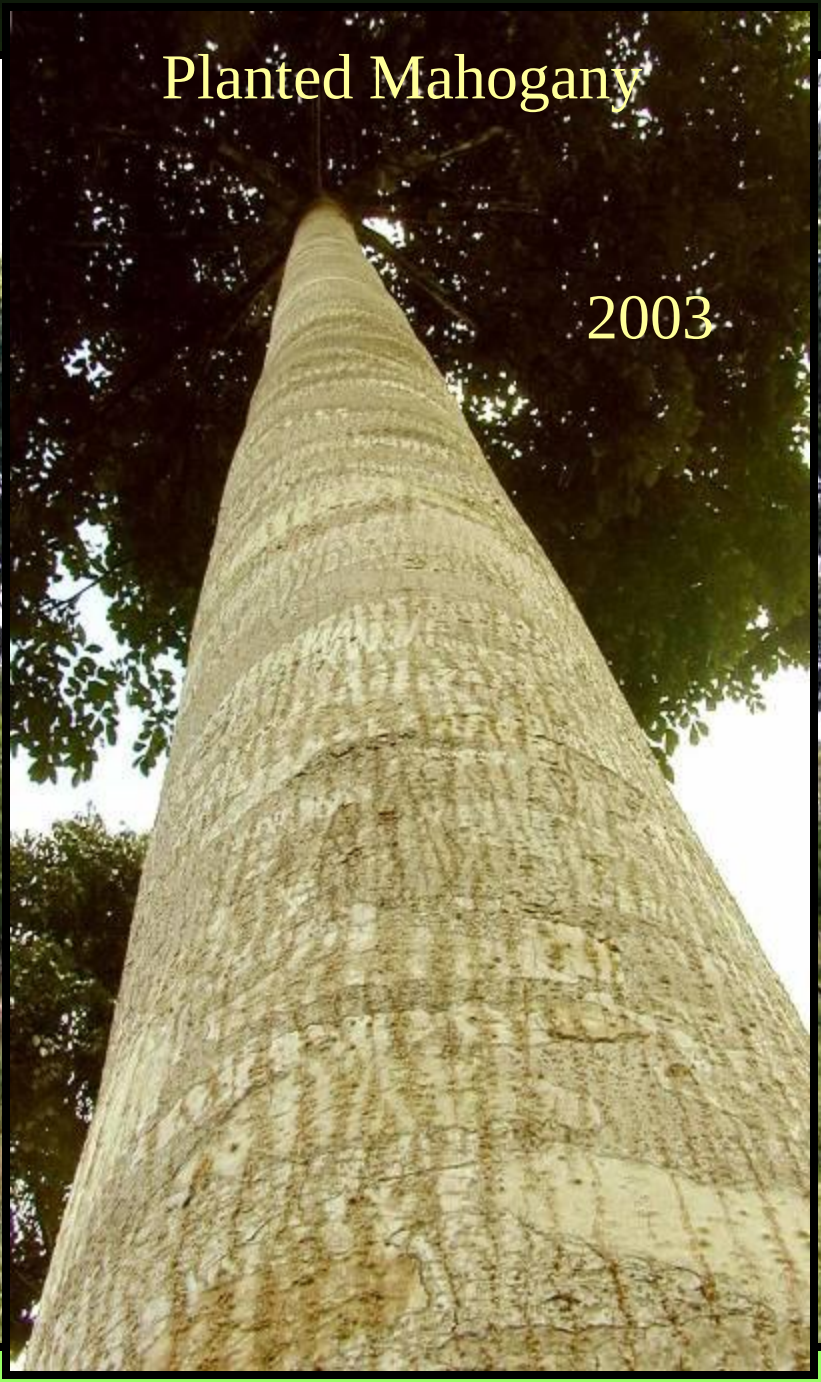

Protein, micronutrients, fibre, vitamins


Planted Mahogany
1998

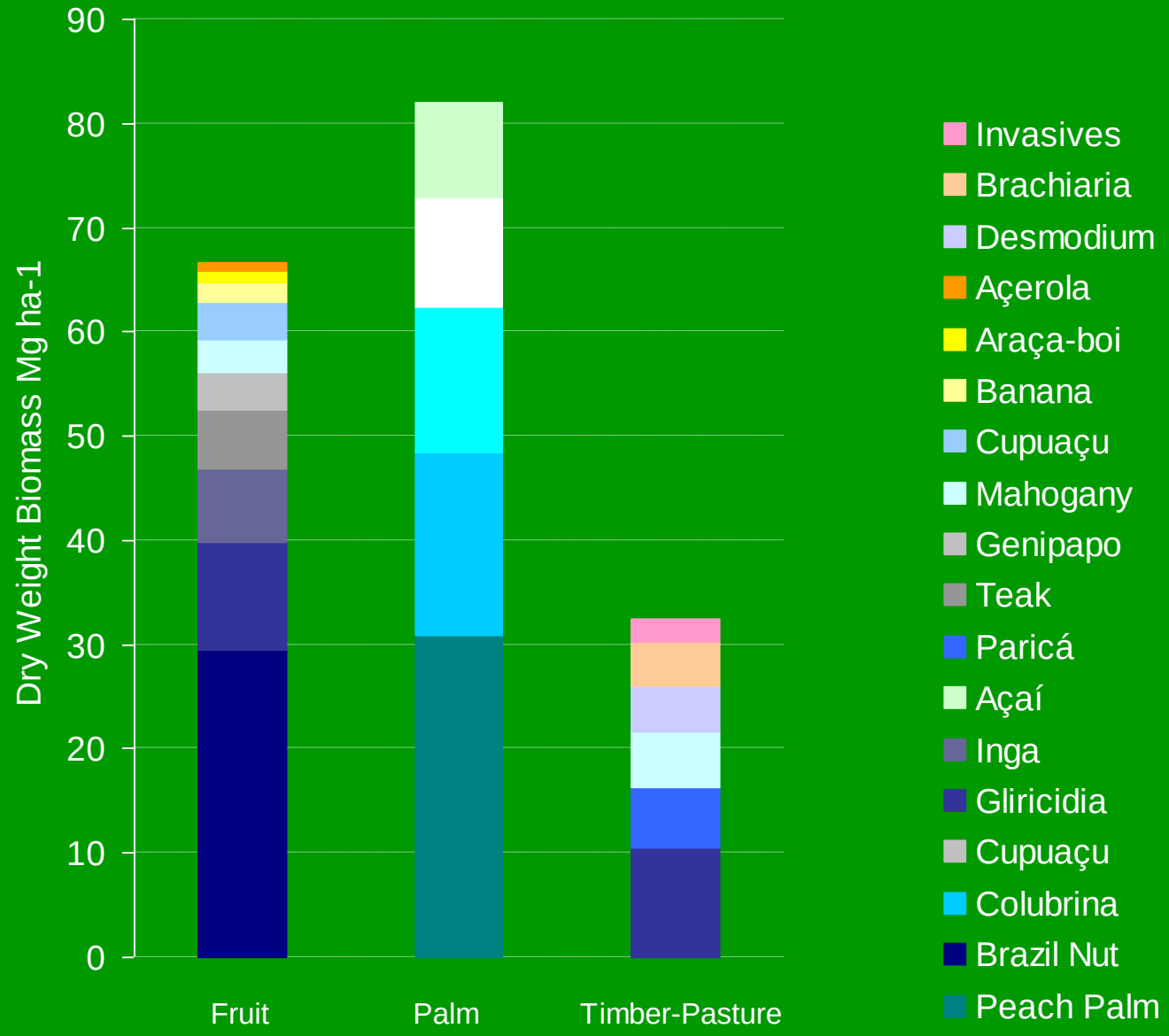
Planted Mahogany

2003



1998

Aboveground Biomass in 9-yr-old Agroforests



Wandelli, McCaffery, Rondon, Fernandes (submitted)

Biomass and Carbon Stocks

System	Biomass Mg ha^{-1}	Rate Mg ha^{-1} yr^{-1}	Carbon Mg ha^{-1}	Carbon Mg ha^{-1} yr^{-1}
Palm	82.0	9.1	41.7	4.6
Fruit	66.7	7.4	34.3	3.8
Timber-Pasture	32.5	3.6	16.0	1.8
Secondary Forest	111.9	12.4	53.8	6.0
*Simple AFS				5.0 – 9.0
*Complex AFS				2.0 - 4.0
*Pastures				-0.2 - -0.6

Florestas 0.55-0.85 Mg/ha C/yr – Y. Mahli

*Source: Sanchez 2000

Butterfly diversity & PES in an agroforestry landscape in Esparza, Costa Rica






"INTEGRATED SILVOPASTORAL APPROACHES FOR ECOSYSTEM MANAGEMENT " CIPAV, CATIE, y NITLAPAN

Index by land uses and its potential for carbon sequestration and conservation of biodiversity

#	Land use	Index Carbon	Index Biodiversity	Total index
2	Degraded pasture	0	0	0
3	Native pasture without trees	0,1	0,1	0,2
8	Live fences	0,3	0,3	0,6
11	Fodder bank	0,3	0,5	0,8
14	Native pasture high tree density*	0,5	0,5	1,0
20	Improve pasture high tree density*	0,6	0,7	1,3
23	Young secondary vegetation	0,6	0,8	1,4
24	Riparian forest	0,8	0,7	1,5
27	Secondary forest	0,9	1,0	1,9
28	Primary forest	1,0	1,0	2,0

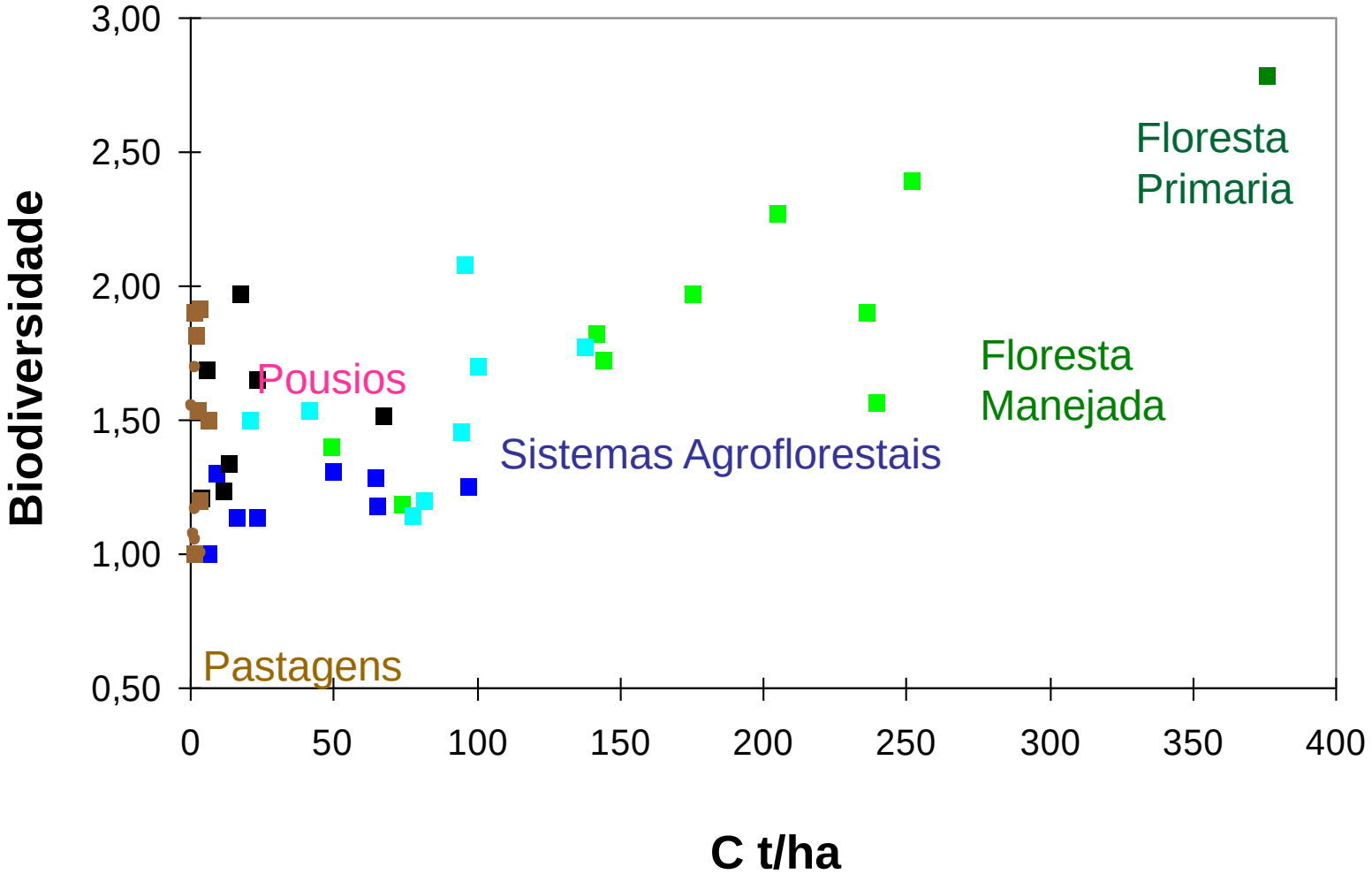
* > 30 tree ha^{-1}

Use of GIS for monitoring land use changes

Tradeoffs Analysis

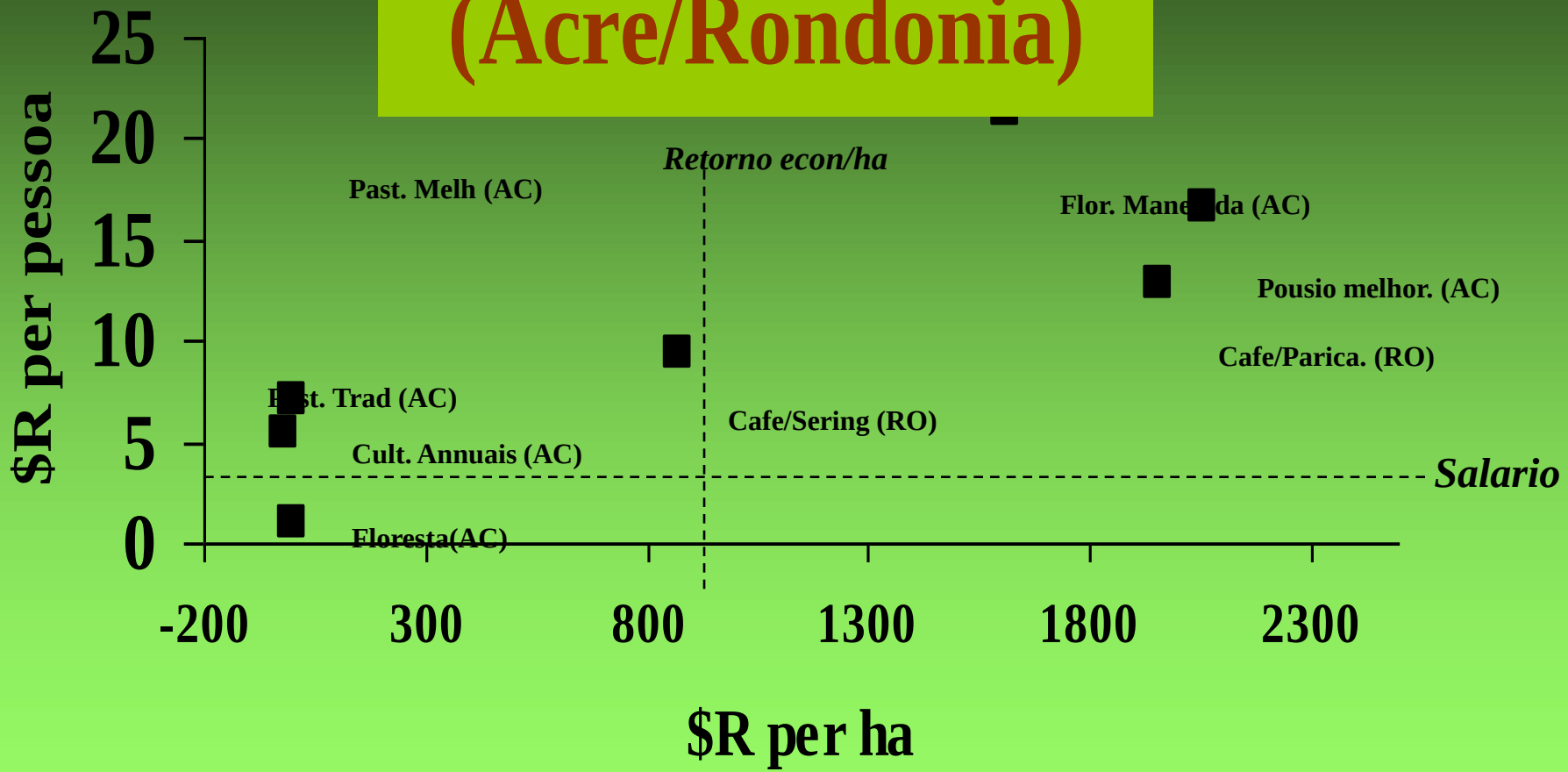
- Quantitative and semi-qualitative, cross-sector analysis.
- Compare and contrast a range of land use models/systems.
- Possibility of coupling such analyses to spatial tools to test scaling-up/down hypotheses.

Carbono e Biodiversidade



Gillison and Palm, 1998

Retorno Economico (Acre/Rondonia)



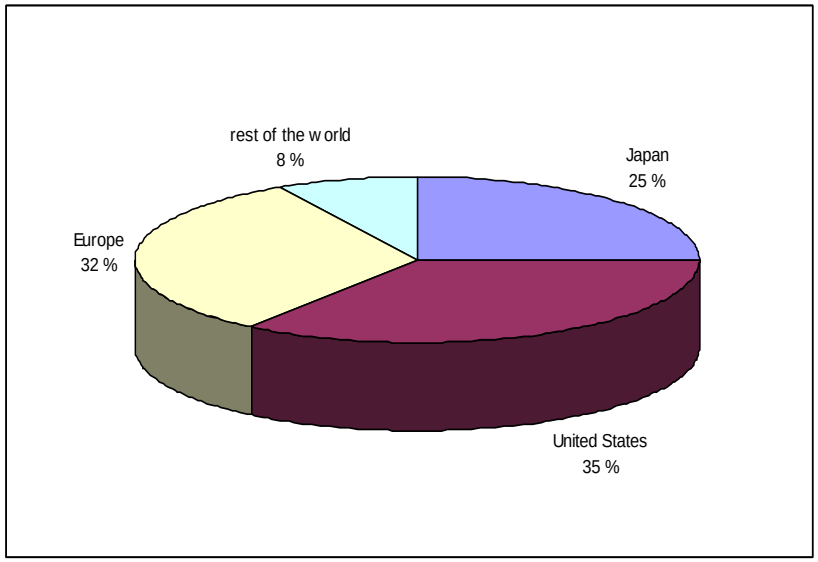
Vosti, Witcover, and Carpentier 1998.

	GLOBAL ENVIRONMENTAL CONCERNS		AGRONOMIC SUSTAINABILITY[b]			NATIONAL POLICYMAKERS' CONCERNS		SMALLHOLDERS' CONCERNS / ADOPTABILITY BY SMALLHOLDERS	
LAND USE SYSTEMS	Carbon storage	Bio-diversity	Plot-level production sustainability			Potential profitability[c]	Labor require-ments	Returns to Labor[c]	Household food security[d]
	Above-ground tC/ha (time-averaged)[a]	Above-ground plants (#species per standard plot)	Soil Structure	Nutrient Export	Crop Protection	Returns to Land (private prices) R$/ha	Labor (person-day/ha/yr)	$/person-day (private prices)	Entitlement Path (Operational Phase)
Forest	148	80	0	0	0	-2	1	1	na
Managed Forestry	~148	nm	0	0	0	416	1.22	20	$
Coffee/ *Bandarra*	56	27	-0.5	-0.5	-0.5	1955	27	13	$
Coffee/ Rubber	56	16	-0.5	-0.5	-0.5	872	59	9	$
Traditional Pasture	3	10	0 to -1	-0.5	-0.5 to -1	2	11	7	$ + consumption
Improved Pasture	3	nm	0 to -1	-0.5	-0.5 to -1	710	13	22	$ + consumption
Annual/ Fallow	7	34	0 to -0.5	0 to -0.5	-0.5 to -1	-17	23	6	$ + consumption
Improved Fallow	~3-6	26	0 to -0.5	0 to -0.5	-0.5 to -1	2056	21	17	$ + consumption

Health Enhancing – Functional Foods: Opportunities for strengthening the Sector and enhancing livelihoods in Developing Countries?

The demand for functional foods

- Global: past annual growth rate of about 10 % (value)
- The current market value estimate: from US$31 billion to nearly US$61 billion



- Expected to grow to US$ 167 billion by 2010 – 13% a year
- Overall food sector: 2% annual growth rate

Japan:

- Market share: US$4-15 billion
- Expected growth rate: 12%

EU:

- The market share about 1% - more than US$15 billion (of US$1-1.5 trillion)
- Expected growth rate: 15%

US:

- About 3% - US$15-19 billion (of US$500 billion)
- Expected growth rate: >6%

Global organic market:

- US$36 billion (2005)
- Growth rate: past 15%, expected to continue at nearly 13%

Source: Riikka Rajalathi, ARD

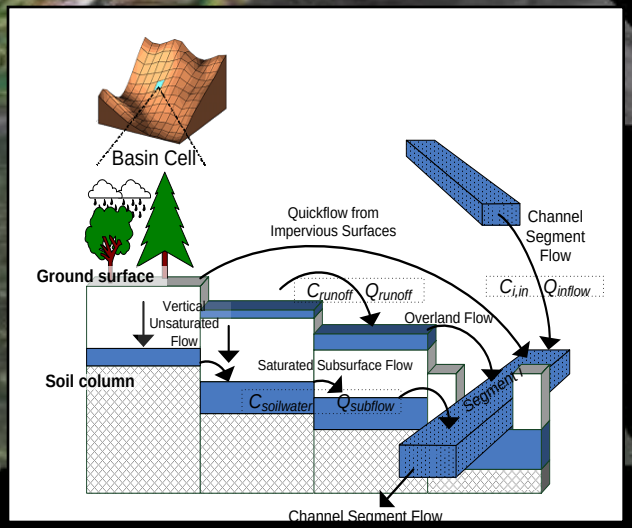
"DYNAMIC INFORMATION FRAMEWORK (DIF)"

….noting especially issues of data gaps……..

(Transboundary) Political Boundaries

Landuse/Landcover

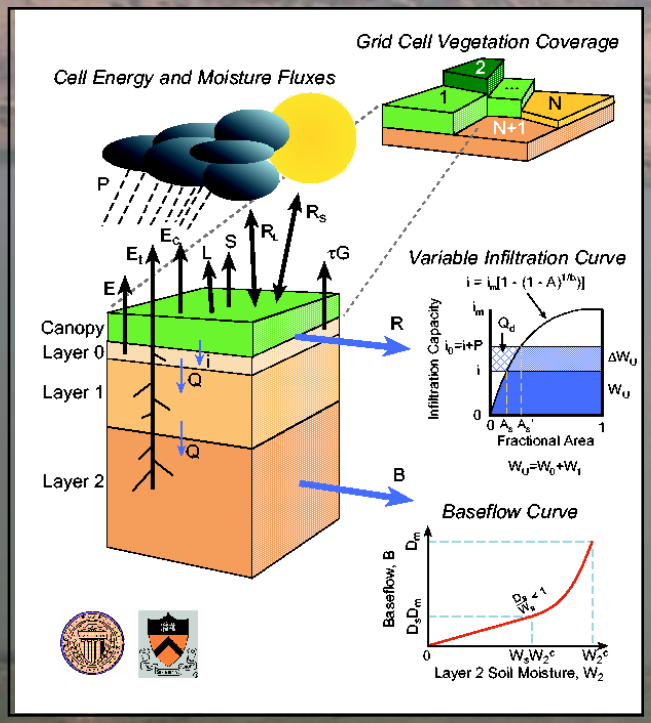
Physical "Template"



Richey, Gillison, and Fernandes, 2007

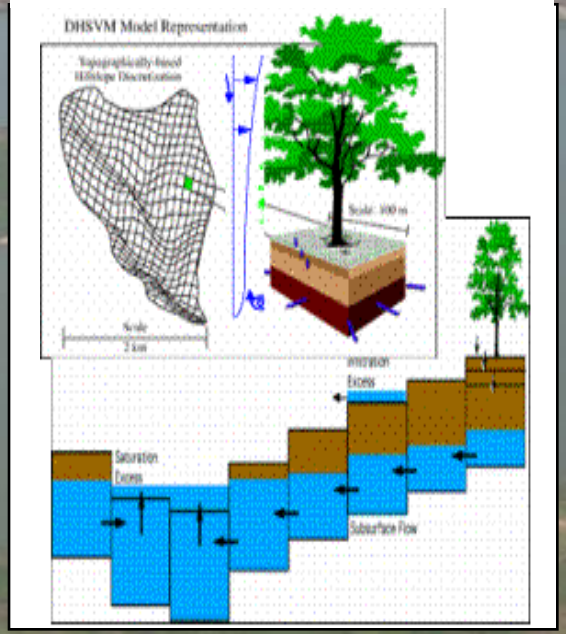
DISTRIBUTION OF WATER ACROSS THE Zambezi

VIC *
(Variable Infiltration Capacity)



*extensive literature in international peer-review

DHSVM (Distributed Hydrology Soil Vegetation Model) (150m)

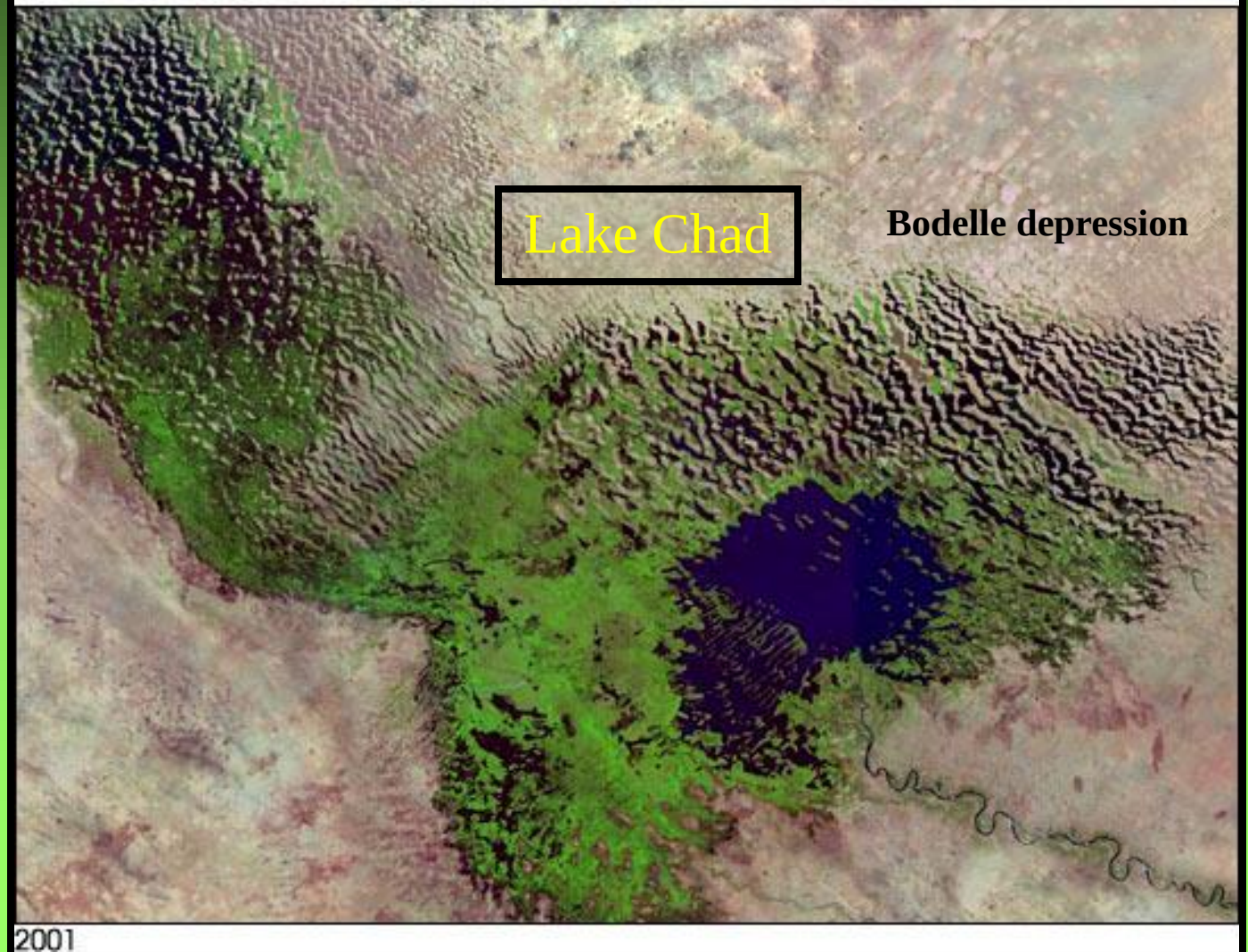


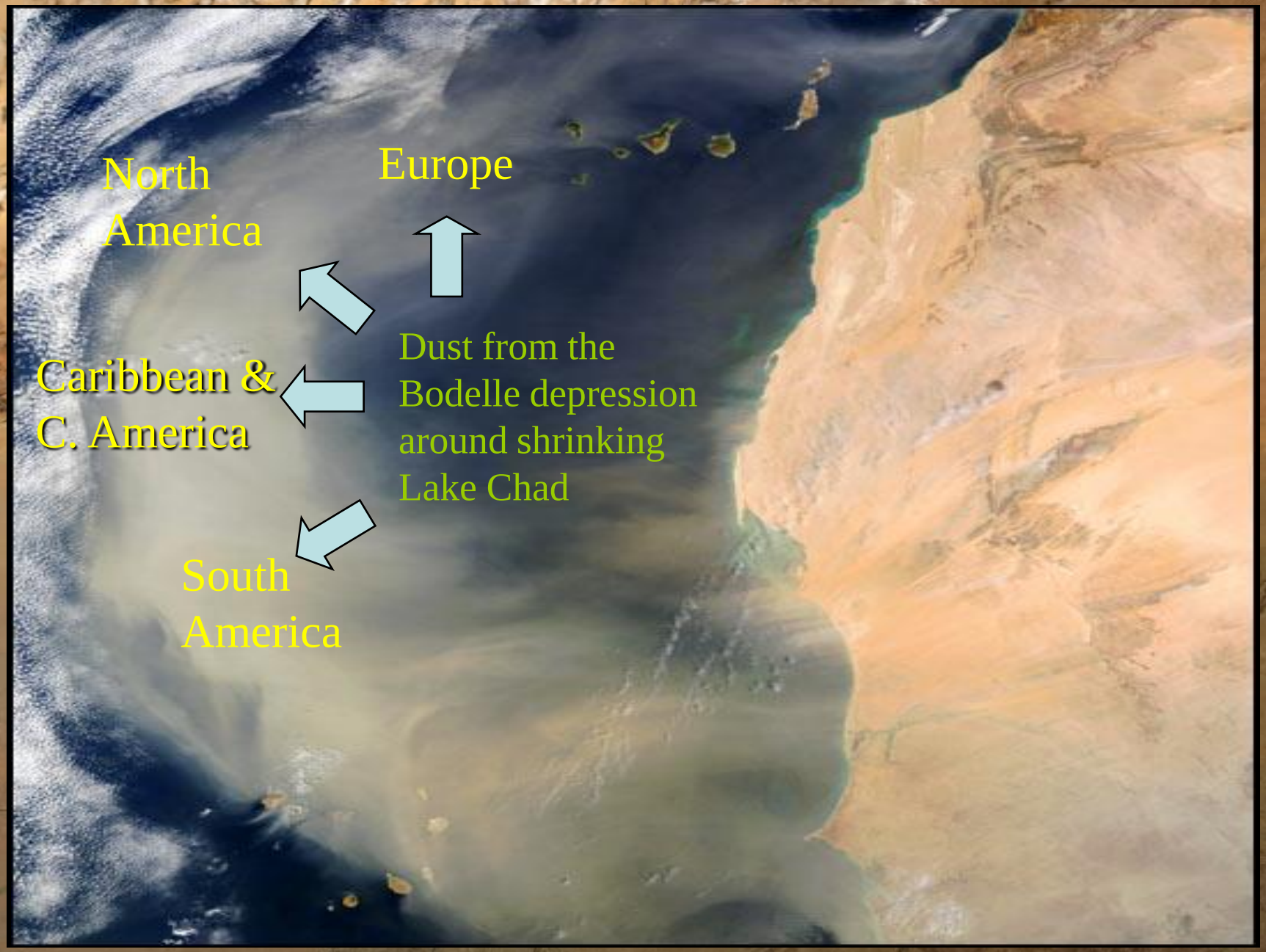
Beyond the Amazon

- Far field effects
- Dust and aerosols
- Pathogens
- Forced Migrations….

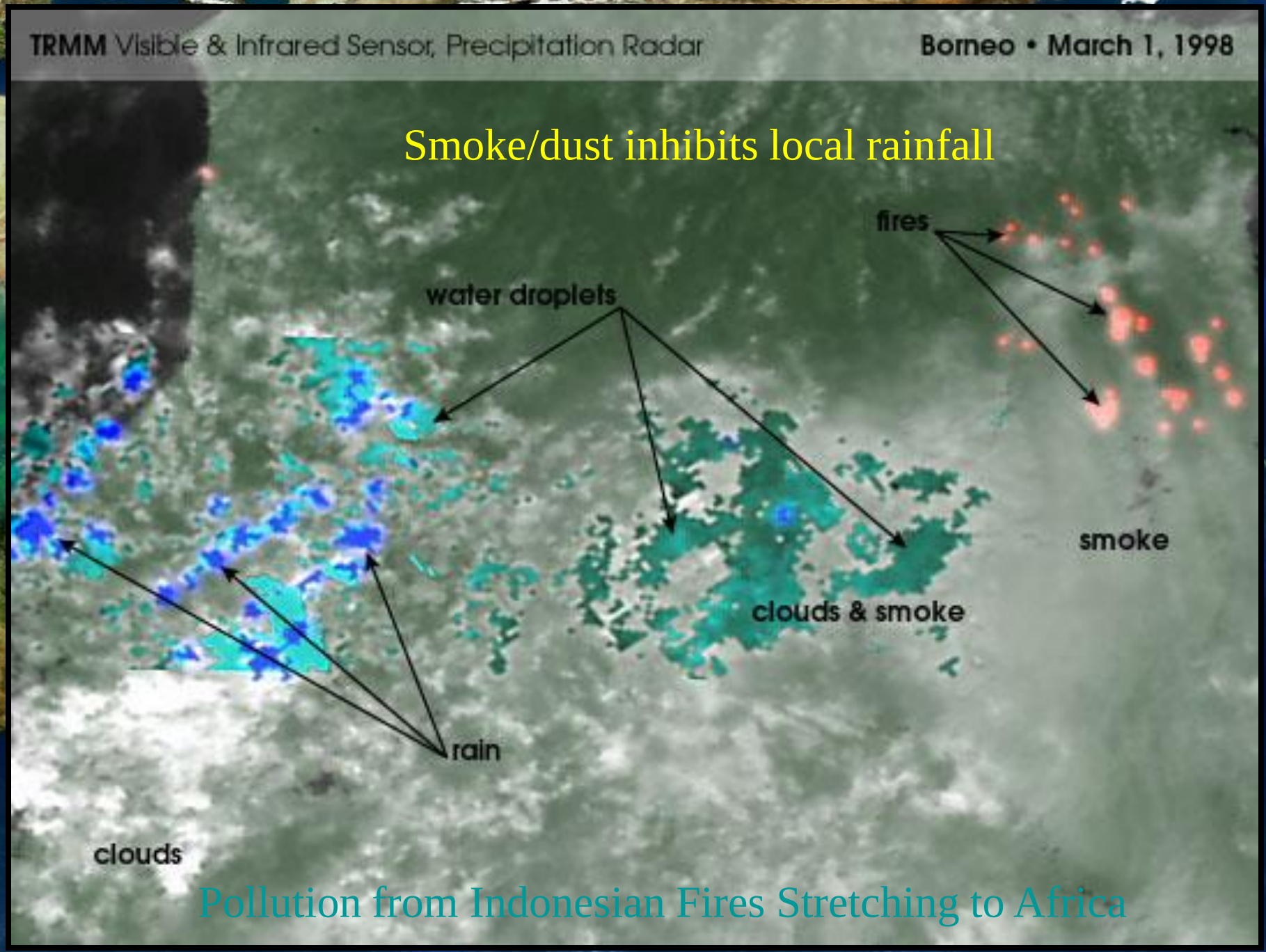
Since Kili's glaciers and snow fields were first mapped in 1914, 85% of the snow cap has been lost. Current estimates suggest total loss by 2015


1973
1987
1997

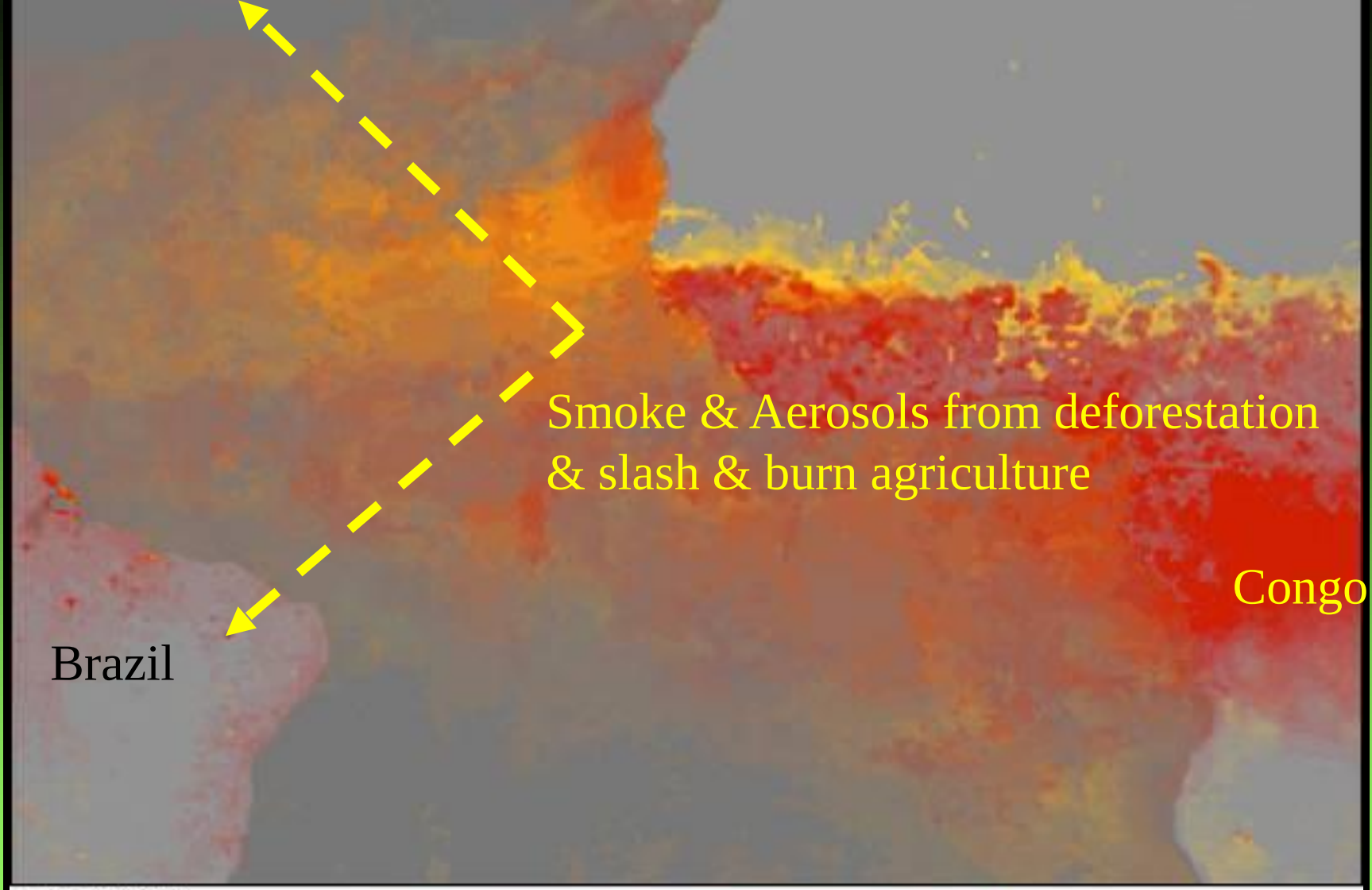

Lake Chad
Bodelle depression
2001

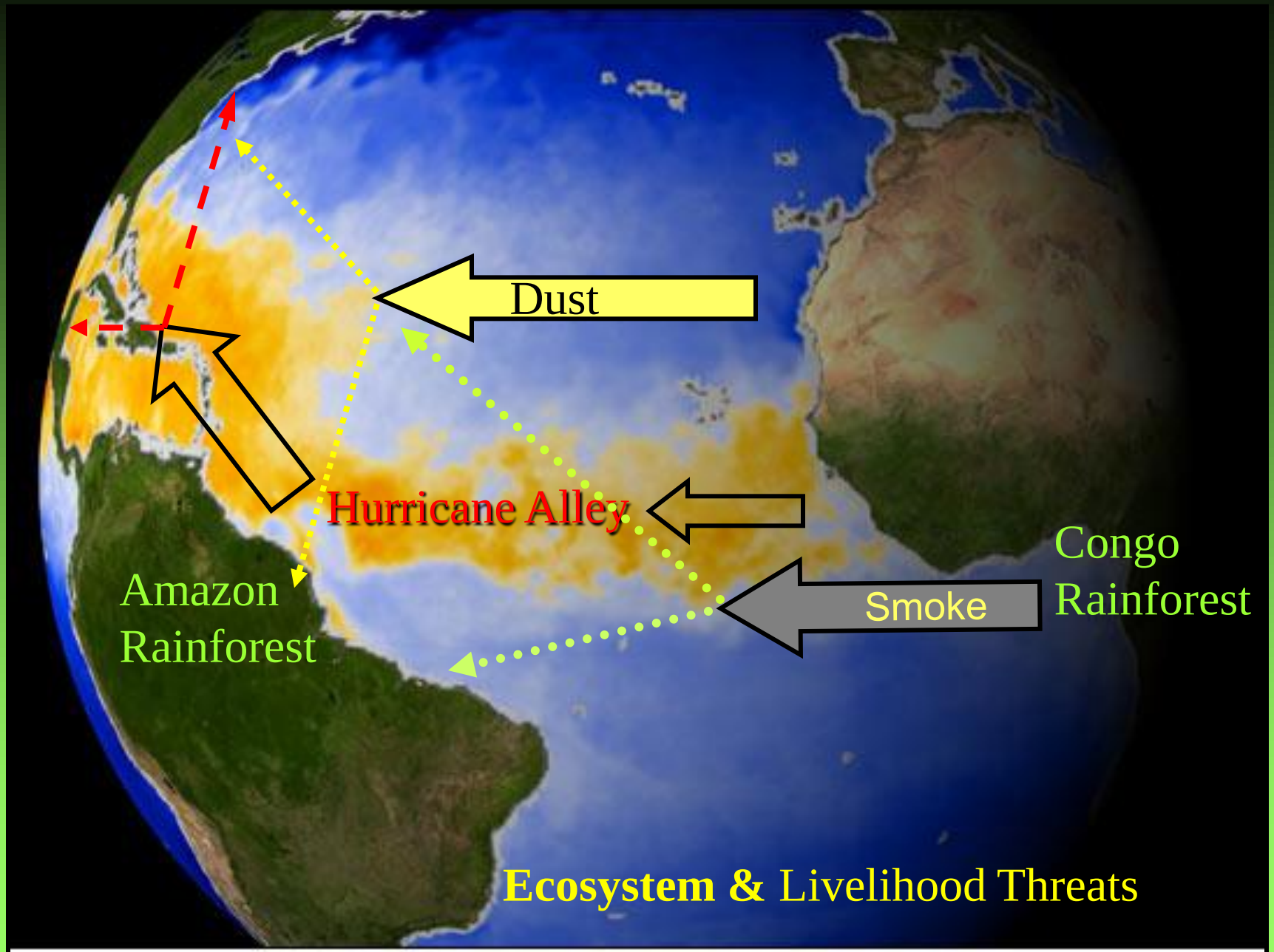


NASA Earth Observatory



Pollution from Indonesian Fires Stretching to Africa


Smoke & Aerosols from deforestation
& slash & burn agriculture
Congo
Brazil
June 6, 2004
small
mixed
large
Fine
Particle
Fraction
0
0.2
0.4
0.6
0.8
1.0
Aerosol Optical Depth


Dust
Hurricane Alley
Amazon
Rainforest
Congo
Rainforest
Smoke
Ecosystem & Livelihood Threats
Sea Surface Temperature (°C)
-2
28
35

Food & Ecosystem Services

- Well nourished, healthy populations
- Robust and resilient agroecosystems in stable landscapes
  - Hilltops & riparian areas protected
  - Native biodiversity conserved & enhanced
  - Invasive species controlled & removed
  - Landscape hydrological functions restored
- Plant productivity enhanced to fix and sequester C and augment sinks for other GHGs

Ecosystem Services Valued

- State of the art cropping systems (varieties, inputs, best management)
- Diverse food and fiber systems that also provide nutritious foods, protect high potential crop lands and maintain a diverse range of ecosystem functions (hydrology, C sequestration, biodiversity conservation)
- Rehabilitated productivity of degraded lands for diverse food and fiber systems and ecosystem services

Scale Issues

- Impacts of human activities and natural disturbances on C pools
  - Large-scale land use & land cover changes
  - Extreme events (floods, droughts)
  - Increasing atmospheric CO_2
  - Fluctuating temp & precipitation?
- Ecosystem services (local to global)
- Social benefits?

Resumindo…

- A significant Amazonian science and natural resource management knowledge base already exists.
- Organize it to provide Decision Support to Policy Makers
- Increase food productivity on the "best" land and protect the existing forest against fragmentation.
- Diversify agroecosystems to protect food systems, improve diets, minimize risks, diversify incomes, and conserve agrobiodiversity
- Rehabilitate productivity and ecosystem functions of degraded lands to enhance environmental roles (C sequestration, environmental flows, biodiversity habitats)
- Strengthen local institutions and community-driven natural resource management for managing the expanding scale of shocks, stresses, and global trade