4.** Respect for traditional practices of local communities | **4.** Rely on external experts for credible information |

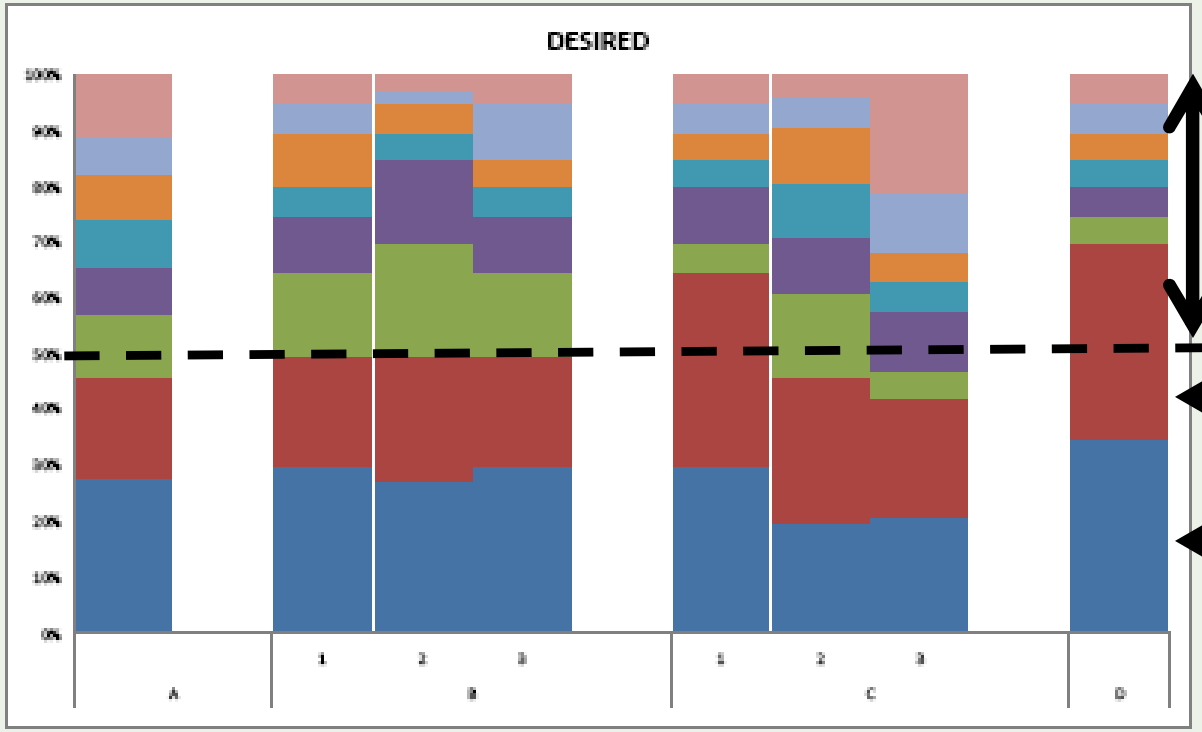



Expected by various stakeholders in Indonesia

75% transaction costs

Sustainable development pathways: fairness

Direct emission reduction: efficiency




'desirable' for various stakeholders in Indonesia

50% transaction costs

Sustainable development pathways: fairness

Direct emission reduction: efficiency

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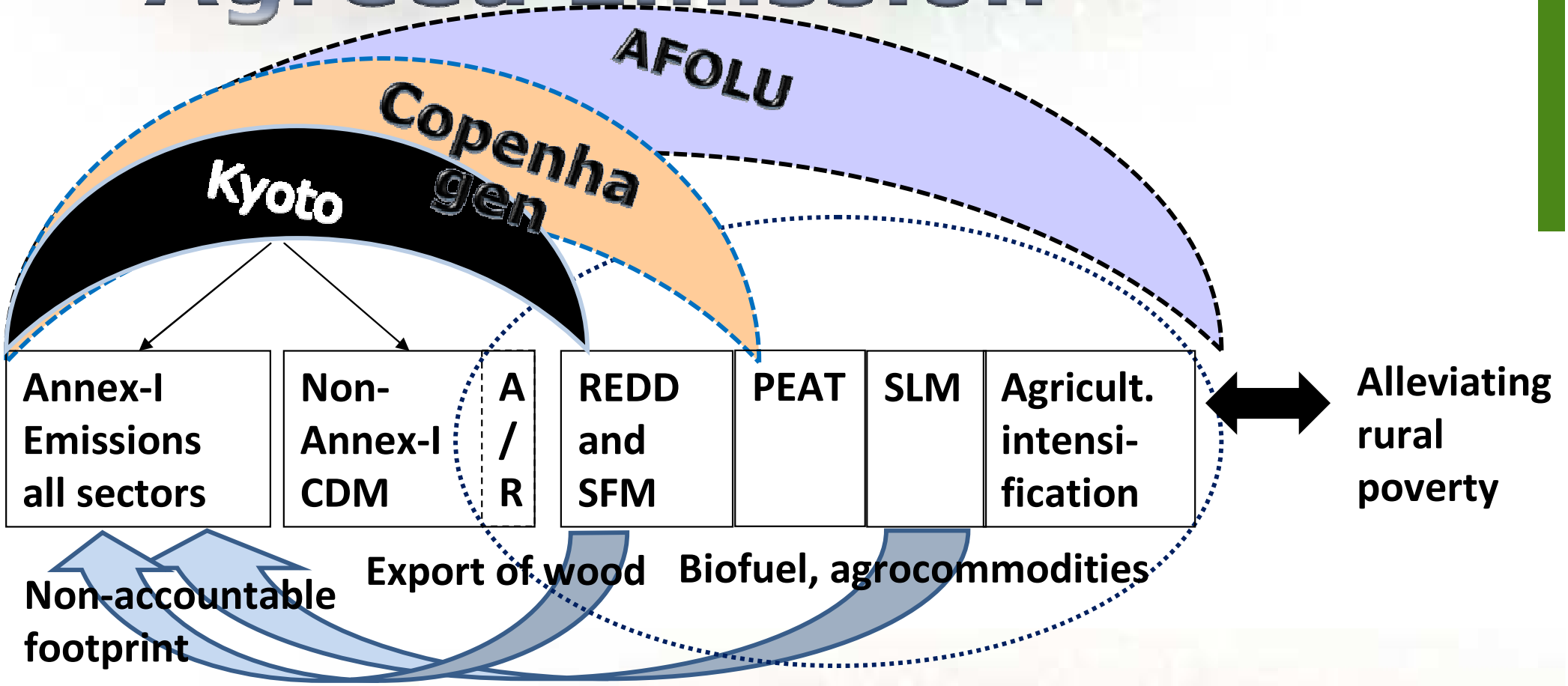
# Agreed Emission



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# Reducing Emissions from All Land Uses: The case for a whole landscape approach

A whole-landscape approach to reducing emissions and managing carbon stocks can help address the drivers of deforestation, reduce problems like leakage, and enhance participation of developing countries in a REDD deal.

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**Reducing Emissions from All Land Uses: The case for a whole landscape approach**

**A whole-landscape approach to reducing emissions and managing carbon stocks can help address the drivers of deforestation, reduce problems like leakage, and eliminate the need for precise forest definitions.**

**Key Findings**

**1. Compared to schemes currently under discussion for forest-based emissions mitigation, Reducing Emissions from All Land Uses (REALU), using the full accounting scheme for Agriculture, Forestry and Land Use (AFOLU), will be more:**

- Effective, in bringing major 'leakage' concerns into the accounting rules and allowing increased land use intensity outside forests as a contributor to net emission reduction.
- Efficient, by providing many cost-effective options for emission reduction, including tropical peatlands and smallholder agroforestry.
- Equitable, by applying the same accounting rules for Annex-I and non-Annex-I countries, and embracing low-forest-cover countries on a proportionate basis and rewarding the rural poor.

**2. The absence of a globally agreed definition of 'Forest' will impede implementation of REDD or REDD+ schemes.**

**3. Trees outside forest, woody vegetation outside of institutionally defined 'forest' and peatlands contain large carbon stocks that are excluded from current mitigation discussions.**

**The way forward**

- **Emission Reductions through High C-stock land Use.** Promoting high carbon stock land uses and reducing emissions from all land uses in a comprehensive manner remains the best way to achieve global climate goals, especially enabling low carbon emission development pathways and sustainable development in developing countries.
- **AFOLU accounting.** Whole landscape approaches and accounting (AFOLU) is needed as a way of minimising leakage and definition / eligibility questions that may hamper the implementation of REDD+, CDM and other mitigation options as currently framed under the UNFCCC.

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SPECIAL FOCUS ON REDUCING EMISSIONS FROM ALL LAND USE

# *If we cannot define it, we cannot save it: forest definitions and REDD*

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Forest definitions are ambiguous so often forest loss is not officially counted as deforestation. As well, ground-level implications of REDD+ will depend on the operational definition. Application of AFOLU accounting rules can bypass the need for clear definitions, reduce leakage and promote multifunctional landscapes in an equitable, efficient and effective way

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**If we cannot define it, we cannot save it: forest definitions and REDD**

**Ambiguous forest definitions may become a major bottleneck in reaching REDD agreements at and beyond UNFCCC COP15**

**Key Observations**

1. UN Framework Convention on Climate change (UNFCCC) guidelines for setting forest definitions have created ambiguous forest categories and inconsistencies between countries about what qualifies as deforestation
2. In many countries, forest loss or conversion is not officially counted as deforestation
3. The ground-level implications of the current framing of REDD-plus will depend on the operational definition of a forest

**Implications**

- Application of UNFCCC accounting rules for Agriculture, Forestry and Other Land Use (AFOLU) can help countries bypass the need for clear definitions, reduce leakage and promote multifunctional landscapes such as agroforestry
- The scope of emission reduction agreements needs further negotiation alongside the overall commitments for emission reductions
- Before new emission reduction targets are set, no credible way of reducing emissions should be left untested

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SPECIAL FOCUS ON AVOIDED DEFORESTATION WITH SUSTAINABLE BENEFITS 1

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# *Perceptions on Fairness and Efficiency of the REDD Value Chain*

REDD will require development of a value chain that links local emission reduction and carbon enhancement activities with global carbon markets. A REDD deal must be fair for the providers of those services, effective at reducing emissions and be cost-efficient.

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**Perceptions on Fairness and Efficiency of the REDD Value Chain**

**Methods and results from pilot analyses in Indonesia and Peru**

Reducing Emissions from Deforestation and Degradation (REDD) will require a 'value chain' that links global beneficiaries to local actions towards high carbon-storing land use patterns. The value chain includes: effectively reducing emissions, a shift in development pathways and all 'transaction costs' to make a transparent, verifiable claim on emission reductions that can obtain 'credits' and market value. Fairness in this context means rewarding stewards of current forests, and efficiency means focussing on high-emission areas for reductions.

The Fair and Efficient REDD Value Chain Allocation (FERVA) method explores perceptions along the emerging REDD value chain. This brief reports on its applications in Indonesia and Peru.

**Key findings**

1 Efficiency and fairness need to be balanced in order for REDD to accomplish its objectives. Immediate and efficient emission reductions require a focus on 'hot spots' of current emissions, but incentives for effective stewardship ('fairness') are also needed to achieve medium-to-long term goals.

2 Stakeholders indicate that their 'desirable' value chain allocation differs from the 'expected' allocation of REDD money; this can and should lead to further dialogue on how a realistic, conditional, voluntary and pro-poor mechanism can emerge.

3 The currently expected allocation of funds to 'transaction costs' of monitoring, reporting and verification reduces both 'fairness' and 'efficiency' of the REDD value chain, hence transaction costs will have to be lowered through simple and clear rules.

4 There is considerable divergence among the perceptions of different stakeholders; negotiations and dialogue are needed to reduce these gaps for mutually acceptable solutions.

**Implications**

The FERVA method provides a replicable approach for involving stakeholders in the design of REDD mechanisms that will be effective, efficient and fair. It uses a preliminary definition of a REDD value chain and allows for the analysis of the divergent opinions with respect to it and, if replicated over time, analysis of progress along learning curves in local negotiations.

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# *Global survey of REDD projects and survey of Africa's biocarbon experience*

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

The current patterns of REDD investments across the tropics will miss important opportunities to maximize emissions reductions. Investments in REDD demonstration projects, particularly in Africa, should be increased, in order to generate practical lessons for future REDD implementation and to enhance participation in mainstream carbon markets.

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**Global survey of REDD projects:**
**What implications for global climate objectives?**

Does the current distribution and composition of demonstration and readiness investments for Reduced Emissions from Deforestation and forest Degradation in countries (REDD) hold for radically reducing gas emissions? A glob REDD activities finds t of activity are unequa regions, and may not p maximum emission re

**Key findings**

1. National REDD readiness activities are largely evenly distributed across Africa, Asia and Latin America, while demonstration activities are concentrated in East Asia, the Pacific and Amazon regions. Africa has the lowest number of demonstration projects.

2. The greatest levels of REDD readiness and demonstration activities are in Indonesia and Brazil, countries with the greatest potential for reduced emissions from REDD. Otherwise, there is little relation between level of REDD investment and apparent potential for reduced emissions.

3. Biodiversity co-benefits are a major motivation for investments in REDD demonstration activities.

**Implications**

- Continuing curre patterns will miss opportunities to reductions from
- The small numbe demonstration p suggests a repeat distribution of pr seen under the C Mechanism.
- Investments in RE demonstration ac more consistently to advance both and sustainable d objectives.

http://www

World Agroforestry Centre 06

Policybrief
IN COLLABORATION WITH THE COMMON MARKET FOR EAST AND SOUTHERN AFRICA (COMESA)

**Africa's biocarbon experience**

**Lessons for improving performance in the African carbon markets**

Carbon stored in trees, soils, vegetation and leaf litter offers great promise for African countries to participate in global carbon markets. However, compared to other regions, Africa has made little progress in benefiting from such opportunities.

**Key messages**

1. Africa has more than 100 biocarbon projects, ranging from forest conservation to agroforestry, as well as many sustainable land management programmes
2. Most projects are at an infant stage, with less than 5% generating financial benefits to local communities.
3. An inventory carried out by ASB confirms that Africa is seriously lagging behind other continents in terms of participation in the Clean Development Mechanism (CDM), REDD, and voluntary carbon markets.
4. The development of biocarbon projects in Africa is constrained by barriers including complex rules set by buyers, high costs and poor governance. If these barriers are not addressed, Africa will remain marginalized from mainstream carbon markets despite the continent being the most vulnerable to climate change.

**The way forward**

1. Africa should influence international climate change negotiations so that favorable and realistic international modalities and procedures are put in place for global biocarbon mechanisms. This includes supporting Clean Development Mechanism reform, ensuring that current negotiations adequately include emissions from agriculture, forestry and other land uses (AFOLU), and embracing Nationally Appropriate Mitigation Actions (NAMAs).
2. African governments should develop enabling national policy frameworks for investment, financing and development of biocarbon initiatives.
3. Investors should support learning-by-doing, by proactively funding and developing REDD demonstration projects to build capacity.
4. African governments should promote sub-regional efforts to pool resources, knowledge and skills in technical aspects of biocarbon project development.

# Key messages:

- Does anybody understand what forest definition will apply to REDD+? A REDD+ agreement here in Copenhagen will have to be quickly followed by efforts to Reduce Emissions from All Land Uses to reduce impacts of arbitrary forest definitions.
- Tree-based land use outside of 'forest' store large amounts of carbon, while enhancing other environmental services and creating climate change adaptation benefits for smallholder farmers.
- NAMA's (Nationally Appropriate Mitigation Actions) need to be aligned with Globally Appropriate Mitigation Actions (GAMA?) and Locally Appropriate Mitigation Actions (LAMA?): there are Fairness vs Efficiency challenges at each level, but we have tools to clarify the tradeoffs