Biodiversity Conservation in Agriculture 31 May – June 2 2006 Dominican Republic

Agro-biodiversity and CGIAR tree and forest science

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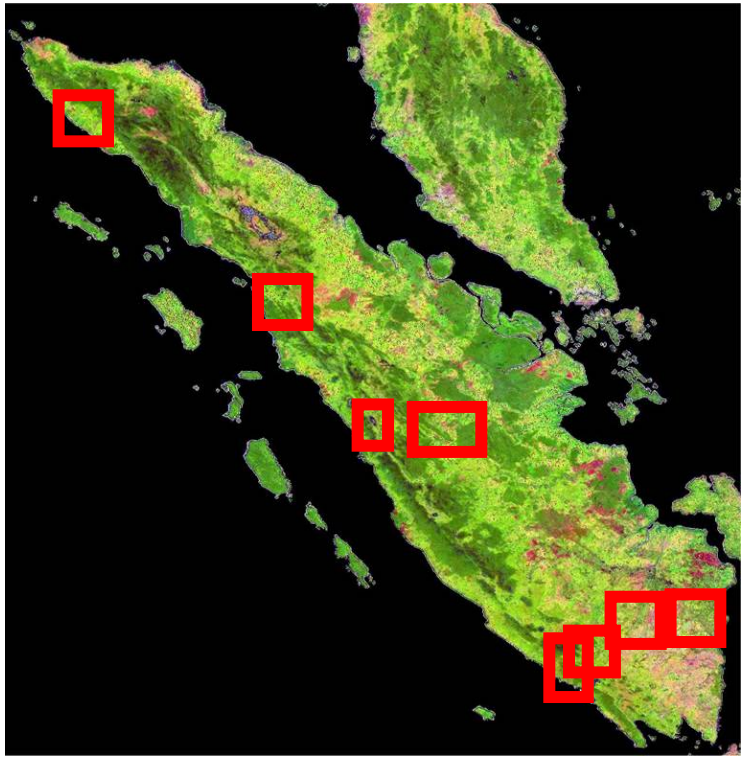
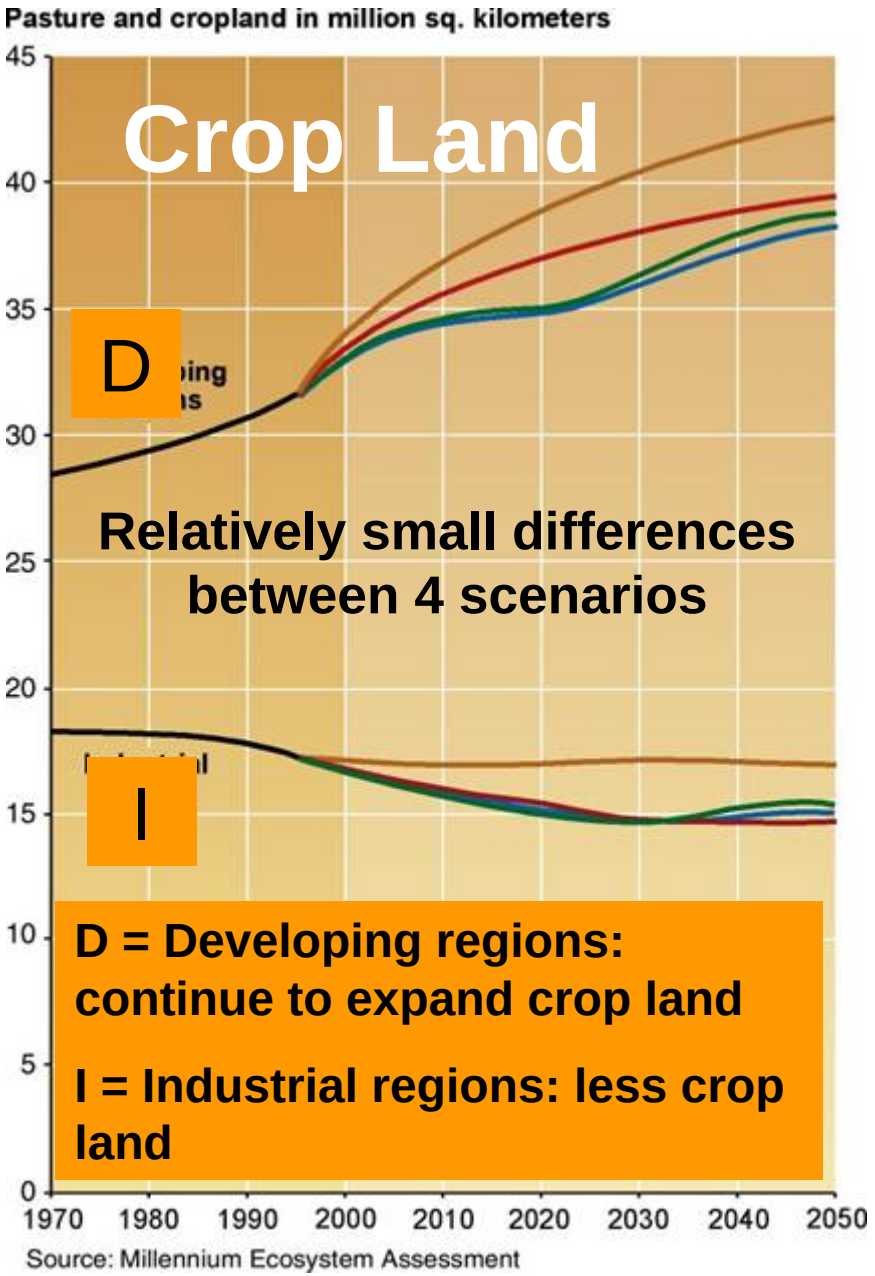
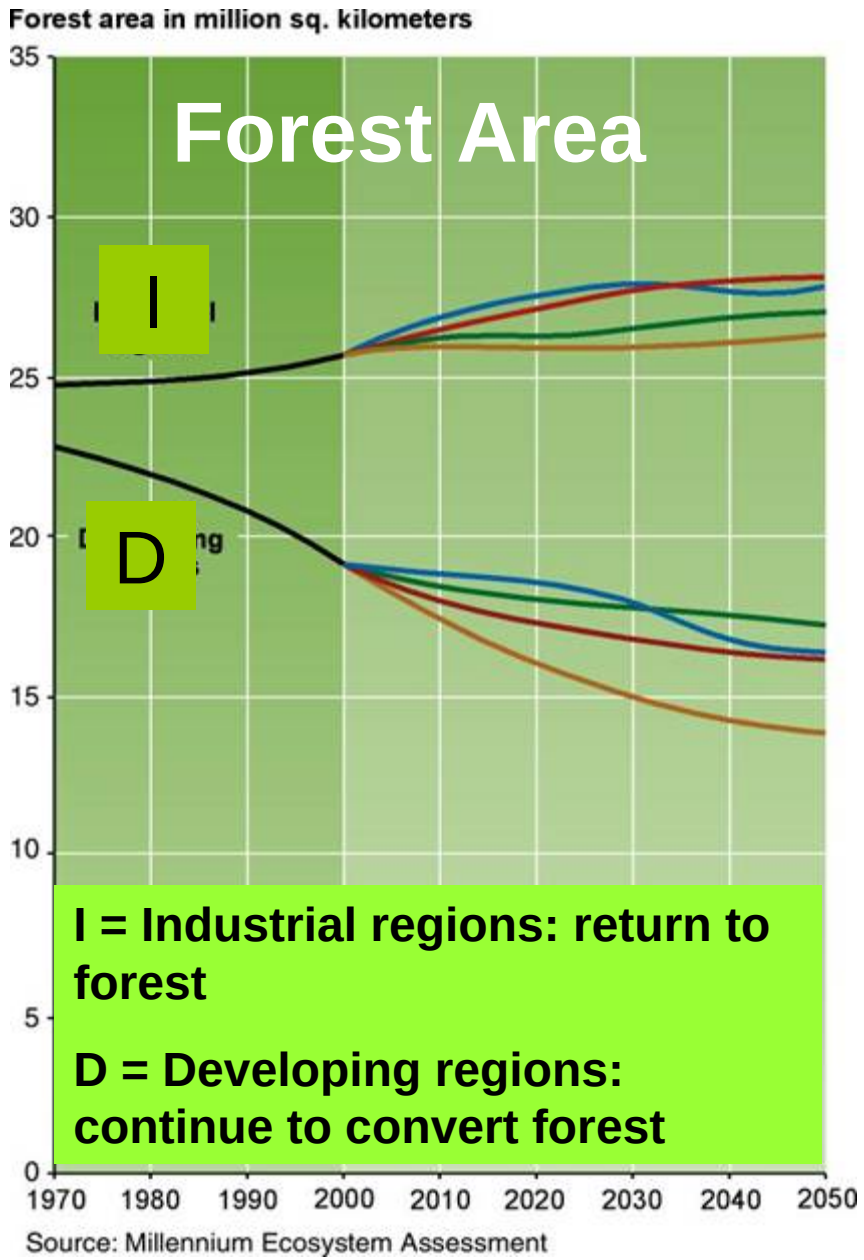
Outline

- CGIAR priorities for Future Harvests
- Biodiversity/productivity tradeoffs and the global DIVERSITAS Agrobiodiversity workplan,
- Sustainable Management of Below Ground Biodiversity (BGBD)
- The CIFOR-ICRAF Biodiversity Platform “Matrix Matters”
- RUPES (Rewarding Upland Poor for the Environmental Services they provide) program in Southeast Asia, > PES
- The CI – ICRAF ‘hot spot alliance’ to enhance conservation landscapes through agroforestry science and technology,

Illustrated with examples from the worlds’ 6th largest and 4th most populous island, a recognized hot spot of global biodiversity







Millenium Ecosystem Assessment


Good governance
Biodi-versity
Carbon stocks
Water-flows
External stake-holders
Multifunctional landscapes
Protected areas
Production forest
Crop production
Healthy farms
working trees
World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Science priorities for CGIAR

Millenium Development Goals :Economic growth facilitated by employment in urban and non-agricultural sectors made possible by availability of affordable and high quality food + clean water and other environmental services

5: Improving policies and facilitating institutional innovation

MDG's in rural areas

3: Reducing rural poverty through agricultural diversification and high-value commodities and products

4: Poverty alleviation and sustainable management of water, land, and forest resources

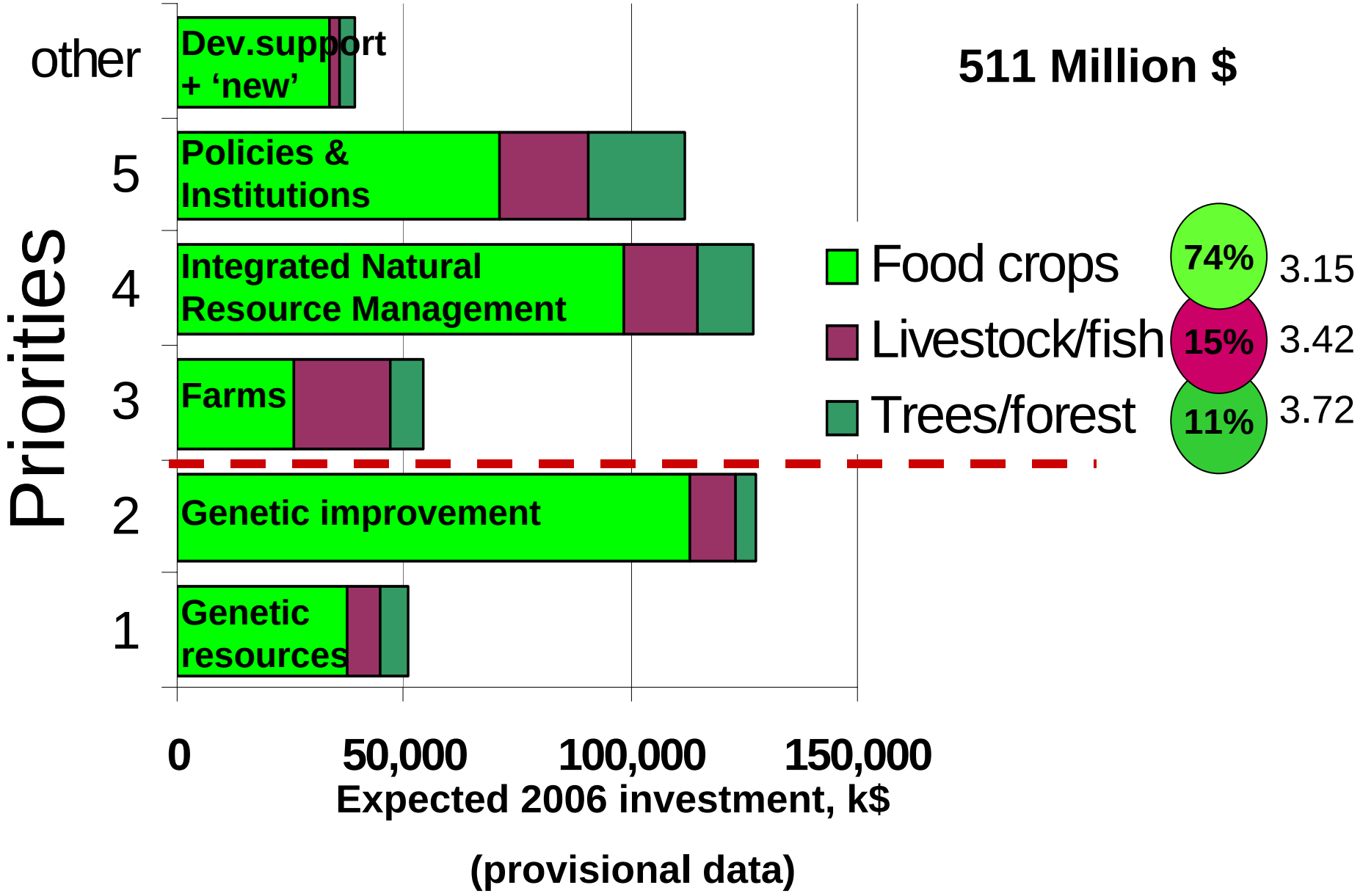
Longer term

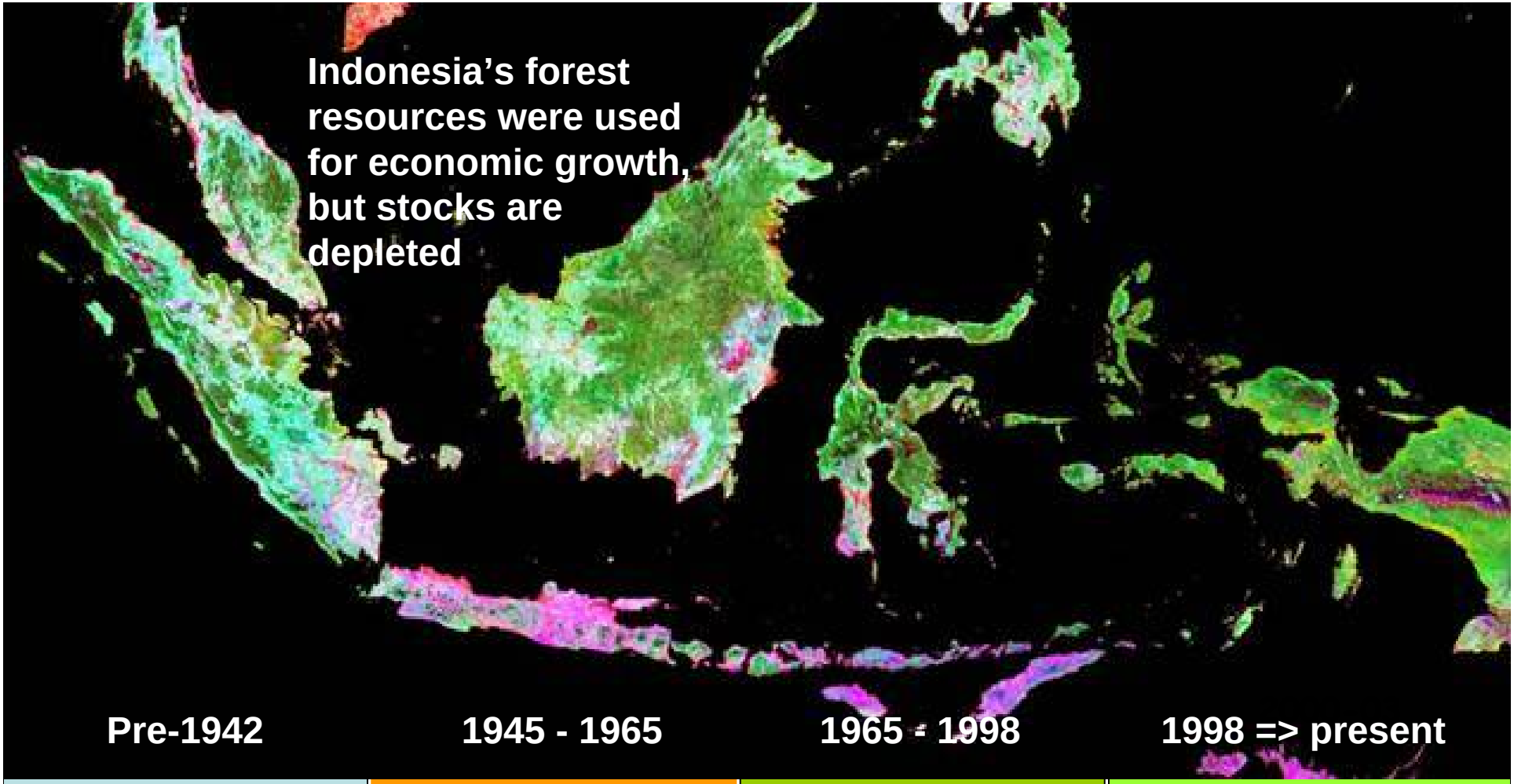
2: Genetic improvements for producing more food at lower cost

1: Sustaining biodiversity for current and future generations

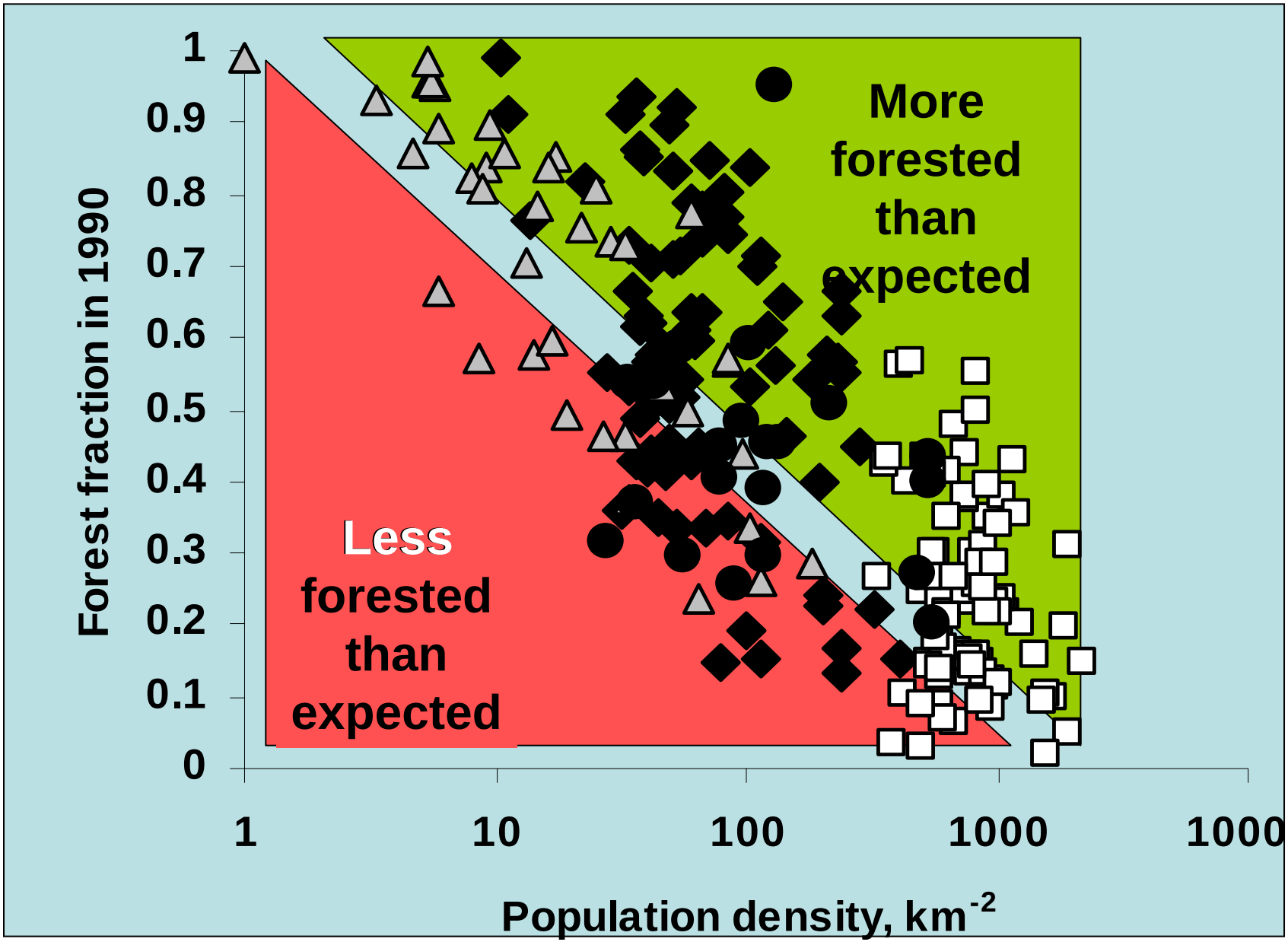
Priority 1	Priority 2	Priority 3	Priority 4	Priority 5
Sustaining biodiversity	**Genetic improvement**	**Diversification & high value commodities**	**Integrated natural resource management**	**Policies and institutional innovation**
1A Conservation of plant genetic resources for food and agriculture	2A Maintaining and enhancing yield of staples	3A Income increases from fruit and vegetables	4A Integrated land water and forest management at landscape level	5A. Science and technology policies and institutions
1B Promoting conservation / characterization of UPGR for income	2B Tolerance to abiotic stresses	3B Income increases from livestock	4B Sustaining aquatic ecosystems for food and livelihood	5B. Making international and domestic markets work for the poor
1C Conservation of indigenous livestock	2C Enhancing nutritional quality and safety	3C Enhancing in comes through production of-fish and aqua culture	4C Improving water productivity	5C. Rural institutions and their governance
1D Conservation of aquatic and animal genetic resources	2D Genetic enhancement of high value species	3D Sustainable income from forests and trees	4D Agro-ecological intensification in low/hipotential areas	5D. Improving R&D options to reduce rural poverty and vulnerability

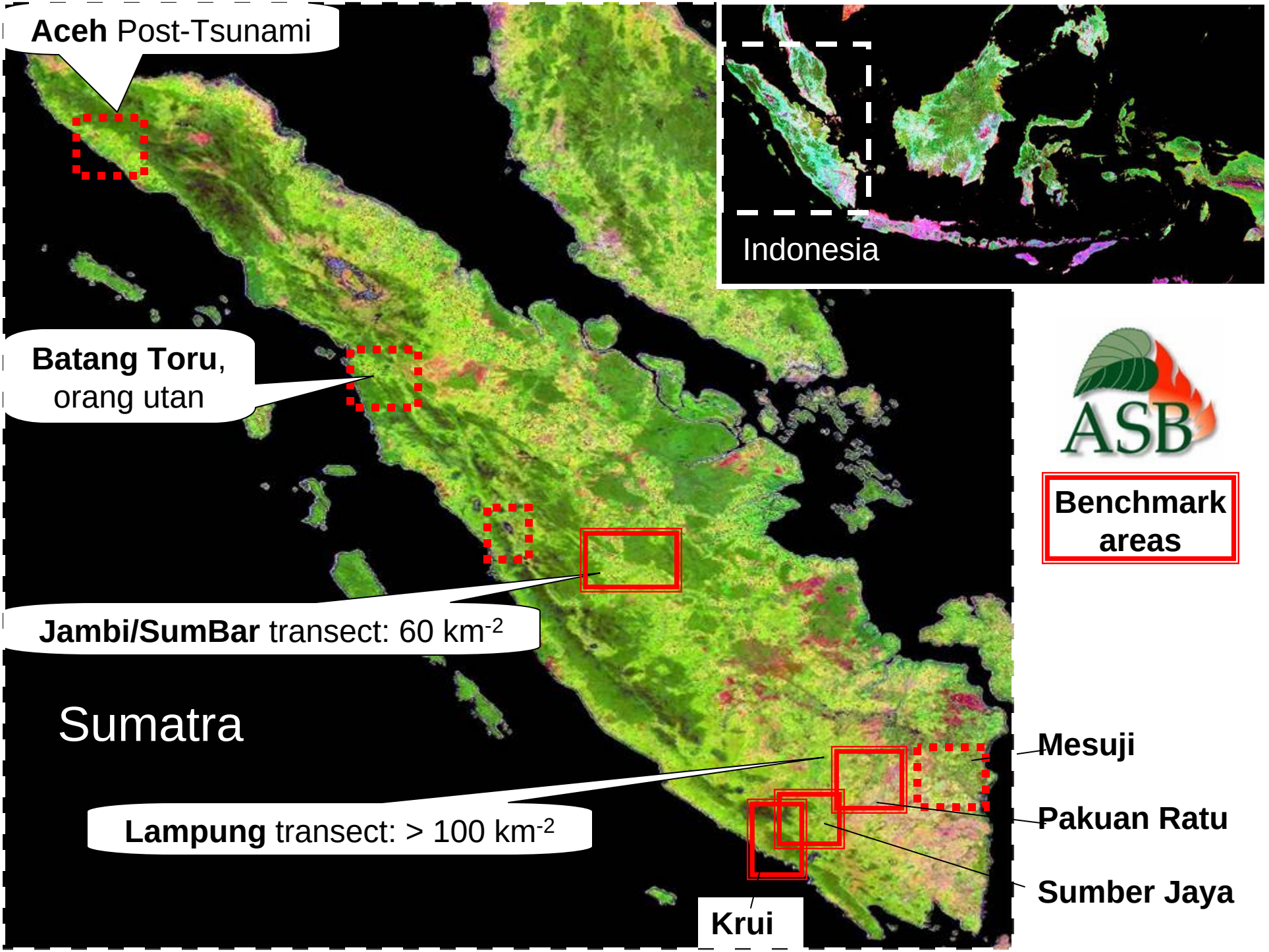
CGIAR Future Harvest centres in 2006





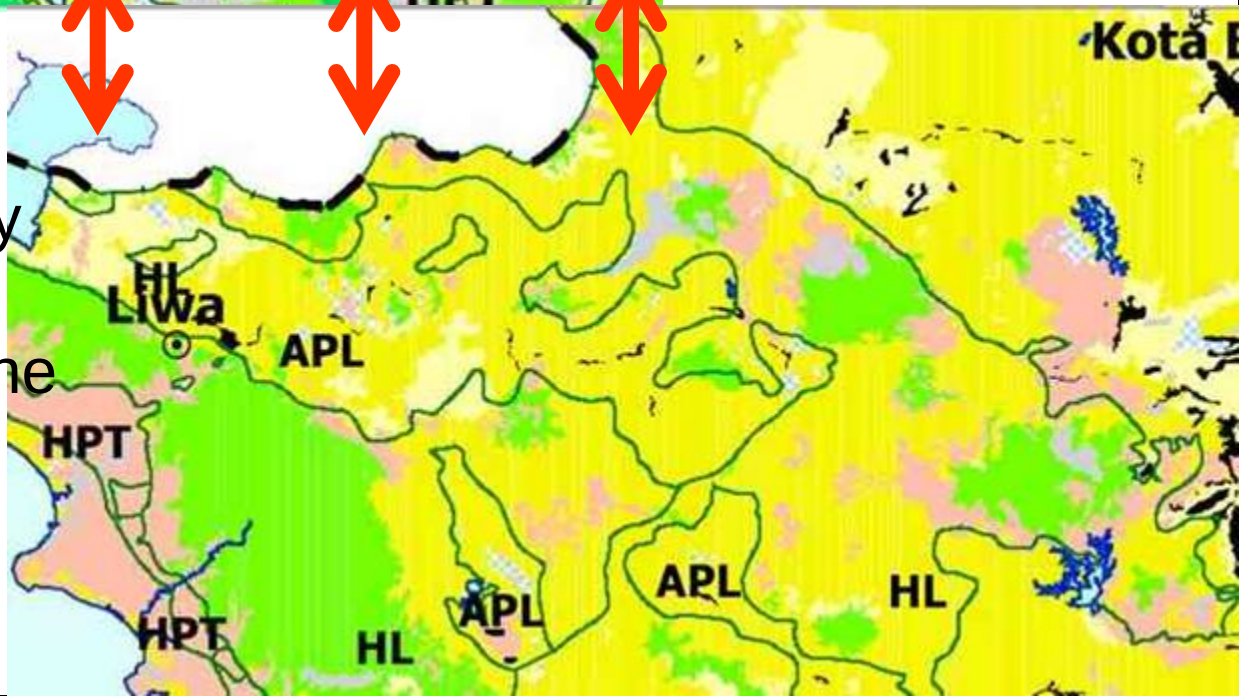
Pre-1942	1945 - 1965	1965 - 1998	1998 => present
Colonial Forest Ser-vice tries to get control over all forest lands but fails to get a ***legal basis*** for this.	**'Merdeka'**, natural re-sources are for the Indonesian people… Chaotic period. 1960 Agrarian Law gives ***legal basis*** for land ownership.	'**New Order**' regime claims all forests for the state, controlled and used by ***nationnal elite***; local pro-tests are interpreted as 'communist'	'**Reformation**' period implements decentra-lization; initial exces-ses of local elite cap-ture; illegal logging issue prominent; legal basis of state's forest claim still weak…

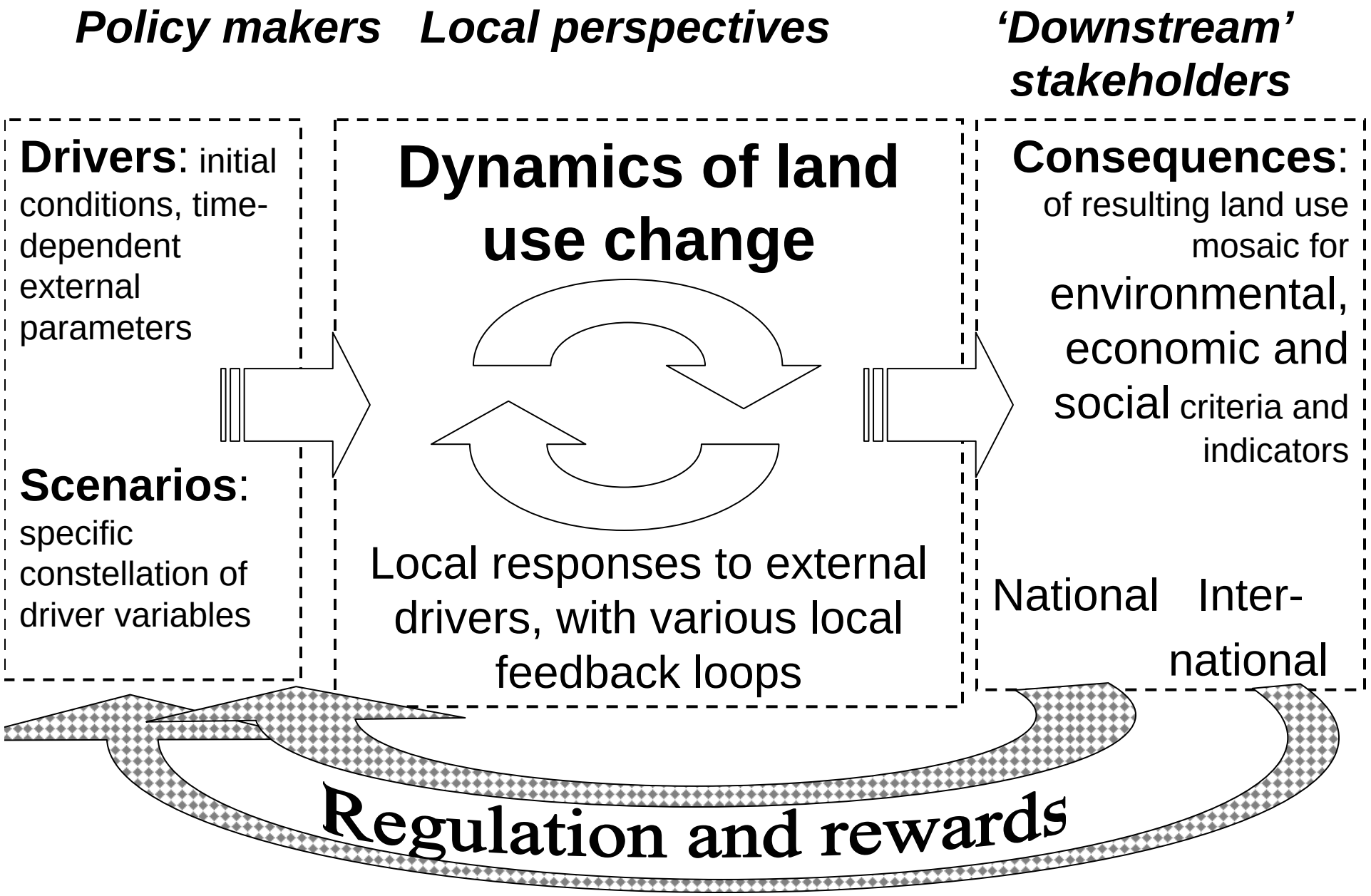

Forest fraction in 1990
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
More forested than expected
Less forested than expected
1
10
100
1000
10000
Population density, km-2


Aceh Post-Tsunami
Indonesia
Batang Toru, orang utan
ASB
Benchmark areas
Jambi/SumBar transect: 60 km^{-2}
Sumatra
Lampung transect: > 100 km^{-2}
Mesuji
Pakuan Ratu
Sumber Jaya
Krui

West Sumatra: general correspon-dence between ‘forest zone map’ and actual land cover ➔ Opportunities for avoided defores-tation

Lampung province: very little relation between ‘forest zone map’ and the actual land cover ➔ Opportunities for reforestation CDM




Policy makers
Local perspectives
'Downstream' stakeholders
Drivers: initial conditions, time-dependent external parameters
Scenarios: specific constellation of driver variables
Dynamics of land use change
Local responses to external drivers, with various local feedback loops
Consequences: of resulting land use mosaic for environmental, economic and social criteria and indicators
National
Inter-national
Regulation and rewards

Open field agriculture

agroforestation

re- and afforestation

Farm fo-
restry,
agrofo-
rests

Less
patchy:
*Inte-
grate*

Less trees

*Fields,fallow,
forest mosaic*

More trees

More
patchy:
*Segre-
gate*

Fields,
Forests
& Parks

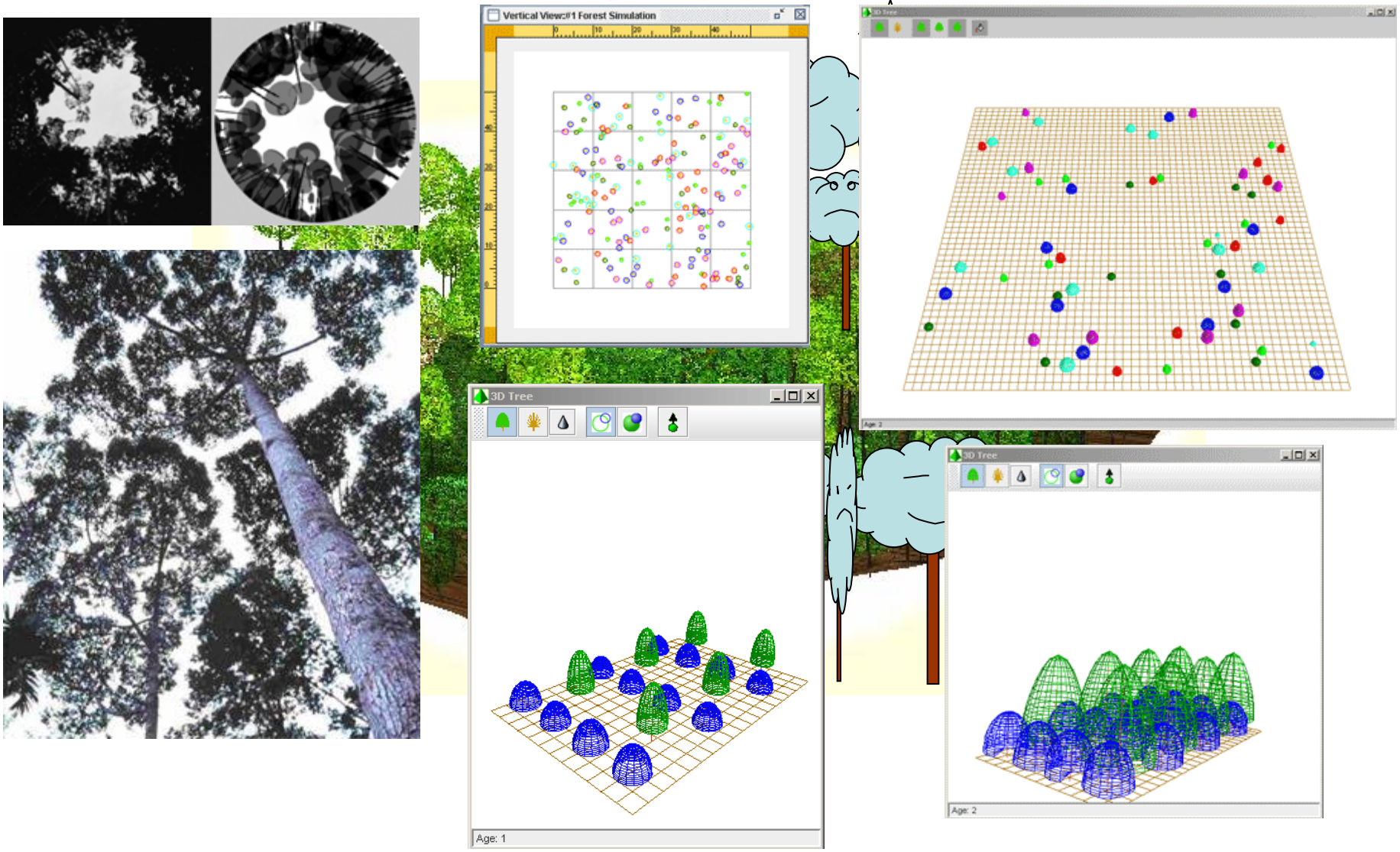
forest modification

deforestation

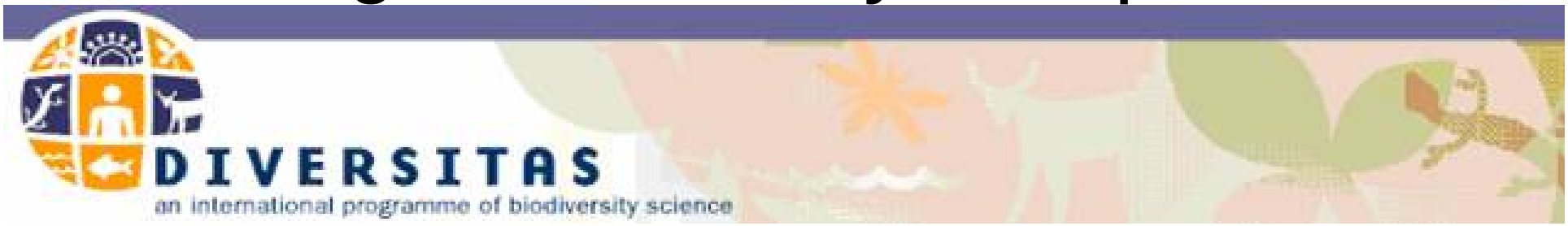
100% forest

SExI-FS

A Spatially Explicit Individual-based Forest Simulator



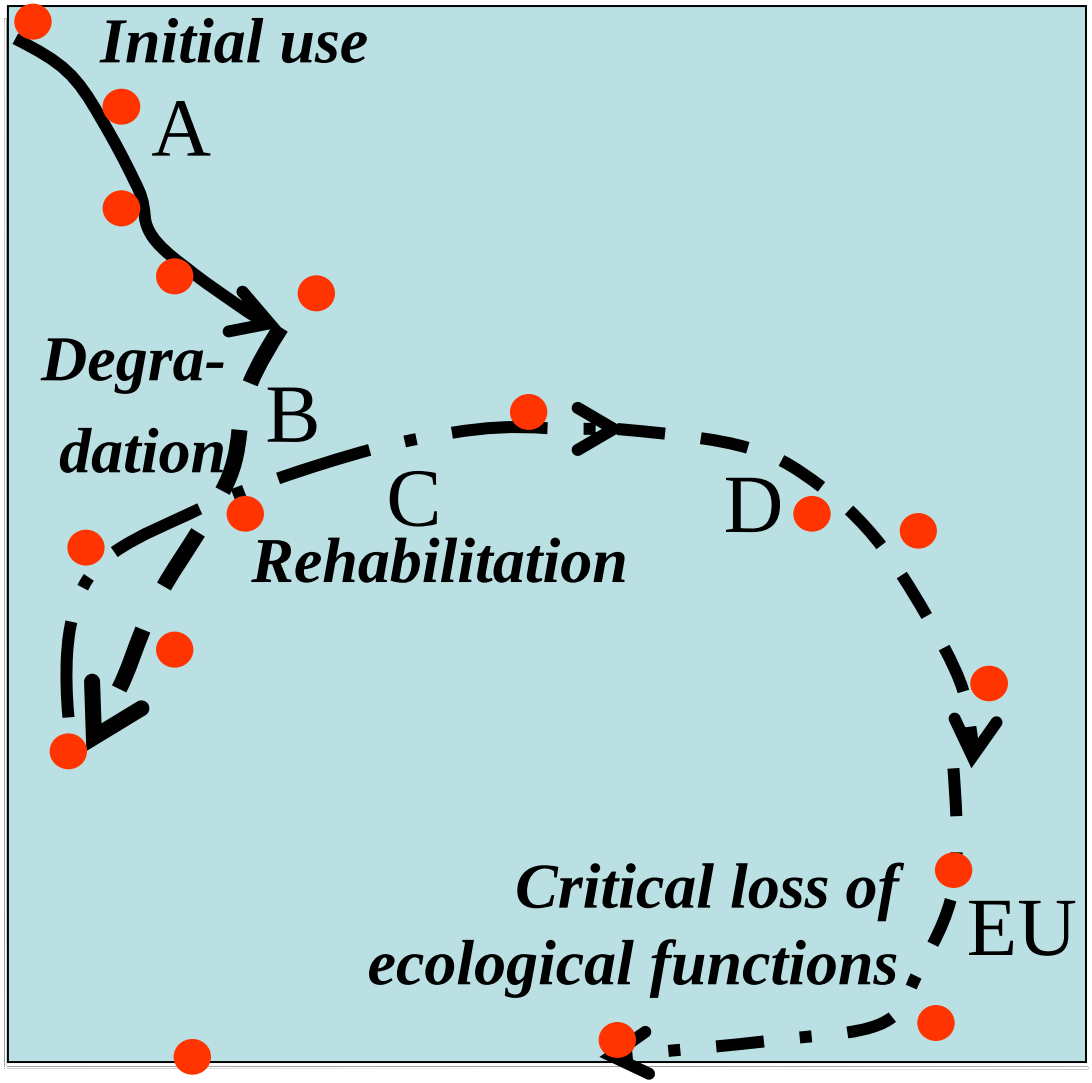
Biodiversity/productivity tradeoffs and the global DIVERSITAS Agrobiodiversity workplan

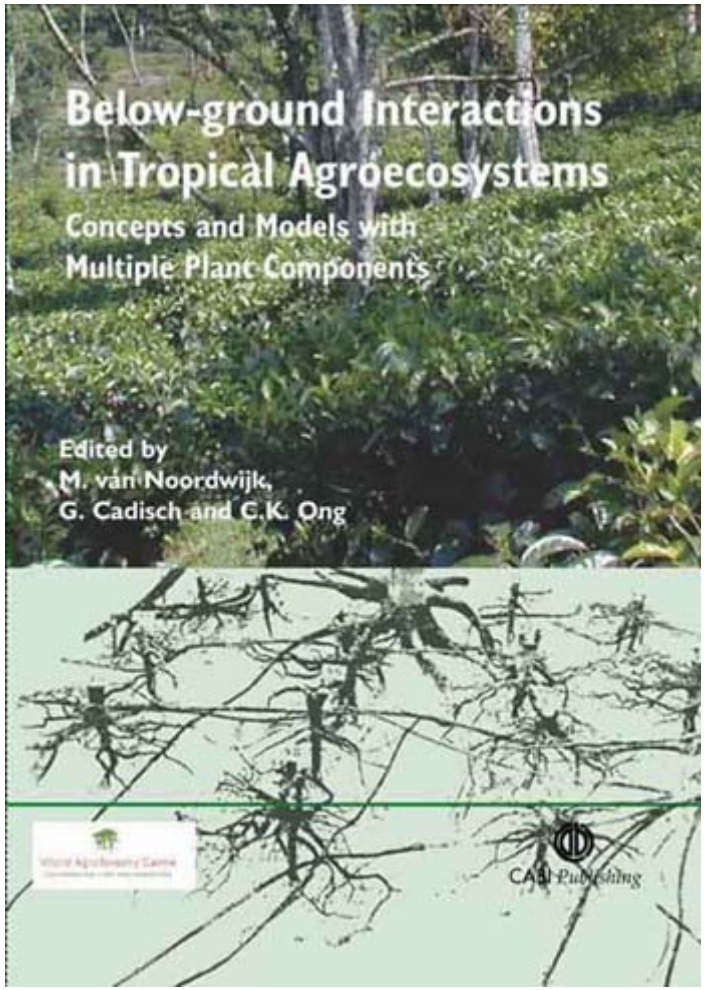


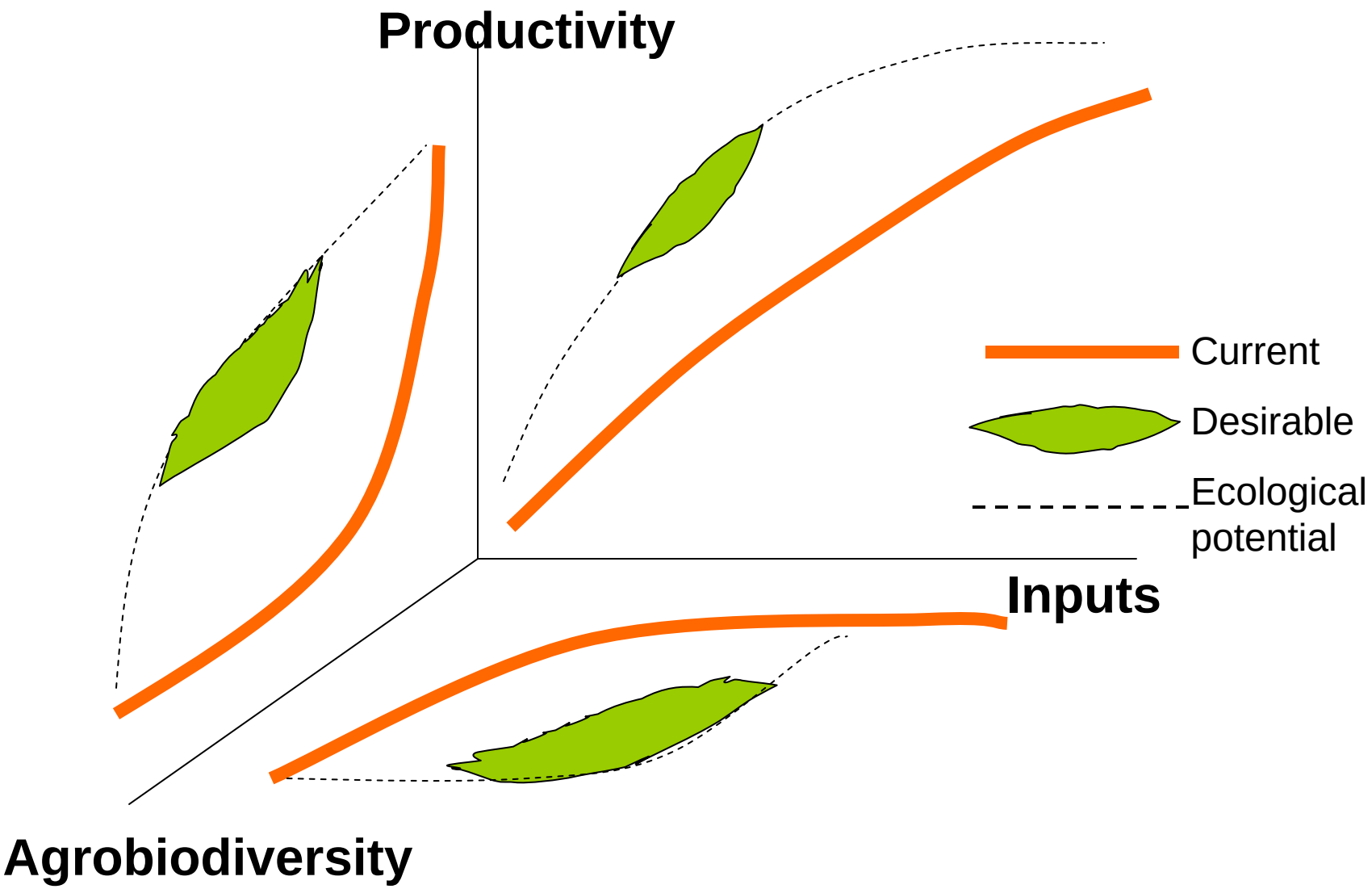
Within Diversitas, the cross-cutting program on Agrobiodiversity (Jackson *et al.*, 2005) relates to the three primary Foci:

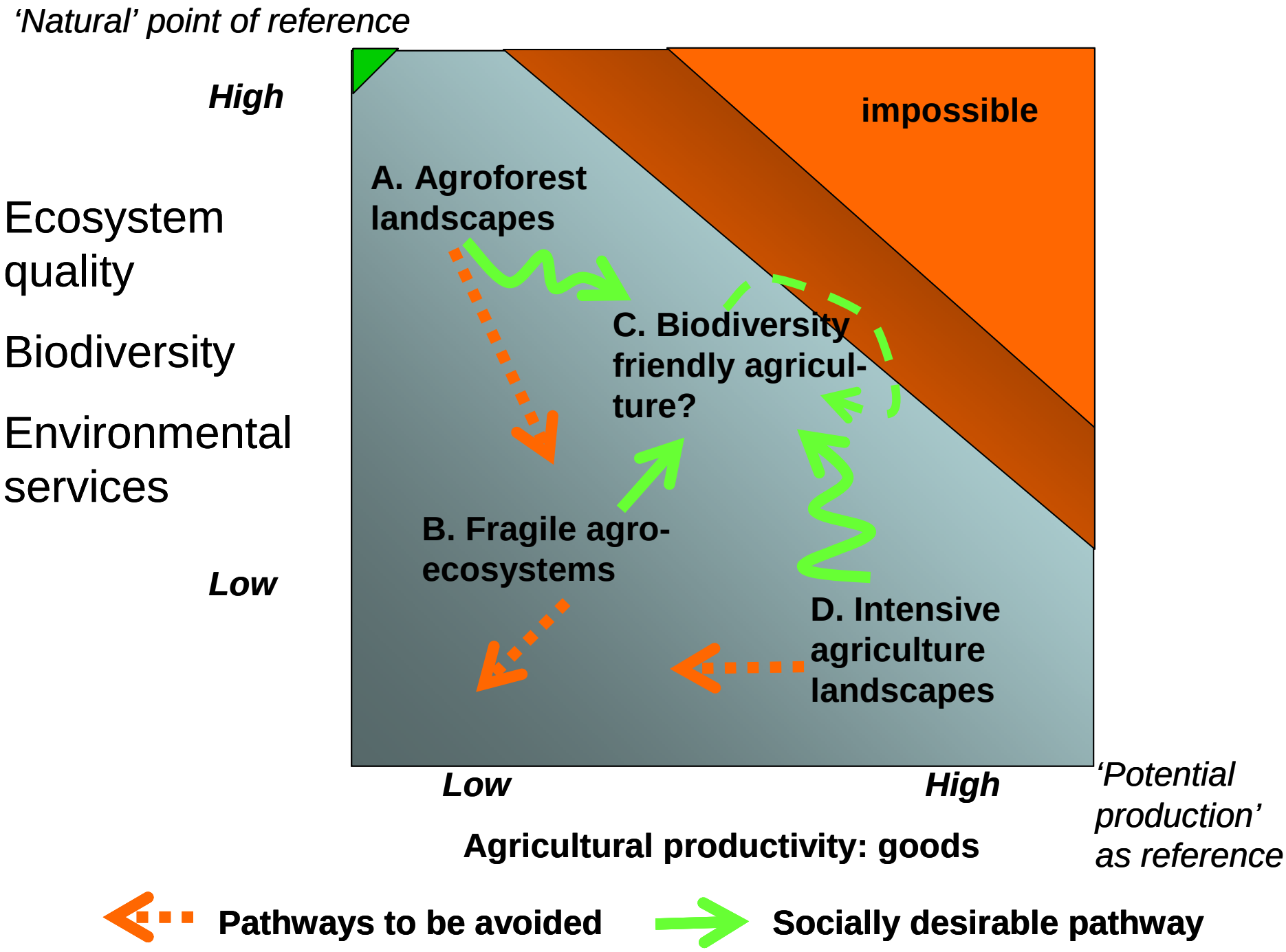
- bioDISCOVERY: *Factors that increase biodiversity in agricultural landscapes and anticipating impacts of social and environmental change*
- ecoSERVICES *Using biodiversity in agricultural landscapes to enhance ecosystem goods and services*
- bioSUSTAINABILITY *Societal support for the use of biodiversity for sustainable agriculture and equitable sharing of the benefits of conservation*

Trade-off REF/RAF: convex, concave, win-win after loose-loose






Productivity
Inputs
Agrobiodiversity
Current
Desirable
Ecological potential


'Natural' point of reference
High
Ecosystem quality
Biodiversity
Environmental services
Low
impossible
A. Agroforest landscapes
C. Biodiversity friendly agricul-ture?
B. Fragile agro-ecosystems
D. Intensive agriculture landscapes
Low
High
'Potential production' as reference
Agricultural productivity: goods
Pathways to be avoided
Socially desirable pathway

Hypotheses (domains A, B & D)

- Currently dominant pathways of agricultural intensification have negative effects on ecosystem conditions and environmental services
- Alternative, biodiversity-friendly options can be derived from traditional management practices and ‘unpacked’ modern technology
- Adoption of such biodiversity-friendly pathways has benefits at local community as well as external scale
- Recognition, rewards and payments are appropriate mechanisms for providing positive incentives for the adoption of biodiversity-friendly pathways

Lubuk Beringin – Jambi

Rubber agroforests: source of income + clean water + children's playground + fruits + medicinals

Kopi campuran: Shade coffee

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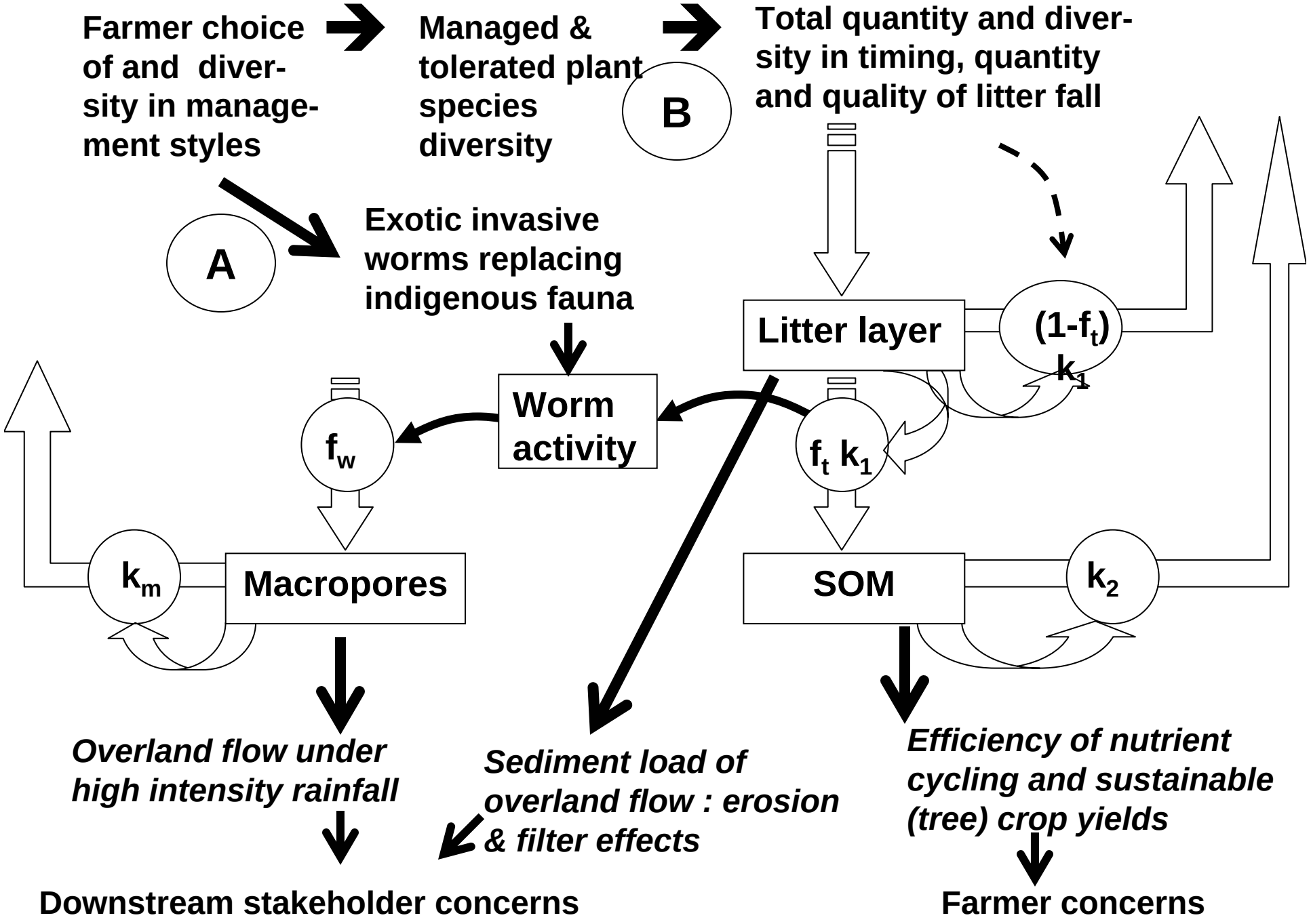
'Shade coffee' supports the survival of bird diversity in the landscape – but this 'service' is not yet reflected in better prices….

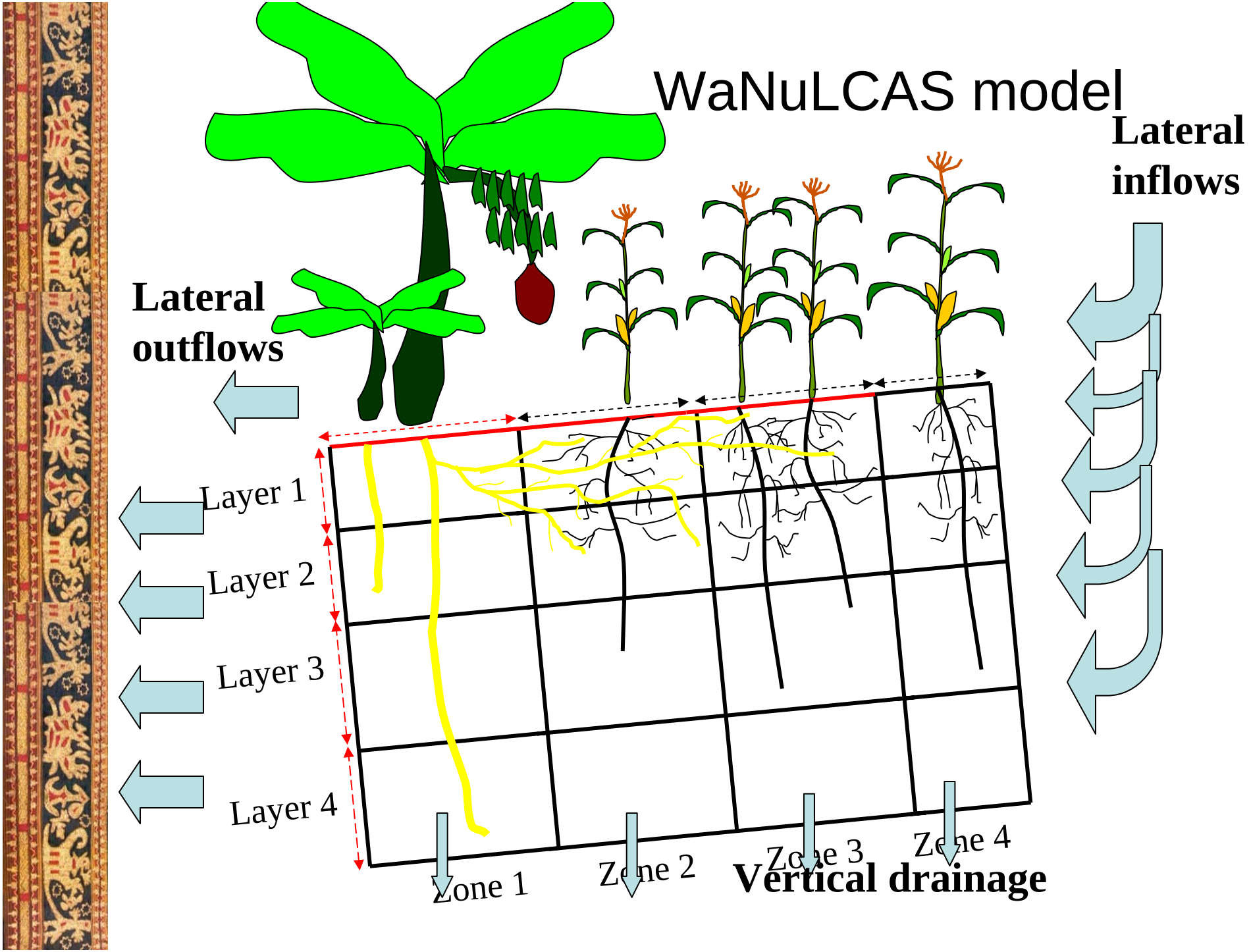
Sustainable Management of Below Ground Biodiversity (BGBD)

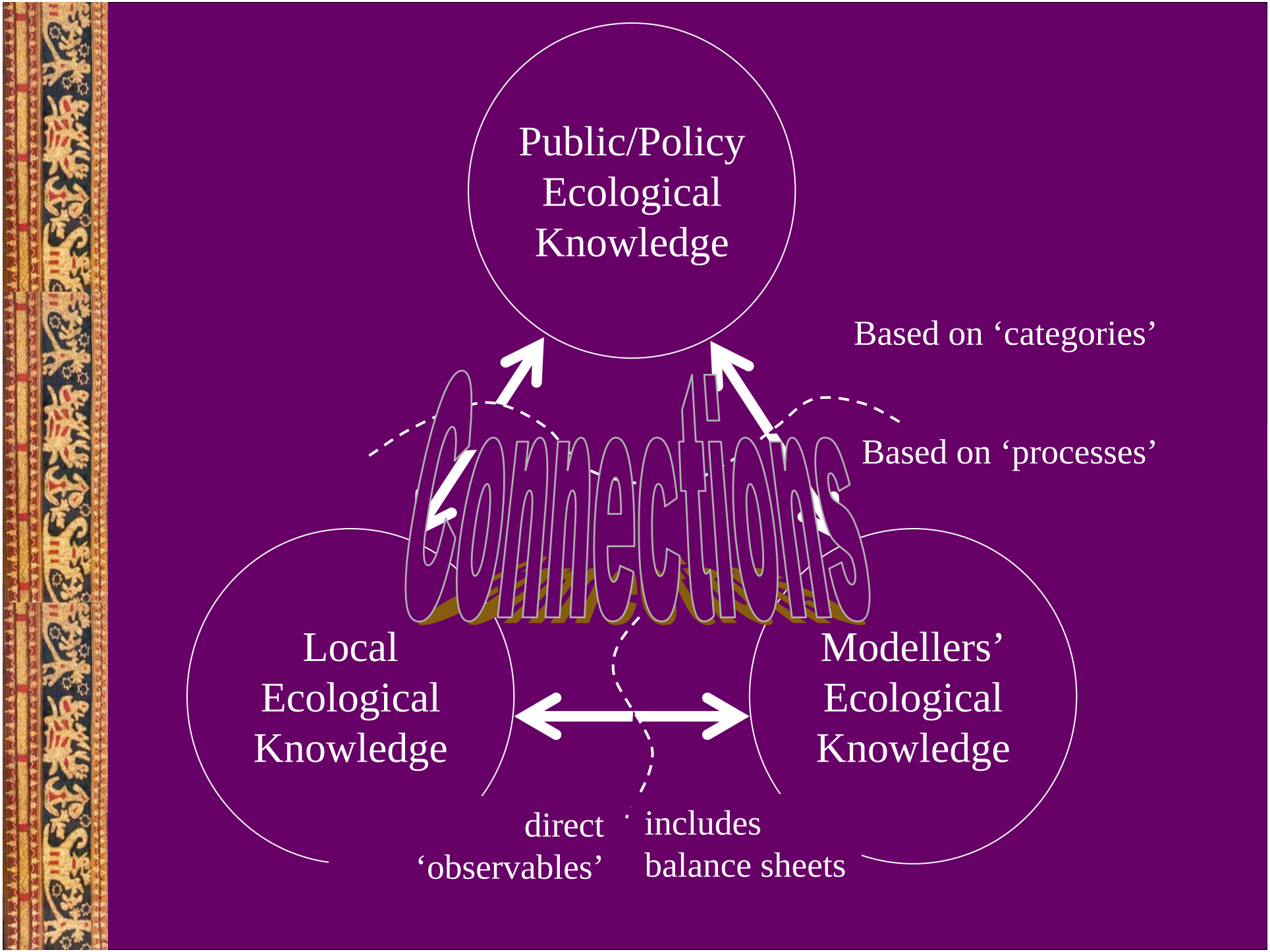
TSBF-CIAT, GEF

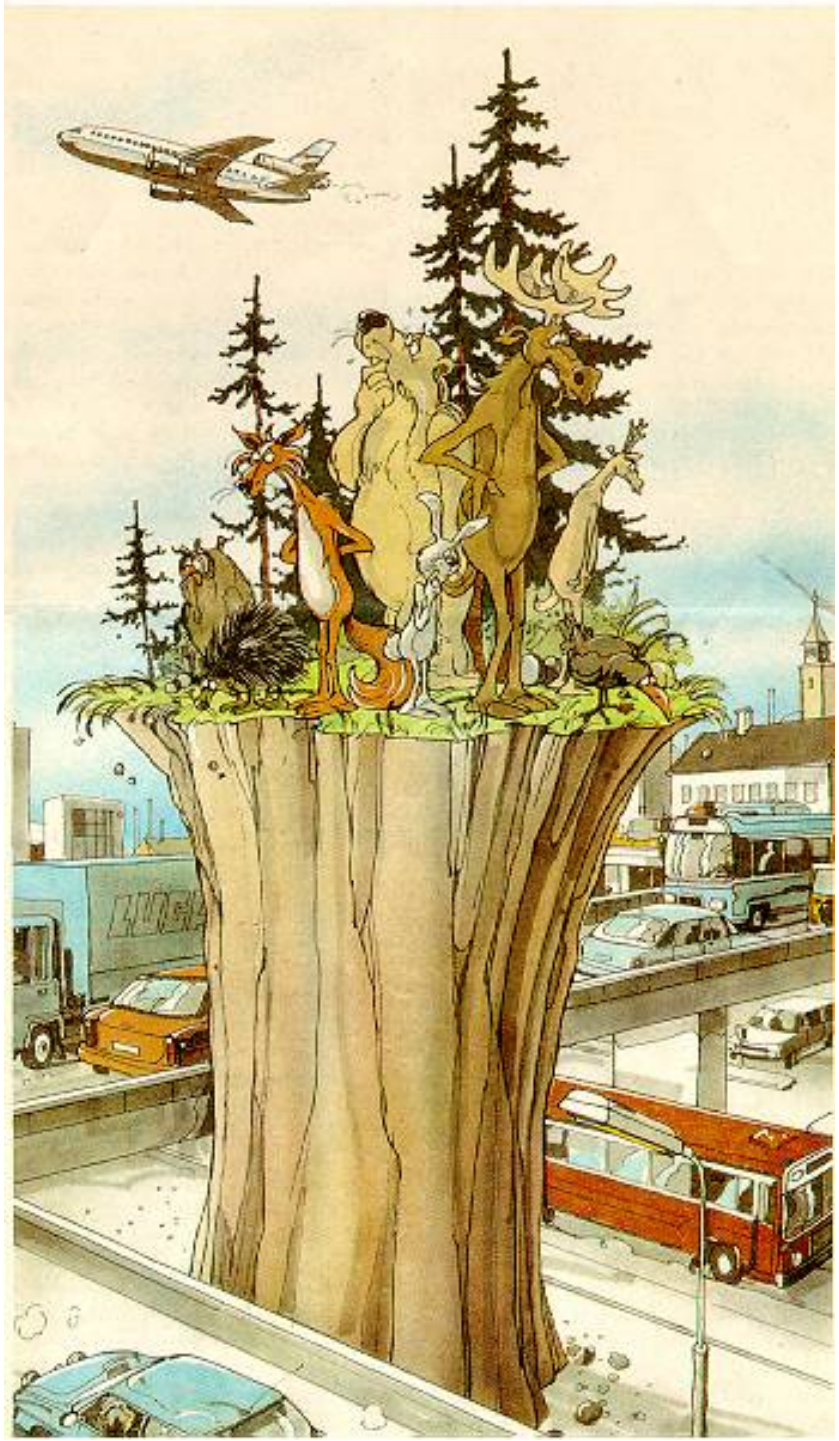
Indonesian NARS

Sumber Jaya: Forest earth-worms (***Meta-phire spp.***) versus 'invasive exotic' (***Ponto-scolex spp.***) in coffee gardens


Farmer choice of and diversity in management styles
Managed & tolerated plant species diversity
B
Total quantity and diversity in timing, quantity and quality of litter fall
A
Exotic invasive worms replacing indigenous fauna
Litter layer
(1-ft) k1
Worm activity
fw
ft k1
km
Macropores
SOM
k2
Overland flow under high intensity rainfall
Sediment load of overland flow : erosion & filter effects
Efficiency of nutrient cycling and sustainable (tree) crop yields
Downstream stakeholder concerns
Farmer concerns


WaNuLCAS model
Lateral inflows
Lateral outflows
Layer 1
Layer 2
Layer 3
Layer 4
Zone 1
Zone 2
Zone 3
Zone 4
Vertical drainage


Public/Policy Ecological Knowledge
Based on ‘categories’
Based on ‘processes’
Connections
Local Ecological Knowledge
Modellers’ Ecological Knowledge
direct ‘observables’
includes balance sheets



CIFOR-ICRAF Biodiversity Platform "Matrix Matters"

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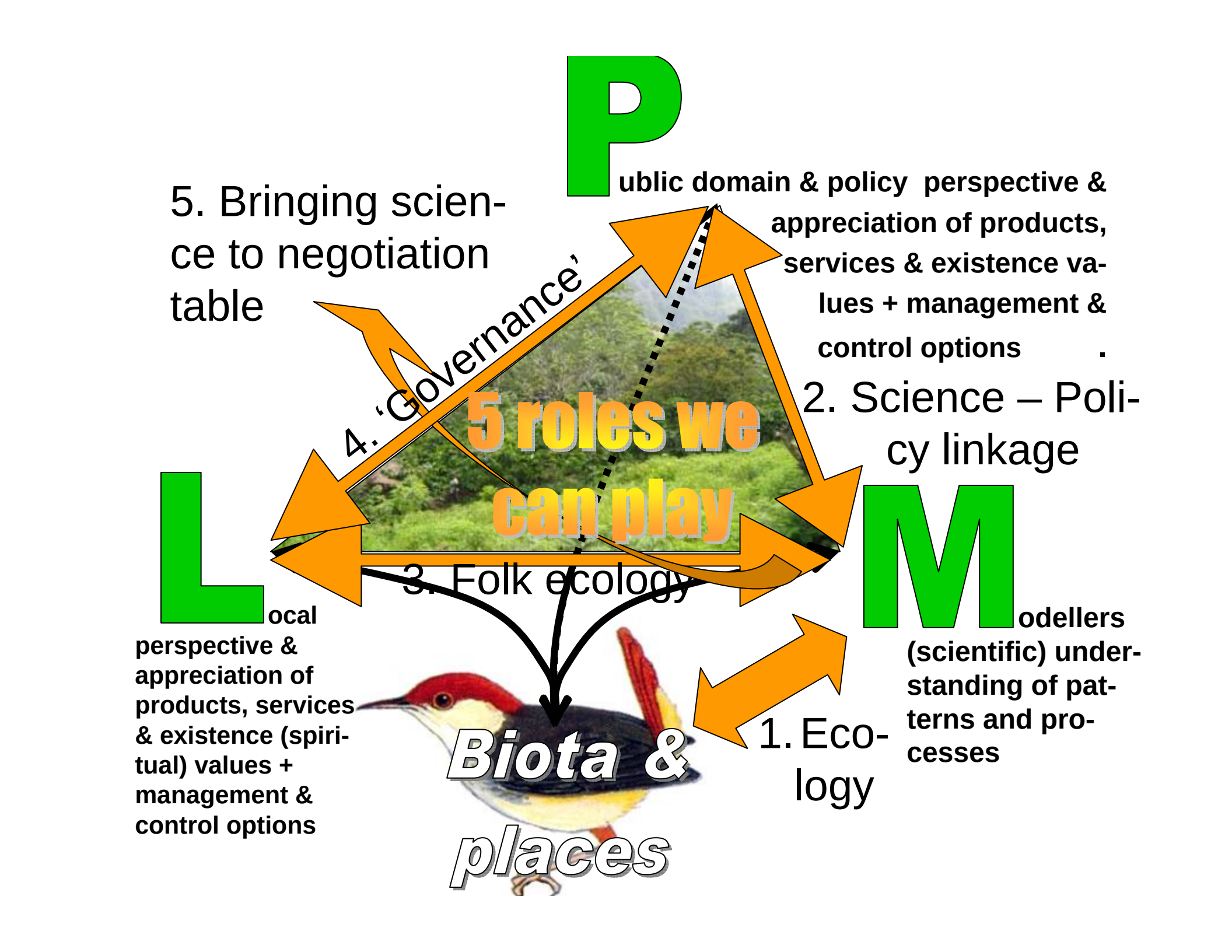
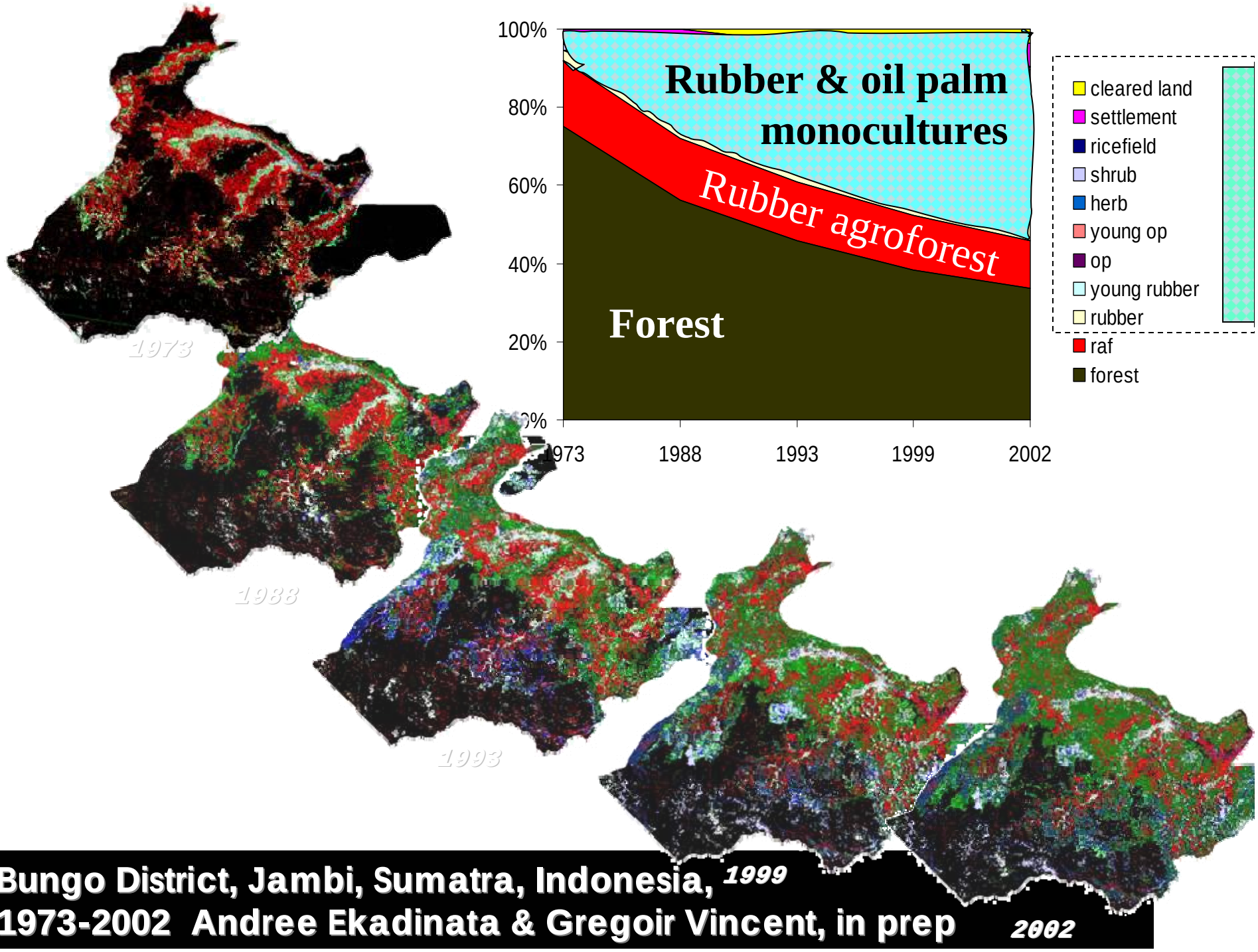
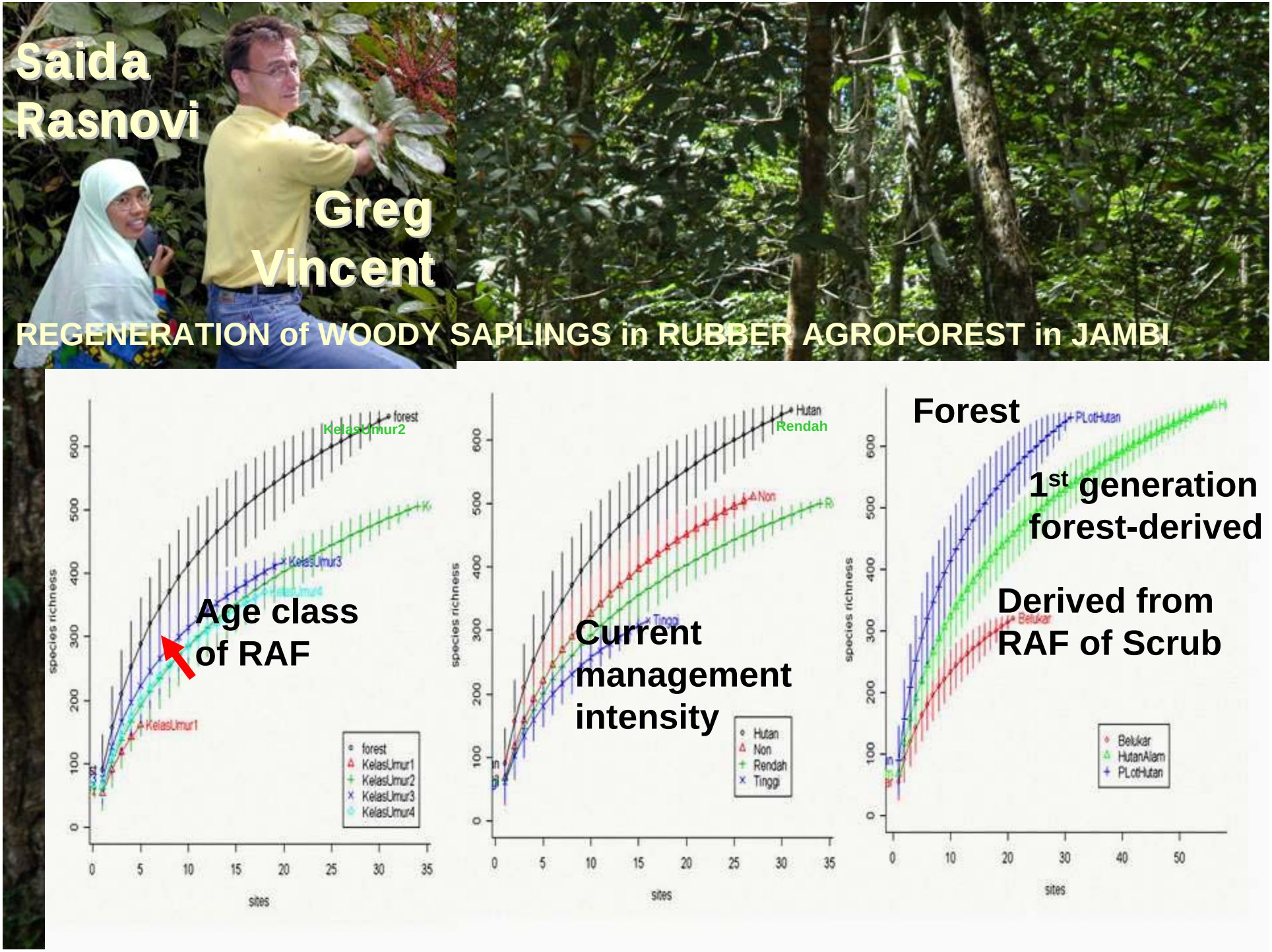
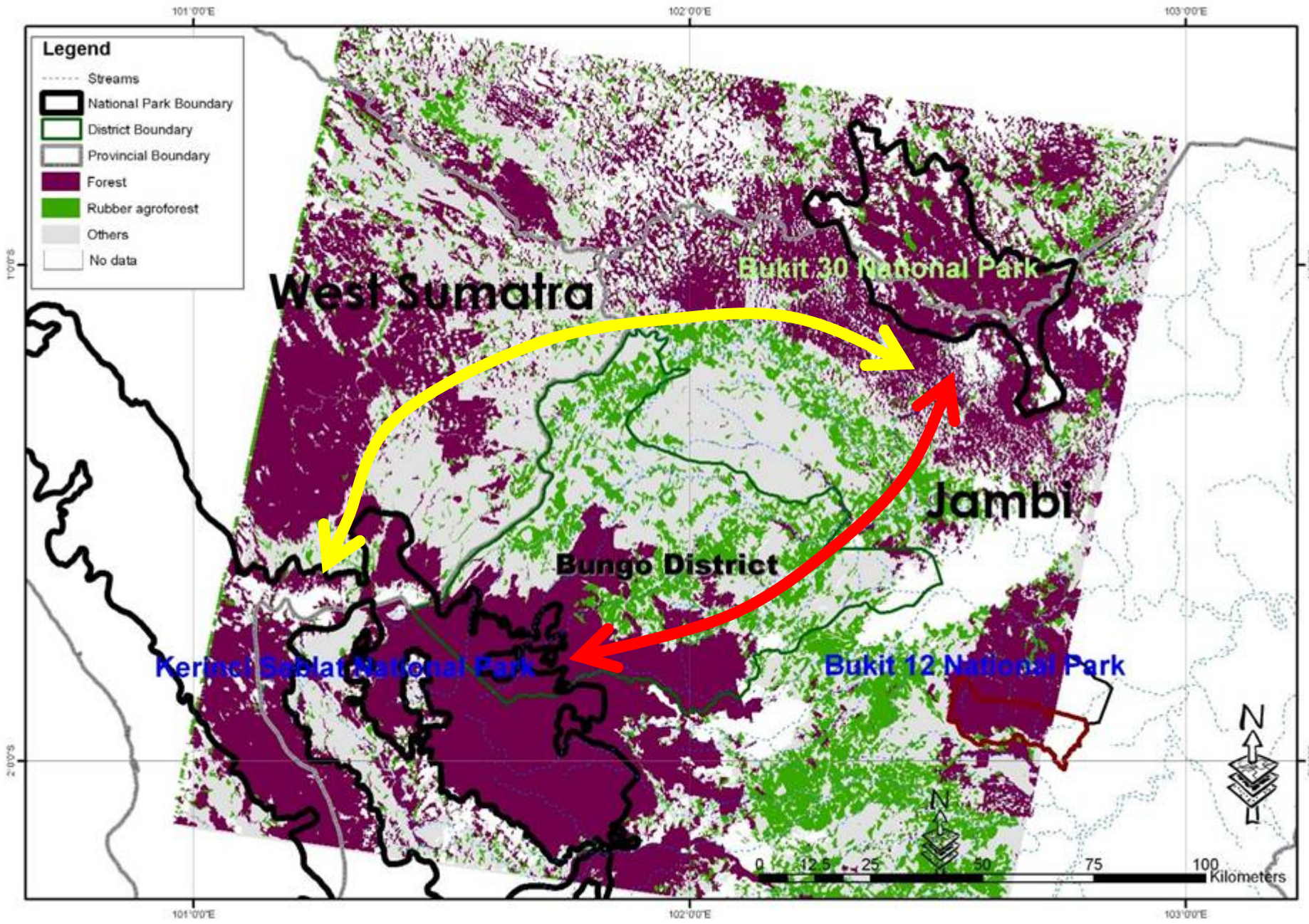
CIFOR

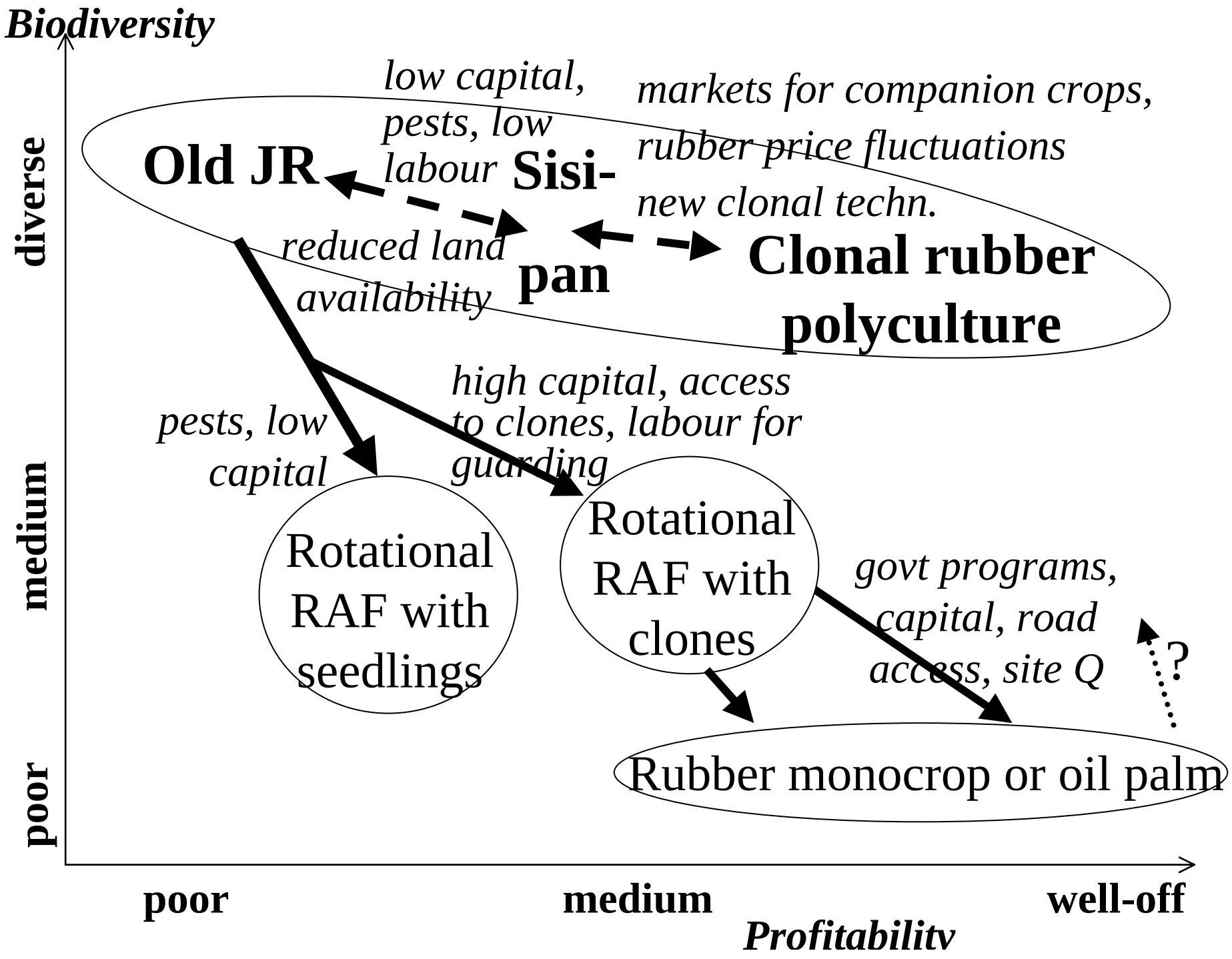
2002 Center-Commissioned External Review "Matrix matters: Biodiversity Re-search for Rural Landscape Mosaics: Recommenda-tions for a Joint CIFOR-ICRAF Unit" (A. Cunningham, S. Scherr & J. McNeely)


P
ublic domain & policy perspective & appreciation of products, services & existence values + management & control options .
5. Bringing science to negotiation table
4. 'Governance'
5 roles we can play
2. Science – Policy linkage
L
ocal perspective & appreciation of products, services & existence (spiritual) values + management & control options
M
odellers (scientific) understanding of patterns and processes
3. Folk ecology
1. Ecology
Biota & places

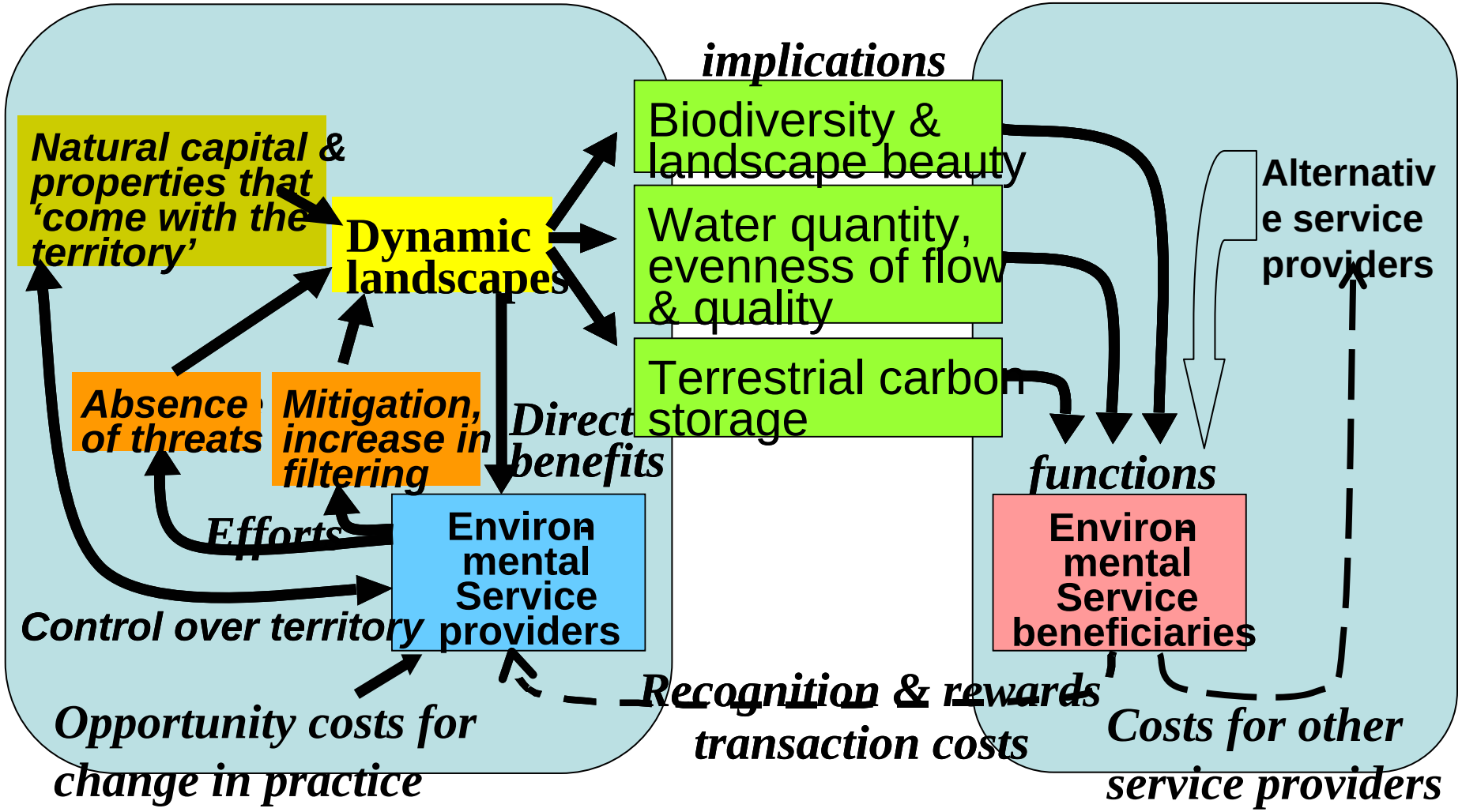

100%
80%
60%
40%
20%
0%
1973
1988
1993
1999
2002
Rubber & oil palm monocultures
Rubber agroforest
Forest
cleared land
settlement
ricefield
shrub
herb
young op
op
young rubber
rubber
raf
forest
1973
1988
1993
1999
2002
Bungo District, Jambi, Sumatra, Indonesia,
1973-2002 Andree Ekadinata & Gregoir Vincent, in prep


Saida
Rasnovi
Greg
Vincent
REGENERATION of WOODY SAPLINGS in RUBBER AGROFOREST in JAMBI
species richness
sites
forest
KelasUmur1
KelasUmur2
KelasUmur3
KelasUmur4
Age class
of RAF
Hutan
Non
Rendah
Tingg
Current
management
intensity
Forest
PLotHutan
Belukar
HutanAlam
1st generation
forest-derived
Derived from
RAF of Scrub

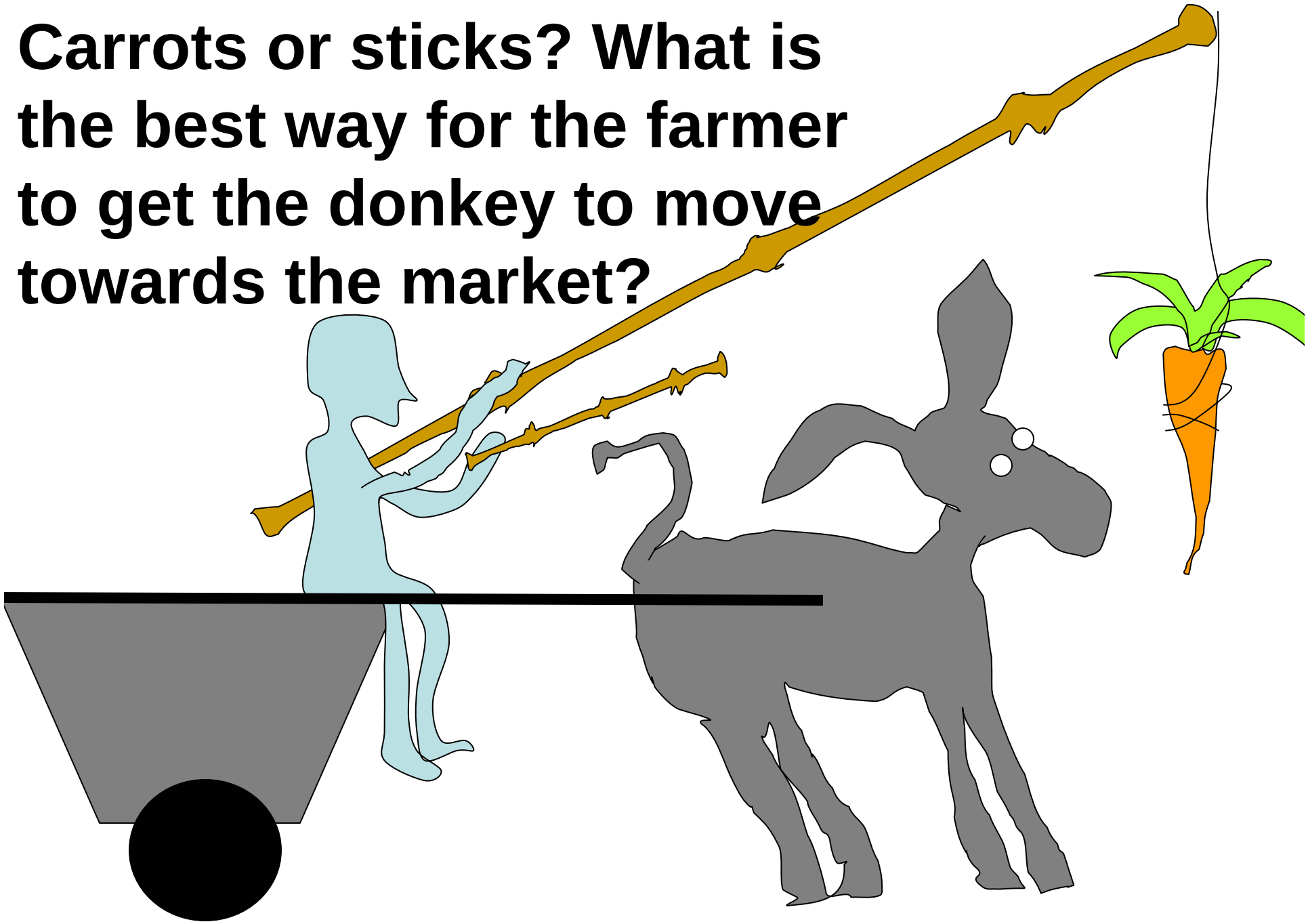

Legend
Streams
National Park Boundary
District Boundary
Provincial Boundary
Forest
Rubber agroforest
Others
No data
West Sumatra
Bukit 30 National Park
Jambi
Bungo District
Kerinci Seblat National Park
Bukit 12 National Park
101°0'0"E
102°0'0"E
103°0'0"E
1°0'0"S
2°0'0"S
N
0 12.5 25 50 75 100
Kilometers


Biodiversity
diverse
medium
poor
low capital, pests, low labour
markets for companion crops, rubber price fluctuations
new clonal techn.
Old JR
Sisi-pan
Clonal rubber polyculture
reduced land availability
high capital, access to clones, labour for guarding
pests, low capital
Rotational RAF with seedlings
Rotational RAF with clones
govt programs, capital, road access, site Q
?
Rubber monocrop or oil palm
poor
medium
well-off
Profitability

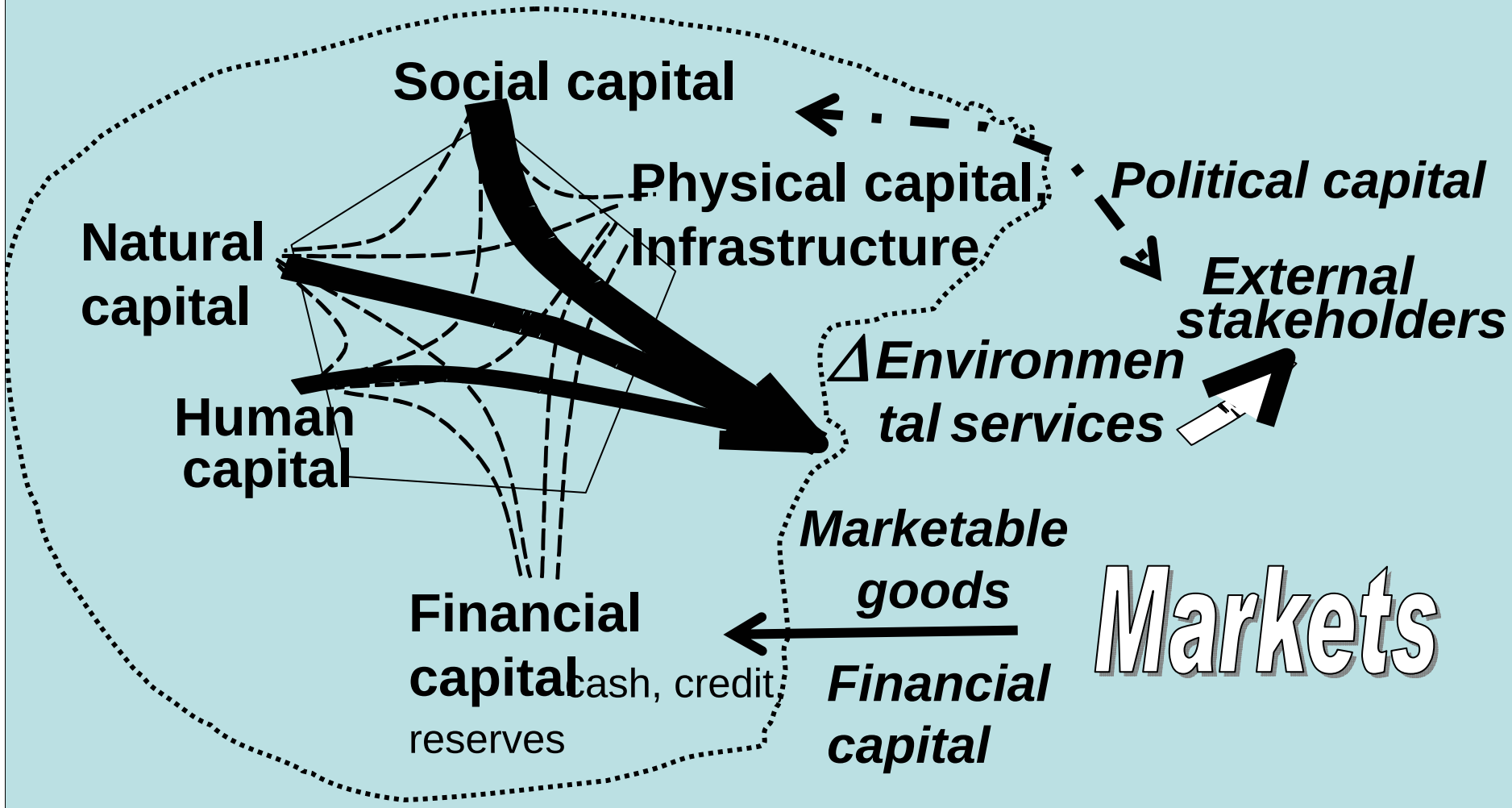
RUPES: Rewarding Upland Poor for the Environmental Services they provide in Asia ….more then PES



Carrots or sticks? What is the best way for the farmer to get the donkey to move towards the market?



Assets (capitals) based perspective on ES generation and entry points for rewards



Kalahan

RUPES

Rewarding Upland Poor for Environmental Services

Bakhun

Kulekhani, Nepal

Singkarak-W.Sumatra

Bungo-Jambi

Sumber Jaya

HKM

Forest edge

2005/6 BASIS CRSP impact study

Drinking water supply

Stream users

RUPES

Rewarding Upland Poor for Environmental Services

Sumber Jaya

3 nested scales:

River quality for hydro-electric

Four stages in developing ES reward mechanisms

	Stage	Providers, sellers of ES	Interme-diaries	Beneficies, buyers of ES
I	Scoping		Rapid As-sessment of Marketable ES	
II	Identifying partners			
III	Negotia-tions			
IV	Monitoring agreement			

RUPES = Rewarding Upland Poor for the Environmental Services they provide

Can we get support/ incentives for maintaining agrobiodiversity in our landscape?

Honest Broker

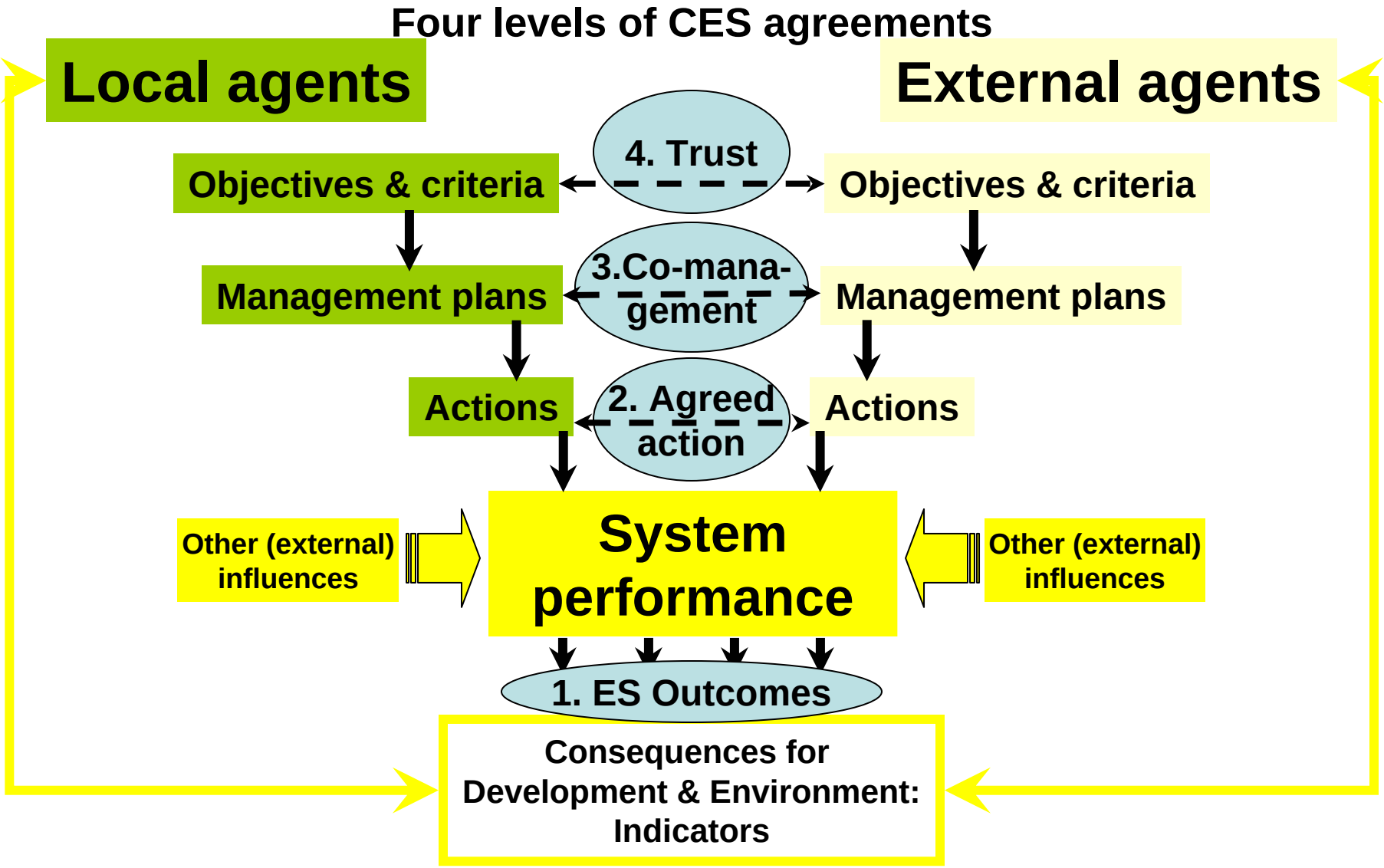
Can we find local communities who really want to conserve agrobiodiversity for a small incentive?

RABA

Stage	***Sellers' perspective*** Communities that control biodiversity-rich agroecosystems	***Buyers' perspective*** Institutions interested in **conserving** agrobiodiversity
Scoping	➢What do we have that is of interest to outside stakeholders? ➢What are the **downsides** to us of efforts to conserve? ➢What are the **positive** sides to us of maintaining biodiversity? ➢What 'willingness to pay' can we expect?	➢Where are the areas under threat? Where are conservation activities needed? What are species and ecosystems under threat? ➢Who can effectively influence conservation uses in these areas? ➢What 'willingness to sell' can we expect?
Identifying potential partners	➢Who should we talk to? ➢What documentation do we need?	➢Who can effectively and equitably represent all local 'actors'? ➢Does local government qualify?

RABA conclusion: Yes/No, there are good opportunities for conservation/restoration in this area through appropriate types of rewards, because of

- VALUE (to ‘sellers’ and ‘buyers’) is clear
- THREATS linked to Land Use activities are urgent
- OPPORTUNITIES exist to overcome the THREATS
- Sufficient TRUST exists to get buyers, sellers & government to negotiate ‘deals’


Four levels of CES agreements
Local agents
External agents
4. Trust
Objectives & criteria
Objectives & criteria
3.Co-mana-gement
Management plans
Management plans
2. Agreed action
Actions
Actions
Other (external) influences
System performance
Other (external) influences
1. ES Outcomes
Consequences for Development & Environment: Indicators

Follow up to ***negotiated agreements***, monitoring compliance and impact on environmental services and peoples' livelihoods

Biological Water Quality monitoring by villagers/schools

CI – ICRAF ‘hot spot alliance’: enhance conservation landscapes through agroforestry science and technology

CONSERVATION INTERNATIONAL

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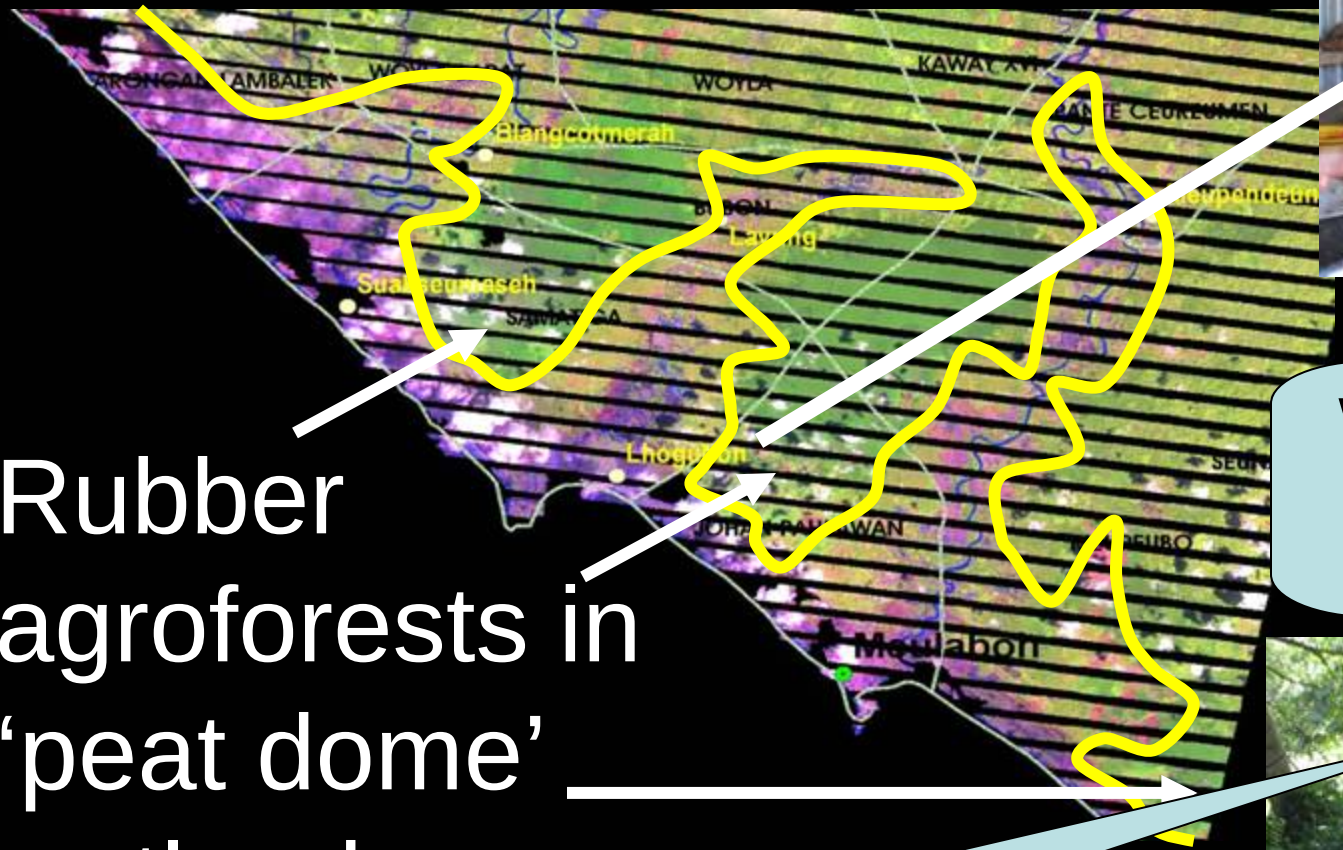
West Batang Toru

Tsunami Damage West Aceh



Rubber agroforests in ‘peat dome’ wetlands

When the waves came I climbed the rubber trees

Today we started to tap the trees again…

A view into our kitchen…

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